# Consilience

Interdisciplinary Communications 2005/2006





Willy Østreng, editor

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Interdisciplinary Communications 2005/2006

#### Centre for Advanced Study in Oslo

The Centre for Advanced Study (CAS) is an independent private foundation. It was established by the Norwegian Academy of Science and Letters in 1989, but its activities did not commence in full until the autumn of 1992. Its purpose is to promote basic research and interdisciplinary theoretical research on the highest international academic level within the humanities/theology, the social sciences/law and the natural sciences/ medicine/mathematics. The Centre's academic activity is of a long-term nature and is to be permanent and academically independent vis-à-vis political and economic influences and the influence of research policy.

Outstanding researchers from Norway and abroad are nominated for one-year stays to engage in research in the Centre's premises in the Norwegian Academy of Science and Letters' mansion in Oslo. The activities are organized in three groups - one in the humanities, one in the social sciences and one in the natural sciences – each with from six to ten members whose affiliation is long-term. In addition come numerous researchers who spend shorter periods conducting research, altogether some 40-45 researchers of 10 to 15 nationalities a year. Each group is planned and organized around a unifying theme and headed by one or two recognised Norwegian researchers. The groups have no other obligations than their own research. They receive administrative and financial support from the Centre in formalized cooperation with six Norwegian universities and one high-level research college, i.e. the University of Oslo, the University of Stavanger, the University of Bergen, the University of Tromsø, the Norwegian University of Science and Technology in Trondheim, the Norwegian University of Life Sciences in Ås and Norwegian School of Economics and Business Administration in Bergen. The Centre has a Board appointed by the Norwegian Academy of Science and Letters, the Norwegian Association of Higher Education Institutions and the Research Council of Norway. The day-to-day operation of the Centre is handled by a four-member administrative staff.

Centre for Advanced Study at the Norwegian Academy of Science and Letters Drammensveien 78 NO-0271 Oslo Norway

Telephone: +47-22 12 25 00 Fax: +47-22 12 25 01 E-mail: cas@cas.uio.no Internet: http://www.cas.uio.no

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## Research groups 2005/2006

#### Statistical Analysis of Complex Event History Data

Group leaders:

Professors Odd O. Aalen and Ørnulf Borgan, University of Oslo

Survival and event history analysis denote a set of statistical methods used to analyse and describe life times, durations and more complex event histories. It is the traditional tool for analysing incidence and prognosis of cancer and other chronic diseases, but is also of importance in fields like demography, social science, economics, and technical reliability. Although a large body of theory and methods exists, the methodology for analysing complex event histories, with many events and concomitant information (covariates) measured at the entry to the study and during the follow up, is still not well developed. One example would be a clinical study where success of a treatment cannot only be measured by survival, but also by how the course of the disease develops, e.g., with respect to periods of remission and quality of life. The purpose of the project at the Centre for Advanced Study was to contribute to the development of statistical methodology for complex event history data. In particular the aim was to

- study connections with modern methods of causality
- study methods that account in a realistic way for unobserved heterogeneity
- study methods for proper inclusion of high dimensional gene expression data in the analysis of survival and event history data
- develop alternatives to the commonly used Cox regression that are better suited to handle dynamic covariates and time-varying covariate effects
- · develop useful summary measures of complex event histories

#### **Narrative Theory and Analysis**

Group leader: Professor Jakob Lothe, University of Oslo

No human culture can emerge without defining itself by means of the telling of stories. We understand ourselves, our fellows, and our lives by incorporating them into narrative accounts. Investigations into various forms of narrative have contributed to the development of narrative theory. This growing body of knowledge now plays an essential part in a wide range of academic disciplines. The basis for the project was literary studies, yet the research team studied not only verbal but also filmic fictions as well as historical narratives. A main premise for the team's understanding and application of 'narrative theory' is that narrative theory and analysis are, and should be, closely interrelated. Although narrative analysis has sometimes been seen as a purely formalist and technical activity, the project was committed to the view that how a narrative is structured and understood (by both its creator and its interpreter) has fundamental interpretative and moral significance. The main questions and issues explored by the research team were divided into two problem

areas: first, analysis of modernist narrative, concentrating on Joseph Conrad and Franz Kafka; second, theoretical exploration of narrative, focusing on the relationship between fiction and history. Modernist fiction, and not least that of Conrad and Kafka, presents a particular challenge to the study of narrative: it is the product of the epistemic break of the turnof-the-century, which generated an aesthetic break and a problematization of realistic narrative premises. As regards the second problem area, the team concentrated on narrative representations of and responses to the Holocaust. Narrative representations of the Holocaust may be autobiographical as well as fictional. Studying examples of both, the team focused on the complex and shifting relationship between past and present selves as presented in first-person autobiographical and fictional Holocaust narratives.

#### Environmental Economics: Policy Instruments, Technology Development, and International Cooperation

Group leader: Professor Michael Hoel, University of Oslo

The advantages and disadvantages of various types of environmental policy instruments are well understood under simplifying assumptions about how the rest of the economy works. However, the real world is much more complex than simple economic models often assume. Once one introduces more realistic assumptions about how an economy works, our knowledge about the properties of various types of environmental policy instruments is much less than it is under the simplifying assumptions. The purpose of the project was to increase our understanding of the properties of several types of environmental policy instruments. The analyses done in the project included several important features of the economy that are often ignored in previous analyses. In particular, the group considered

- Pre-existing distortionary taxes
- · Endogenous technology development
- Dynamics, irreversibility and time consistency
- Non-competitive firms
- International trade
- Transboundary/global environmental problems
- Limited rationality, altruism, and social interdependency of preferences

#### CAS' annual book series on interdisciplinarity

In the academic year of 2003/2004 CAS commenced the publication of a long-term series of books on multi- and interdisciplinary research and communication. The books are based on weekly luncheon seminars closely related to on-going research in which the Fellows of the Centre are invited to make presentations of their scientific specialities to a mixed bag of humanists, social scientists and natural scientists. In this multidisciplinary setting unexpected results have emerged.

As part of the dispersion policy of CAS, the books are distributed free of charge to a wide readership – nationally and internationally – extending far beyond the ranks of experts.

Book series: Interdisciplinary communications, Centre for Advanced Study, Oslo, ISSN: 0809-8735

The following books have been published and are available from CAS:

Willy Østreng (ed): *Synergies. Interdisciplinary Communications 2003/2004*, Centre for Advanced Study, Oslo, January 2005, 112 pages, ISBN: 82-996367-2-8 (A few copies are still available)

Willy Østreng (ed): Convergence. Interdisciplinary Communications 2004/2005, Centre for Advanced Study, Oslo, December 2005, 178 pages, ISBN: 82-996367-3-6 (Copies are still available)

Willy Østreng (ed): Consilience. Interdisciplinary Communications 2005/2006, Centre for Advanced Study, Oslo, January 2007, 144 pages, ISBN: 978-82-996367-4-2
(Copies are still available)

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### Foreword

The Centre for Advanced Study (CAS) at the Norwegian Academy of Science and Letters has two overriding long-term objectives. The first is to enhance the quality of Norwegian basic (fundamental) research to the highest international level and standard. Here the call is for specialization and penetration in depth – to benefit basic disciplinary science and scholarship. The other is to promote the same quality and achieve the same level of excellence when it comes to interdisciplinary research. Here the call is for wholeness and integration in breadth straddling disciplinary boundaries without loosing out in depth. The two objectives relate equally to the humanities, the social sciences and the natural sciences, and both are supposed to find expression within and between the three fields of academe.

This book is the result of a series of weekly luncheon seminars in which the fellows of the Centre have been invited to make presentations of their respective specialties aiming of fostering a multidisciplinary dialogue and exchange between the groups and across disciplinary delineations. Three groups were in action throughout the academic year of 2005/2006. The humanists addressed the relationship between *Narrative Theory and Analysis*, the social scientists aimed at developing a deeper understanding of *Environmental Economics* giving special attention to the role of *policy instruments, technology development* and *international cooperation*, whereas the natural science group were concerned with *Statistical Analysis of Complex Event History Data* (See presentations on blue pages).

It turned out that a central theme of discussion in the seminars concerned differences and overlaps in methods and approaches. The social and natural scientists had a common denominator in quantitative methods and mathematically based statistics, whereas the methodological device of the humanist group was that of qualitative assessments and interpretations. Here 'objective' facts stood against 'subjective' meaning. This made up a diversified and varied basis for intellectual interchange of ideas between partly contrasting research cultures, highlighting their pros and cons, flaws and strengths. In this post-positivist friendly 'battle of cultures' the call from within the humanist group was for literary studies to become more concerned with methodology aiming at committing text reading to a higher degree of scientific systematization (See second article by Anniken Greve).

To provide an overall synthetic perspective to the book, the editor has contributed an introductory article on *Reductionism versus Holism* – *Contrasting approaches?*, arguing that there are no insurmountable ideological or practical contradictions between reductionism and holism in scientific synthesis. What is required to succeed is *curiosity* to explore what is on the other side of the 'fence', *courage* to jump over it and *willingness* to make investments in terms of time and effort after touch down.

For the first time in the short history of this book series, all articles have been peer reviewed and adjusted to preserve a reasonable standard of popularization without compromising the high standards of sound scientific and scholarly research and reporting. Altogether, six nationalities took part in this evaluation process. CAS has two hopes for the book. First, to extend the internal multi-and interdisciplinary discussions of the groups to a wider readership – nationally as well as internationally – and to ease communication between readers and authors by providing the e-mail addresses of the authors. Second, and closely related to the first point, we want to contribute to break down the alleged "ivory tower of basic research" by dispersion of a scientifically reliable book written to appeal to readers beyond the realm of pure experts.

Happy Reading!

Oslo, January 2007

Willy Østreng Scientific Director and Editor

#### Acknowledgement

This booklet involves the work and involvement of many individuals. Bjarne Røsjø, project leader at Faktotum Informasjon A/S has effectively coordinated the work process between the designer, CAS and the printer, whereas Ketill Berger at *dEDBsign* is responsible for the attractive design of the book. The language editing has been competently done by our external language consultant Linda Sivesind at Informatic Translations, whereas Unn Hagen at CAS has invested long hours in a most conscientious proof reading process. Marit Finnemyhr Strøm has - as always - assisted where and when need be. A special thank goes to Maria Sætre who has taken care of all the organisational and planning matters involved in producing the book. As such, she has had the function of an assistant editor. She is also responsible for having taken all the nice-looking portraits of the authors and for making the proofreading process thorough, smooth and effective. The referees - whose names for obvious reasons cannot be disclosed - took time off from hectic workdays to ensure the popularized scientific quality of the publication. Last but not least, the Board members of the Centre should be commended for forging a book policy that complies with the strict scientific standards enshrined in the overall objectives of the Centre. To all these individuals - named and unnamed - the editor would like to express his deep appreciation.

## Reductionism versus Holism – Contrasting Approaches?

In the afternoon of 7 May 1959, Dr. Charles Percy Snow entered the prestigious rostrum of the Senate House at the University of Cambridge to deliver the annual Rede lecture. His address on 'The two Cultures and the Scientific Revolution' unleashed – much to his own surprise – one of the fiercest discussions among natural scientists and humanists in the 20th century. What provoked the most was Snow's contention that a gulf of misinterpretations existed between the two ruling knowledge-producing cultures of modern science – the literary intellectuals and the natural scientists. C.P. Snow – by training a scientist, by vocation a writer – held that the two cultures had a curious distorted image of each other based in

profound mutual suspicion and incomprehension, and that their attitudes were so different that, even at the emotional level, they could not find much common ground. In his opinion, the literary intellectuals regarded the scientists as being unaware of Man's condition, whereas the latter assumed the former to be totally lacking in foresight and

#### Scientific Director and Editor Willy Østreng

Centre for Advanced Study at the Norwegian Academy of Science and Letters willy.ostreng@cas.uio.no



"anxious to restrict both art and thought to the existential moment" (C.P. Snow, 1959, p. 5). These imageries made the feelings of the one culture, the anti-feeling of the other, and produced hostility rather than fellowship between them. What was worse: The prospects of this hostility-gap ever being bridged seemed bleak indeed, and history, in Snow's mind, provided no source of inspiration or comfort. In the late 1920s, the two cultures managed a kind of frozen smile across the gulf. In 1959 the politeness had gone and they just made faces (C.P. Snow, 1959).

C.P. Snow regarded this situation to be all destructive – a sheer loss to the creativity of science. To close the gap between the two cultures was, in his mind, a necessity in the most abstract intellectual sense, as well as in the most practical. He was convinced that since the two senses had grown apart, no society was going to be able to think with wisdom.

#### Multiplicity of cultures

Snow's intervention is still a matter of academic debate. Although there is a growing awareness in many research circles that there is a greater need than ever to address holistic processes and problems, researchers are still 'making faces across the gulf'. One inescapable fact straining the topicality of the matter, is that the number of scientific cultures has multiplied since the time of Snow. The two main cultures have grown into four, as the social and technological sciences have taken on their own distinct cultures, deviating to a certain extent from those of the humanities and the natural sciences. More importantly, the four mother cultures have

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split into numerous specialized branches as disciplines and sub-disciplines have multiplied many times over in recent decades. These specialties form their own sub-cultures which may press against the overall culture of the discipline of which they form part, and may pose a threat to its unity. A modern discipline is thus composed of clusters of specialties that form individual micro-environments where most research and professional communications take place. Is this to say that reductionism has got out of hand and made holism a distant and even unrealistic dream?

#### **Reductionism and holism**

In reductionism, the reference is to the classical Newtonian assumption that the dynamics of any complex system can be understood from studying *the properties of its parts*. Complex systems are therefore broken down into their components and each piece is studied individually by way of disciplinary and sub-disciplinary approaches. The challenge is to find the entry points from where to address the particulars of the system. Once one knows the parts, the dynamics of the whole can be derived. In general, scientists have been so successful in applying this method that instead of reverting back to see how their discoveries fit in with totality, they have continued to dig deeper into their specialties, continuously narrowing the focus of their research.

The concept of holism has many connotations, applications and uses - even non-scientific ones. The reference in this article is to the methodological version in which the relationship between the parts and the whole is believed to be more symmetric than in reductionism. The assumption underpinning this approach is that the properties of the parts contribute to our understanding of the whole, but the properties can only be fully understood through the dynamics of the whole. The research focus in holism is on the relationships between the components, i.e. on their interconnectedness, interdependencies and interactions. In holism, the whole is more than or different from the sum of its parts. Consequently, breaking complex systems down into their individual components by the method of reductionism is only a first approximation of the truth, and while it may afford many useful insights, it behoves scientists to put the pieces together again by way of holism. The call is for interdisciplinarity and for bringing the multiple specialities contained in disciplines together in what can be labelled intradisciplinarity.

It stems from the differences in focus that there are no automatic or necessary contradictions between the two 'isms'. The one focuses on the *properties of parts*, the other on the *relationship between them*. Put together, they stand out as supplementary rather than conflicting, as inclusive rather than exclusive.

This notwithstanding, interdisciplinarity has never taken firm root in the disciplinary organization of academia. The organizational scheme of universities is still based in disciplinary departments, leaving the holistic approach to university centres perceived by many to be *at* the universities not *of* them. This difference has made disciplinary work the highway to academic acclaim, whereas interdisciplinarity has been the back road to, at best, congregational praise.

#### Reductionism versus Holism – Contrasting Approaches?

#### Disciplinarity, intradisciplinarity and interdisciplinarity

As stated by Julia Thompson Klein, to picture the relationship between disciplinarity and interdisciplinarity as a double impasse, and as a fixed choice between one or the other, is to oversimplify the creative interplay that has produced changes in the nature of both (J.T. Klein 90, p. 103). This acknowledgement has given rise to the concept of disciplined interdisciplinarity that moves outward from mastery of disciplinary tools. Interdisciplinary work depends totally on highly specialized learning, not so much on universal knowledge. This is why disciplinary specialties have been labelled "the first principle of science (B.R. Clark, p. 342)". Here disciplinarity is the foundation on which synthesis is constructed. By moving across the vertical plane of depth and the horizontal plane of breadth, the latter connotes the comprehensive approach based in multiple variables and perspectives, whereas the former connotes competence in pertinent disciplinary, professional and interdisciplinary approaches. Thus, synthesis connotes creation of interdisciplinary outcome through a series of integrated actions (J.T.Klein, 96, p.212). In integrative processes, the two approaches are intertwined, and inseparable as the two sides of a coin. What then is the scope and extent of integration?

There are scientists convinced that the holistic approach will ultimately result in a grand theory of everything (Wilson, 99), and there are those launching compelling arguments against, stressing the viability of mid-range integrative theories (Wilbur, 00). Whatever the outcome of this disagreement in the future, both parties agree that holism offers an integral vision that provides "..considerably more wholeness than the slice-and-dice alternatives. We can be more whole or less whole, more fragmented or less fragmented; more alienated, or less alienated – (but) an integrated vision invites us to be a little more whole, a little less fragmented in our work (Wilber, p.xii)."

The mutual inclusiveness between reductionism and holism is not to deny that the two approaches have differences in agendas and that the disciplinary pull can be a serious barrier to fostering interdisciplinarity in practice. Among the many hurdles to be overcome are the multiplicities of sub-disciplinary terminologies that, in extreme cases, may seem impenetrable to specialists coming from the outside. This being said, the only prescription to succeed, is to get even with the 'Tower of Babel', theoretically, methodologically and conceptually. Indeed, this is time consuming. Therefore, confusion, frustration and incomprehension are frequent feelings among members of boundary-straddling teams, not least at the commencement of projects. The temptation is to revert back to the comfort and safe haven of ones own domestic territory and leave foreign territories to those who are motivated to make sense of them.

#### Summing up

The important thing in our context is not to deal with the plentiful hurdles to be overcome in inter- and intradisciplinarity, but to demonstrate that there are no philosophical, ideological or practical contradictions between reductionism and holism in scientific synthesis. What is required to bridge Snow's 'gulf of misinterpretation' is the *curiosity* to explore what is on the other side of the 'fence', the *courage* to jump over it, and the *willingness* to make deliberate and patient investments in terms of time and effort after

#### Reductionism versus Holism – Contrasting Approaches?

touch down. This sequence of curiosity, courage and willingness will produce wholeness of some mid-range sort, if not in terms of a grand all-inclusive theory.

The richly varied thematic contributions to this book are interdisciplinary in three respects: First, because most of them are specialist products, representing the first and fundamental step in synthetic integration, i.e. in disciplinarity/sub-disciplinarity. Second, because they all have been the object of multi-specialist attention and discussion. Third, because some of them are in fact intra- and/or interdisciplinary in approach and expression.

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## Literary Innovation and Childhood Trauma

This short essay is part of a book I recently finished, *Crises of Memory and the Second World War.*<sup>1</sup> Under "crisis," Roget's thesaurus lists the following nouns, among others: critical time, key moment, turning point, pressure, predicament. In speaking of crises of memory, I have all those meanings in mind. "Crisis" and "criticism" have the same Greek root: *krinein*, to discriminate, to choose. A crisis of memory is a moment of choice, of discrimination and sometimes of predicament or conflict as concerns the remembrance of the past, whether individual or collective. On the collective side, one example would be the ways that the period of the

Occupation in France has been interpreted and narrated ever since the

Liberation; on the individual side, the problem concerns the vicissitudes of memory and testimony and the relation between autobiography and fiction.

My subject here is experimental writing by child survivors of the Holocaust, those I have called the

"1.5 generation", i.e. people who were

Professor Susan R. Suleiman Department of Romance Languages & Literatures, Harvard University, USA E-mail: suleiman@fas.harvard.edu CAS Fellow 2005/2006



too young to have had an adult understanding of what was happening to them, but old enough to have *been there* during the Nazi persecution of Jews (as opposed to the second generation, born after the war). It is only relatively recently, in historical terms, that the concept of "child survivor of the Holocaust" has emerged as a separate category for scholarly attention, just as it is relatively recently that child survivors themselves have integrated it into their consciousness. Widespread use of the term "child survivor," in the psychological literature as well as by organized associations of child survivors, started around the early 1980s and has gained momentum in the past two decades.

Almost without exception, Jewish children in Europe during the war experienced the sudden transformation of their world from at least some degree of stability and security to chaos: moving from a familiar world to new environments, alone or with strangers, having to learn a new name and new identity, learning never to say who they really were – these were among the "everyday" experiences of Jewish children who survived the war. Only 11 percent of Jews in Europe who were children in 1939 were still alive at the end of the war.<sup>2</sup>

Of course, it can be said that not only children (and not only Jews), but all those who were persecuted by the Nazis experienced feelings of bewil-

<sup>1:</sup> Cambridge, MA: Harvard University Press, 2006.

<sup>2:</sup> Debórah Dwork, *Children with a Star: Jewish Youth in Nazi Europe*, New Haven: Yale UP, 1991, p. xxiii.

#### Literary Innovation and Childhood Trauma

derment and helplessness, not to say massive trauma, during the war. But the specific experience of Jewish children was that disaster hit them before the formation of stable identity that we associate with adulthood, and in some cases before any conscious sense of self. Since the majority survived in some form of hiding, they were obliged to cover over or "forget" their Jewishness, thus complicating an already fragile identity; for children in assimilated Jewish families, who didn't have a sense of Jewishness to begin with, this involved the bizarre simultaneity of becoming aware for the first time of an identity and having to deny it at the same time.

There are an impressive number of contemporary writers, writing in a wide array of languages, who were children or adolescents during the Holocaust and who have dealt with that experience in their works. The Franco-American novelist Raymond Federman, who dates his "birth" from the moment when his whole immediate family was rounded up by French police and deported to Auschwitz, leaving him the sole survivor at age fourteen, has observed: "My life began in incoherence and discontinuity, and my work has undoubtedly been marked by this. Perhaps that is why it has been called experimental."<sup>3</sup> What is the relation between experiment and existence, when existence starts out with a fracture?

Despite the fact that all of his creative works revolve around his childhood trauma, Federman was known for many years chiefly as an American avant-garde writer and theorist, and that was how he presented himself as well. His theoretical statements of the 1970s omitted any reference to personal experience. In a 1983 interview, however, he invoked personal experience as the source and even as the subject of his fiction: "I think that it's true of all fiction writers. [...] that they have to invent for themselves a way of distancing themselves from their subject. [...] And yet, paradoxically in my case, the more complex the system of distancing becomes the closer I seem to be getting to my own biography."<sup>4</sup>

Federman's statement has important implications both for the psychology of childhood trauma and for the experimental writing of the 1.5 generation. He has made use, in his novels, of the full panoply of distancing devices, including a boisterous humor even when – or especially when – treating the most painful subjects. His first novel, *Double or Nothing* (1971) is a brilliant work. Federman has explained that he began it as a series of handwritten notes for a novel, and only gradually discovered that the notes were themselves to be the substance as well as the form he was seeking. He ended up with a manuscript which looked like a verbal collage and yet conveyed the picaresque tale, in fractured form, of a young French Jewish immigrant to America who had lost his whole family during the war.

The book has two opening chapters, the first of which is titled "This Is Not a Beginning" and begins this way:

Once upon a time (two or three weeks ago), a rather stubborn and determined middle-aged man decided to record (for posterity), exactly

Federman, "A Version of My Life – The Early Years," *Contemporary Authors*, vol. 208, 2003, p. 118.

Larry McCaffery, "An Interview with Raymond Federman," Contemporary Literature, 24:3, 1983, pp. 299–300.

#### Literary Innovation and Childhood Trauma

as it happened, word by word and step by step, the story of another man (for indeed what is GREAT in man is that he is a bridge and not a goal), a somewhat paranoiac fellow (unmarried, unattached, and quite irresponsible), who had decided to lock himself in a room (a furnished room with a private bath, cooking facilities, a bed, a table, and at least one chair), in New York City, for a year (364 days, to be precise), to write the story of another person – a shy young man about 19 years old ...<sup>5</sup>

and so on to the bottom of the page in a single sentence that contains, in summary form, not only the narrative we are about to read but also the whole past history of the young man whose story in America will be told by the "paranoiac fellow" who plans to shut himself in a room for a year. Although the traditional opening formula, "once upon a time," promises a tale of adventure told by a single narrator in chronological mode, the tale told here will be that of a writing project involving at least three narrative "persons" whose relationship is ambiguous; and the march of linear time will be replaced by the meanderings of retrospection and prospection.

The large number of parentheses that pepper these first few lines continue down the page, both prolonging the sentence and impeding its progress. Postponement is the basic principle of this novel, as of many others by Federman. The effect is to make the reading more difficult, as well as to call attention to the act of telling. It can also often be humorous, as it is here; however, the humorous effect is in jarring contrast to the past history of the young man, which is evoked briefly on this opening page:

his parents (both his father and mother) and his two sisters (one older and the other younger than he) had been deported (they were Jewish) to a German concentration camp (Auschwitz probably) and never returned, no doubt having been exterminated deliberately (X-X-X-X).

The four X's that mark the extermination of his family are a typographical sign Federman uses throughout his works. In one sense, the X's repeat what has already been said ("exterminated deliberately"), and are therefore redundant. In another sense, they are conventional signs of erasure, and also function as cover-ups for the names of the parents and the sisters, which are not given either here or elsewhere in this book.<sup>6</sup> Commenting on these X's in an autobiographical essay, Federman wrote: "For me these signs represent the necessity and impossibility of expressing the erasure of my family."<sup>7</sup> More recently, he has stated that he sees the writer's task as "the subtle and necessary displacement of the original event (the story) towards its erasure (the absence of story)."<sup>8</sup>

The paradoxical combination of an *excess of communication* (redundancy) and a *lack of communication* ('exing-out', covering up) creates an elaborate

<sup>5:</sup> Federman, *Double or Nothing: A Real Fictitious Discourse*. Chicago: Swallow Press, 1971. Subsequent page references are to this edition.

<sup>6:</sup> In more recent works, Federman has evoked his family in some detail, but always in fragments that one needs to piece together from novel to novel.

<sup>7: &</sup>quot;A Version of My Life - The Early Years," p. 119.

Federman, "The Necessity and Impossibility of Being a Jewish Writer," http://www.federman.com/rfsrcr5.htm

#### Literary Innovation and Childhood Trauma

structure of saying and unsaying (or qualifying) what one has just said. Roland Barthes called this kind of speech "le bredouillement," a stammering or sputtering.<sup>9</sup> When a speaker or a machine sputters, it is a sign that something is not quite right. It is significant that the "sputtering" in *Double of Nothing* occurs most strikingly at the moment when the word CAMPS appears in the text (in capital letters). At that point, the horizontal movement of reading breaks down completely, and we have large white spaces between words. The white spaces signal emptiness, a disruption or arrest of speech, but they also reinforce the meanings of reduction and abandonment associated with deportation.

I propose to call the paradoxical figure of affirmation and denial, of saying and not saying, by its rhetorical name: preterition. The emblematic form of preterition is a sentence of the type "I will not speak about X," where X is named and designated precisely as the thing that will not be said. The most radical figure of preterition is doubtless the sentence: "I must forget about X" – and that is exactly the sentence we find at almost the very end of *Double or Nothing*, in the context of Jewish identity and of the protagonist's name:

(I don't like Dominique. I've never liked Dominique) Too effeminate not Jewish enough (<u>you can't avoid the facts</u>) But we must forget about that about the Jews the Camps (p. 181)

You can't avoid the facts, but we must forget about that: Preterition, the self-contradictory figure of approach and avoidance, affirmation and negation, amnesia and remembrance, is, I would propose, an emblematic figure for writing about childhood trauma and about the early experience of loss and abandonment. How to say it while not saying, or while saying in pieces: Federman's whole oeuvre is a series of variations on the crucial event that is both everywhere and yet nowhere recounted in straightforward fashion in his books.

Barthes: "Le bruissement de la langue," in Le bruissement de la langue, Paris: Seuil, 1984, pp. 99–102.

#### Introduction

Economic geography was a largely neglected area of economic theorising until Paul Krugman re-established the field by publishing his short monograph "Geography and Trade" in 1991. He showed how mathematical tools known from modern models of international trade theory can be used to explain the distribution of economic activity in geographical space. The advantage of his approach compared with the earlier literature was the use of comprehensive economic models in which the concept of geographical space was linked to that of general economic equilibrium. The result is a theory that does not rely on *ad hoc* arguments and heuristics

to explain spatial patterns of economic activity, but instead builds on a selfcontained modelling framework.

One of the major objectives of my stay at CAS was to use this framework to explain spatial patterns of pollution and population. I conjecture that there are three such patterns that are ideal or 'pure':

#### **Professor Michael Rauscher**

Chair of International Economics, University of Rostock, Germany E-mail: michael.rauscher@uni-rostock.de CAS Fellow 2005/2006



- concentration, i.e., a geographical pattern where the most populated regions are the most polluted ones, e.g. big cities such as Shanghai, Mexico City, or Los Angeles;
- the separation of pollution and population, the example being nuclear power stations, which are usually located in peripheral regions with low population densities;
- dispersion, i.e., a pattern where people and pollution are evenly distributed in space.

Of course, these ideal patterns will not be observed in reality in their pure forms (e.g. perfect separation or complete concentration), but nevertheless these concepts are useful as benchmarks to which real-world situations can be compared.

## Elements of modern economic geography: Two workhorses, centrifugal and centripetal forces

The main task of a model of economic geography is to generate microeconomic foundations for two forces: centripetal forces, which lead to concentration of economic activities (production and consumption) in geographical space, i.e., agglomeration, and centrifugal forces, which induce economic activities to move away from the agglomerations. This is achieved by using mathematically tractable models of demand, supply and trade. In economic geography, this is achieved by two modelling

'workhorses': so-called Dixit-Stiglitz preferences and melting-iceberg transportation costs. See Fujita et al. (1999) and Baldwin et al. (2003) for overviews.

Simple models of economic geography look at a world consisting of two regions, called 'the East' and 'the West' in the remainder of this paper. People are mobile between East and West and their mobility costs are neglected. There are two commodities, an agricultural good, which for the sake of brevity will not be considered explicitly in the following presentation, and a manufactured good. The manufactured good is potentially available in infinitely many varieties which are close substitutes for each other from the point of view of consumers (e.g., different types of cars). The preferences are modelled such that the ideal world from the representative consumer's point of view is one in which she can choose from a continuum of infinitely many varieties. A formal model to represent this was introduced by Dixit and Stiglitz (1977). This model is one of the two workhorses of modern economic geography. According to Dixit and Stiglitz, the invention and introduction of a new variety into the market involves a high fixed cost, which the consumer must ultimately bear. Thus, there is a trade-off between diversity and low prices. Consumers are willing to give up some diversity if they get fewer products at lower prices. In the end, only a limited number of varieties will be supplied. This generates the possibility of gains from trade. If *n* varieties are available in the East and  $n^*$  varieties in the West, trade between the two regions makes it possible for each consumer to choose among  $n+n^*$ varieties. The second workhorse in the economic-geography literature is melting-iceberg transportation cost. Albeit introduced into modern economic theory by Paul Samuelson (1954), the original contribution dates back to the German economist Johann Heinrich von Thünen (1842), who argued that horses pulling carriages of grain from the rural areas to the city are fed with grain from the carriages. Thus, the transportation cost is simply a share of the value of the transported commodity and a transportation sector does not have to be modelled. Transportation cost in connection with the Dixit-Stiglitz approach of love of diversity and fixed cost of production generates centripetal and centrifugal forces that affect the spatial patterns of production (location of firms) and consumption (location of mobile citizens).

- Centripetal forces in this simple modelling context are related to what Fujita et al. (1999, p. 346) call "thick markets". Since transportation is costly, people want to live in the region in which many commodities are produced. Moreover, producers benefit from locating close to where the majority of the consumers live. Thus producers attract consumers and consumers attract producers.
- The centrifugal forces are related to congestion. If the number of consumers in a region is large, this raises the prices of domestically produced goods, which are not affected by transportation costs. This makes the region less attractive to potential immigrants. The other centrifugal force is environmental pollution. People do not like to live in areas where polluting industries are concentrated. On the supply side, the concentration of production in a region will increase the demand for inputs in this region and thus factor prices and production costs.

There are additional centripetal and centrifugal forces in more complex models of economic geography, which allow, e.g., for linkages across firms (See Fujita et al., 1999, p. 346).

#### The impact of the environment and of environmental regulation

The standard models of economic geography can be extended by taking into account the environmental impact of production activity. Thus, environmental regulation has two effects. On the one hand, tight environmental regulation raises production costs and reduces the economic competitiveness of the region implementing such regulation. On the other hand, people benefit from less pollution and, *ceteris paribus*, prefer to live in less polluted regions. Thus consumers like to be geographically separated from producers who generate environmental harm. Let us consider three cases:

- 1. All factors of production are immobile. Production capacities are installed in a region and can be relocated only at some cost in the long term. In the short term, these capacities are fixed.
- Capital is mobile. This is the longer-term view in which capacities can be relocated from one region to the other. Note that capital owners do not have to live in the region where their factors are employed.
- 3. Workers are mobile. In a mobile-workers' model, the owner of a factor of production (the worker) must live close to the place where her factor (labour) is employed. This restricts flexibility and generates results that are different from those obtained for a world in which factors and their owners can be separated geographically.

#### Some results

In a first step, consider a scenario in which factors of production are immobile, but their owners are mobile. People like to live close to the producers if environmental problems are minor and if transportation costs for manufactured goods are high. Stricter environmental regulation can lead to inward or outward migration. Outward migration is the result if the dominant effect of environmental regulation is to raise the cost of production. If the increase in cost is dominated by the environmental effect, however, the region using stricter environmental policies becomes more attractive and there will be inward migration. An interesting result turns up if we look at optimal environmental regulation. In most economic models of environmental regulation, the government of a jurisdiction has no incentives at all to take transfrontier spillovers of its domestic pollution into account and, as a consequence, environmental policy will be too lax. This is different in the economic-geography model with mobile residents. If people can freely choose where they want to live, there will be a migration equilibrium determined by the fact that potential migrants are equally well off in both regions. Thus, well-being in the neighbouring jurisdiction determines the well-being of domestic citizens. This forces the domestic government to take foreign well-being into account and, therefore, to care about cross-border pollution spillovers. Finally, as a last result, I was able to show that all three patterns - concentration, hot spots and dispersion – are possible. (See Rauscher, 2005).

The second case is that of mobile capital. Capitalists do not have to live at the location where their source of income is employed. They choose

their location of residence on the basis of environmental quality and consumption possibilities. If the environmental impact of production is severe, they prefer to live in a non-industrial region. If the environmental impact of production is minor, they prefer to live close to where production takes place. Producers, in contrast, always like to be close to consumers. They benefit from large local markets since there are transportation costs. As a consequence, we obtain two patterns that I call 'agglomeration' and the 'chase' (See Figures 1 and 2). In each figure, there is a kinked line indicating that producers are unwilling to relocate if the sizes of the two markets are equal or if 100 per cent of production capacity is in the region where population density is higher. Otherwise, they relocate to the more densely populated region. Factor owners are characterised by the other indifference line, which may slope upward or downward. If environmental harm or environmental concern is small, then this line will slope upward. People want to live close to the places where the goods they want are produced. Ceteris paribus, however, they avoid congestion. People move to the East if many people live in the West. This is the horizontal component of the dynamics depicted by the arrows in Figures 1 and 2. In Figure 1, the complete dynamics composed of the horizontal and the vertical components point to agglomeration: the industry wants to be close to consumer and the consumers want to be close to the industry. In Figure 2, however, environmental concern is large and the mobile residents' indifference line is negatively sloped. The result is the 'chase', i.e. a situation in which, again, the industry wants to be close to the consumers, but the consumers flee the industry.



The third scenario is the mobile workers' model, i.e. factor owners have to live where their factors are employed. In this case, we have the Krugman-type economic-geography model with agglomeration. As long as environmental problems are not too severe, economic activity tends to be concentrated in one region. Workers benefit from high wages and low commodity prices if they move to agglomerations. Matters are different if environmental harm is substantial. Then workers do not like to live in agglomerations. However, production is impossible without workers living in the vicinity of the plants. The result then is dispersion: in a world of two symmetric regions, 50 per cent of the population and 50 per cent of industry are located in each region. Thus, it appears that consideration for the environmental impact of production mitigates agglomeration forces. As a final result, one can show that changes in environmental regulation may have a dramatic impact on the regional patterns of production in

situations with agglomeration. Small changes in environmental regulation may make agglomeration equilibria vanish. For example, a stable agglomeration equilibrium with 80 per cent of the population living in one region and 20 per cent living in the other disappears and, as a result, the patterns of agglomeration are reversed so that workers and producers move to the other region.

#### Extensions

My recent work with Edward Barbier has concentrated on combining models of economic geography with bioeconomic approaches to biodiversity (See Rauscher/Barbier, 2006). We look at endemism versus redundancy of species and develop conditions for the establishment of protected areas, where production activities are completely prohibited. It is shown there that the bioeconomic categories of endemism and redundancy interact with the economic-geography parameters, resulting in agglomeration and dispersion. Further research in this area is underway.

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## **Cost-Benefit Analysis Meets Participatory Democracy**

Cost-benefit analysis provides an important but contested approach to the evaluation of environmental policies. In the United States, cost-benefit analysis was introduced in the 1930s to ensure that public investments in dams and water projects yielded returns comparable with private-sector investments (Porter, 1995, ch. 7). Since 1981, all new and revised U.S. federal regulations must be evaluated using cost-benefit analysis under a set of administrative procedures first implemented by Ronald Reagan (Smith, 1984). Critics, however, charge that cost-benefit analysis is inconsistent with the principles of democratic governance. The purpose of this essay is to consider this claim and its potential resolution.



Professor Richard Howarth Environmental Studies, Dartmouth College, USA E-mail: Richard.Howarth@dartmouth.edu CAS Fellow 2005/2006

Most people accept the view that observed market prices provide a measure of the benefits that people derive from market goods and services. Cost-benefit analysis extends this reasoning to gauge the value people attach to collective goods. It is wellknown, for example, that homes located in neighborhoods with good

air quality and access to high-quality natural areas command higher prices than otherwise identical homes lacking these amenities. Based on such observations, economists have developed an ingenious set of methods for inferring the value of non-market goods using data from markets for housing, employment, and so forth (See Pearce, 1993). The idea is that people's preferences are revealed by the presumably rational choices they make in contexts where their well-being is directly at stake.

More controversial is the contingent valuation method, in which people's willingness to pay for non-market goods is measured using surveys and interviews. This approach is the only tool available to determine the monetary magnitude of so-called 'non-use values', i.e. people's willingness to pay for public goods from which they personally derive no tangible benefit. To give one example, Hagen et al. (1992) found that U.S. households were willing to pay an average of \$144 per year to conserve the old-growth forest habitat of northern spotted owls in the Pacific Northwest. This holds true despite the fact that most Americans have no plans to ever visit this part of the country or the unique ecosystems that would be conserved. With a total of 94 million households, Hagen et al.'s study suggests that spotted owl conservation would yield total benefits of some \$14 billion per year – a figure that is substantially higher than the costs that conservation would impose through reductions in commercial timber supplies.

On what grounds might cost-benefit analysis be characterized as undemocratic? Authors such as Dryzek (2000) interpret democracy

#### Cost-Benefit Analysis Meets Participatory Democracy

as a system of governance through which decisions are taken through a process that strongly emphasizes public debate and deliberation. Advocates of this view claim that active engagement within civil society is essential if citizens are to refine their personal value judgments and reach "workable agreements" (Dryzek, 2000, p. 170) that represent an effective synthesis or accommodation between different points of view. In this perspective, democracy is a mechanism through which members of society reach consensus on the norms and values that should guide public decisions and the relationships between private-sector actors. Such social values are conceptually distinct from the mere aggregation of the consumer preferences held by individual persons.

In his seminal book *The Economy of the Earth*, Mark Sagoff (1988, ch. 4) compares the contingent valuation method to a jury trial in which the presiding judge asks each juror to provide his or her private opinion regarding the defendant's innocence or guilt after hearing only a brief synopsis of the case. After interviewing each juror, the judge decides the case by comparing the number of votes cast for the verdicts of 'guilty' and 'innocent.' According to Sagoff, this approach is problematic for two key reasons:

- 1. Forming meaningful judgments regarding complex and unfamiliar issues the facts of a criminal indictment or the merits of conserving spotted owls requires immersion and participation in an information-rich environment.
- 2. In a U.S. criminal trial, the case is decided through a deliberative process in which jurors quite literally must reach consensus on the core facts of the case and their moral and legal significance.

A substantial empirical literature supports the hypothesis that people often do not hold the kind of settled value judgments that would be required to provide robust estimates of willingness to pay for goods with non-use values using contingent valuation (see Vatn, 1994). Subtle changes in the wording of a survey or in the information provided to respondents can have marked impacts on the substantive results of a valuation exercise. Bateman and Mawby (2004), for example, showed that even the interviewer's attire can make a difference – willingness to pay increases when the respondent is approached by a better-dressed interviewer.

To address this set of difficulties, authors such as Brown *et al.* (1995) have called for the use of deliberative valuation, an approach in which small groups of individuals are charged with the tasks of: (a) reviewing and discussing the facts and values that pertain to the provisioning of a particular public good; and (b) reaching agreement on the maximum amount of money that society should spend to procure this good through the expenditure of public funds. This approach is illustrated by the work of Gregory and Wellman (2001), who employed deliberative groups to explore social willingness to pay for the restoration and enhancement of ecosystem functioning in the Tillamook Bay estuary in coastal Oregon. In a similar vein, James and Blamey (2004) used deliberative valuation to gauge social willingness to pay for the conservation of ecological resources in the Australian national park system.

Deliberative valuation differs from conventional cost-benefit analysis in two key respects. First, while cost-benefit analysis assumes that people have pre-existing preferences that can be measured using non-market valuation methods, deliberative valuation assumes that value judgments

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are socially constructed through civic engagement. Second, while costbenefit analysis calculates total benefits to society by simply adding up the benefits accruing to each individual, deliberative valuation emphasizes the importance of reaching a consensus that balances the distinct values and preferences of each participant. As Howarth and Wilson (2006) demonstrate in an analysis that combines elements of democratic theory and cooperative game theory, the deliberative approach flows logically from the premise that individuals should have a right to participate in the development of public policies and to consent to the solutions that are arrived at through collective engagement. Moreover, Howarth and Wilson show that deliberative valuation and conventional cost-benefit analysis can yield different policy recommendations under plausible and well-defined circumstances. While this area of research is currently in its initial stages, such findings point to the fruitfulness of linking the methods of nonmarket valuation with the principles of participatory democracy.

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Are consumers as selfish as economic theory has traditionally assumed? Substantial evidence indicates that they are not: A large body of experimental evidence has demonstrated that many are willing to share with others, and to contribute to public goods, to a much larger degree than predicted by the standard *Homo Oeconomicus* model.<sup>1</sup> However, the evidence also indicates that individuals' generosity is highly conditional: In some contexts, most people seem to behave selfishly; in others, they don't.<sup>2</sup> One possible explanation is that individuals' generosity depends upon their perceived moral obligation to contribute, and that feelings of moral duty are context-dependent.

If so, it is of interest to study what triggers, or deteriorates, individuals' feeling of moral responsibility. There are presumably a large number of such factors.<sup>3</sup> Here, I will focus on voluntary contributions to improving the quality or quantity of public goods (such as clean air or a stable climate), and ask whether information about

#### Senior Research Fellow Karine Nyborg

The Ragnar Frisch Centre for Economic Research, Norway E-mail: karine.nyborg@frisch.uio.no CAS Fellow 2005/2006



*the social importance* of potential contributions can affect such contributions through their impact on perceived moral obligations.<sup>4</sup>

#### Information campaigns: Why care?

Many environmental and social problems can be solved through the use of policy instruments such as taxes, subsidies, tradable emission permits, or direct regulations. Nevertheless, such instruments cannot always be used efficiently. If it is impossible to observe and verify actions that cause harm (or benefit) to others, for example, if one cannot prove *who* poured a hazardous chemical into a river – taxes or prohibitions have no bite. Other obstacles can be caused by limited international cooperation or high administrative costs.

<sup>1:</sup> For overviews, see, e.g., Ledyard (1995), Camerer (2003). *Homo Oeconomicus* is assumed to care only about his own access to public and private goods.

<sup>2:</sup> Some experiments particularly relevant to the present paper are reported in Dana et al. (2004) and Lazear et al. (2005); see also Brekke (this volume).

<sup>3:</sup> Social psychologists have e.g. pointed out the roles of *prescriptive norms*, i.e. perceptions of what others are actually doing, and *injunctive norms*, perceptions of behaviors of which others approve or disapprove (Aronson et al., 2005). *Reciprocity*, the tendency to reward others' (believed) good intentions and punish their bad intentions, also seems very important (see e.g. Fehr and Gächter 2002).

<sup>4:</sup> A formal and more detailed analysis can be found in Nyborg (2006).

In such cases, it may still be possible to influence individual behavior, at least to some extent, by other means. One instrument which seems to be widely used by both central and local government, but which is hardly discussed in the economics literature, is information/attitude campaigns aimed at providing information about the social value of potential contributions. While *Homo Oeconomicus* would be unaffected by such campaigns, I will argue below that information may well increase the contributions from duty-oriented, morally motivated consumers by increasing their perceived moral responsibility.

#### The duty-oriented consumer

The duty-oriented morally motivated individual (Brekke et al., 2003) has a preference for regarding himself as a socially responsible person. He assesses his self-image by comparing his *actual* contributions to what he thinks he *ought to* have contributed. The greater the distance between his actual contribution and his perception of the morally ideal contribution, the lower his self-image. Brekke et al. (op. cit.) assume that dutyoriented consumers determine their morally ideal contribution by asking themselves: "What would happen to social welfare if – hypothetically – everyone acted just like me?" The ideal contribution is that contribution *which would have maximized social welfare*, according to the individual's own judgement, *if everybody had contributed this amount*.

In the next step, the consumer's *actual* behavior is determined by maximizing his utility, engendering a trade-off between consumption and a good self-image. The closer to the ideal behavior he comes, the better his self-image.<sup>5</sup>

In a complex world, each action undertaken by a person might potentially be related to a whole array of social problems; directly or indirectly increasing or reducing these problems. Nevertheless, we are not always aware of these relationships. Below I will assume that a person who is *ignorant* of a social problem, or its relationship to her own actions, behaves as if she *knew* that the problem (or the relationship to her own actions) did not exist.<sup>6</sup>

Imagine, now, that there is a social problem of which our duty-oriented individual is not aware; say, for the sake of being specific, that his car emits a newly discovered chemical that harms the lungs of newborn children, but that these emissions can be avoided by adding some costly component to the gasoline. As long as he does not even suspect the presence of this problem, he will not, of course, buy the cleaning component. The morally ideal contribution is the contribution he would like everybody to make, which is, in this case, zero: If everybody bought the cleaning component, everyone's consumption would be reduced, while he

<sup>5:</sup> While the procedure for determining the morally ideal contribution is inspired by Kant's Categorical Imperative, the duty-oriented individual is not a Kantian, since he is willing to make trade-offs between own consumption and a morally ideal behavior (thanks to Anniken Greve for pointing out this). Our model is rather an attempt to formalize a common 'everyday' moral reasoning. Brekke et al. (2003) provide survey evidence indicating that this reasoning is indeed common.

<sup>6:</sup> The underlying assumption is that an ignorant person does not even consider the possibility that the problem might be there. I thus treat *ignorance* as different from *uncertainty*. This assumption may be questioned, and will be explored in more depth in follow-up work.

believes (erroneously) that no social benefits would result. Thus, his selfimage is at its best even though he contributes nothing; since not contributing is, in this case, judged to be both individually and socially best.

Assume that an information campaign then informs him about the problem. If the problem is important enough, he will now think that ideally, everyone should buy the cleaning component. Hence, if he behaves as before and does not buy the extra component, his self-image is reduced: He is no longer doing the morally correct thing. If, however, he buys the cleaning equipment, he keeps his good self-image but loses consumption. Hence, for a duty-oriented person, new knowledge of this kind can *increase* voluntary contributions; but it *decreases* the individual's utility.

#### **Duty versus altruism**

It is the latter conclusion, i.e., that individual utility can decrease even if contributions are voluntary, which may surprise an economist. Within the most popular economic model for explaining voluntary contributions, James Andreoni's "impure altruism" theory (Andreoni 1990), no such conclusion would emerge. This model assumes that the individual gets a private benefit: "the warm glow of giving", from her own contributions. Let us extend this model to take the *effects* of contributions into account: Assume that the *consequentialist impure altruist* cares about the *welfare effects* of her contributions; she prefers to be important to others.<sup>7</sup> Assume also that like the duty-oriented individual, she is initially ignorant about the hazardous emissions from her car. When receiving information about the problem, she may, too, increase her contributions. There is a crucial difference compared with the duty-oriented individual, however: While the duty-oriented person's utility is *reduced* as a result of the new information, the consequentialist impure altruist's utility increases. Information about the 'new' problem increases her opportunities to be important to others, while she will not, like the duty-oriented, experience the heavier burden of moral responsibility. If she feels that the warm glow is not worth its cost and decides not to contribute, her utility will be as before. Moral duty is not one of her concerns; hence the cold shiver of not giving enough will not bother her.

Starting from a position of ignorance, a consequentialist impure altruist thus has no reason to shy away from seeking information about the world's many problems and what she might do about it: The more problems she knows about, the greater are her opportunities to become even more important. For the initially ignorant duty-oriented person, however, every new problem he becomes aware of may increase the effort required to keep his self-image as a decent person. Thus, while ignorant

Formally, her self-image is proportional to the increase in others' welfare due to her contribution, keeping others' behavior and beliefs fixed (Nyborg 2006, see also Brekke and Nyborg 2006).

consequentialist impure altruists may be willing to pay a positive amount to become informed about possible problems, the ignorant duty-oriented may prefer to *avoid* such information.<sup>8</sup>

#### Conclusion

Information campaigns may increase contributions, but unless information is too costly to obtain individually, there is reason to believe that the campaigns will mainly affect duty-oriented individuals. The consequentialist impure altruist may also contribute more, provided that she is, initially, ignorant. However, since she likes being important and is not bothered by duty, she may already have asked for additional information on her own initiative. The ignorant duty-oriented person, on the other hand, cannot be expected to actively seek information about potential problems on her own. Hence, an important effect of information campaigns can simply be to provide unwanted information to dutyoriented individuals, thus increasing their perceived burden of moral responsibility.

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<sup>8:</sup> Note that for an individual who is aware of the problem, but is uncertain about its true extent (i.e. *not* ignorant, as this concept is defined here), neither the duty-oriented person nor the altruist would unambiguously prefer to seek or avoid information. The duty-oriented person would fear to discover more demanding problems to care about, while the altruist would be afraid to discover that his contribution is less important that he thought.

## **Predicting Patient Survival using Genomic Data**

#### The role of medical statistics

Clinical (medical) research is centered around clinical trials that compare different treatments. The role of medical statistics is i) to design such studies (how many patients etc.), ii) to compare the treatments (is there a significant difference?), iii) to use the data to predict outcome of treatment, and iv) to help to select the best treatment.

In cancer, the main primary outcome is SURVIVAL, if possible adjusted for QUALITY OF LIFE. Survival data are special because *it takes time to observe time*. Hence, the data are always incomplete (censored) and, moreover, the data are dynamic over time.

Special techniques have been developed to analyze survival data. The most well-known are the Kaplan-Meier survival curves and the Cox regression model for survival data. One prime example is given by the following graph (Figure 1) based on data from the Dutch Gastric Cancer Trial (Putter et al., 2005). There, two

Professor Hans C. van Houwelingen Medical Statistics and Bioinformatics, Leiden University Medical Center, The Netherlands E-mail: J.C.van\_Houwelingen@lumc.nl CAS Fellow 2005/2006



different surgical strategies, denoted by D1 and D2 are compared. At first sight there is little difference. Risk avoiders might opt for D1, the less aggressive treatment, because its short term prospects are better, while risk seekers might opt for D2, the more aggressive treatment, which might give better long term survival.



**Figure 1.** Kaplan-Meier plots of the survival curves for D1-and D2-dissection. The survival curves cross after 53 months.

#### **Building prognostic models**

Treatment is usually not the most relevant predictor of outcome. More important are clinical factors such as i) stage of the disease, ii) residual tumor after surgery, iii) subtype of tumor (histology), and iv) condition of the patient (at start of treatment or dynamic during follow-up).

#### Predicting Patient Survival using Genomic Data

The general structure of a prognostic study is

- find out what information is relevant for a prognosis
- define a score (Prognostic Index) that summarizes the information
- use that score to classify patients in prognostic categories
- communicate the relationship between score and prognosis by means of tables or graphs (or interactive software)

One example of such a prognostic model can be found in one of my first papers after I moved into medical statistics in 1986 (Van Houwelingen

et al., 1989). It deals with the prognosis of patients with advanced ovarian cancer. On the basis of the clinical information, six prognostic groups can be distinguished. The survival curves as shown (Figure 2) are obtained from the Cox regression model. They are based on the percentiles of the prognostic index derived from the Cox model (0–10 per cent, 10–25 per cent, 25–50 per cent, 50–75



Figure 2. Survival function for patterns 1-6.

per cent, 75–90 per cent, 90–100 per cent). Thus, for example, the upper curve of the plot is the survival curve of the patients having the most favorable prognosis. The curve implies that in this group approximately 60 per cent of the patients will survive for six years.

Although such studies are popular and useful, the 'predictability' of patient survival should not be overestimated. The differences seen in survival curves are of very limited relevance for the patient. There is a lot

of variation around 'mean survival' within groups with similar prognoses. Instead of showing survival curves, it would be better to give survival margins (prediction intervals). Figure 3 shows the survival of the Dutch ovarian cancer patients as the 25 per cent -75 per cent prediction interval in years per category. For example, in the fourth group (50-75) 25 per cent of the patients will die within one year and 75 per cent will die within 3.5 years, so the prediction interval runs from 1 to 3.5 years.



#### Using genetic and genomic information

Can genetics and genomics help improve prognoses and, hopefully, offer better treatment for patients? Genetics (inherited DNA) is relevant for the susceptibility. (However, cancer is less genetic than most people think). Genomics (RNA, gene expression obtained through micro-arrays that

#### Predicting Patient Survival using Genomic Data

measure the amount of RNA in tissue or serum, proteins measured by mass spectrometry ) might be helpful for prediction. The success story in using gene expression data for prediction is the breast cancer data set of the Netherlands Cancer Institute in Amsterdam (van de Vijver, 2002).

I reanalyzed those data with colleagues in Amsterdam (Van Houwelingen et al., 2006), using statistical methodology one of my PhD students and I developed about a decade ago. The problem with using such data for prediction is that there are many more predictors (gene expression for about 5000 genes) than patients (295 for the breast cancer data).

Conventional methodology (step-wise regression) that works well for small number of predictors will fail. We can perfectly 'predict' what we have, but fail to predict new observations. In order to get answers that make sense, we have to 'tame' the statistical algorithm by penalization to prevent over-fitting and check continuously what we would get in new data by crossvalidation.

As a result, we obtained four prognostic groups (see the flanking graph, figure 4) that show some differentiation with respect to survival.



Figure 4. Kaplan-Meier curves for four equal sized subgrups.

However, the genomic information appears to be correlated with the clinical information (tumor stage etc.) and gene expression does not add very much to the prognostic model based on clinical information. Currently, I am working on methods to improve the prognostic model by using biological information that helps to group the genes in pathways. It looks as though that might help considerably.

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# Telling History/Histories: Autobiographical Writing and Testimonies of the Holocaust

The relation between history and literature, or historiography and works of fiction, has been at the centre of an ongoing debate within literary and historical studies for some decades. The New Critics' insistence on the autonomy of the literary text on the one hand, and most traditional historians' denial of the relevance of literary texts for their field of study on the other, were in a sense well suited to each other. Historians and literary critics occupied different territories with few points of contact.

These two positions have come under attack from several quarters,

leading to a climate in which few find it easy to maintain a clear-cut distinction between fact and fiction. Indeed, the denying of such a distinction has become a kind of hallmark of the post-modern condition (cf. Assmann, 1989). Derrida's dictum "Il n'y a pas de hors-texte" is not acceptable to many scholars, but the very idea that

Professor Beatrice Sandberg Department of German, University of Bergen, Norway E-mail: Beatrice.Sandberg@germ.uib.no CAS Fellow 2005/2006



our grasp of past and present events is mediated through and conditioned by language has gained widespread recognition. In his meta-historical reflections, Hayden White gives a central place to the role of language in producing both fictional and historical narratives:

"Readers of histories and novels can hardly fail to be struck by the similarities. There are many histories that could pass for novels, and many novels that could pass for histories, considered in purely formal (or I should say formalist) terms. Viewed simply as verbal artefacts, histories and novels are indistinguishable from one another." (White, 1978: 121f.)

White concludes by collapsing the two concepts into one, namely that history is fiction with ethical consequences.

Understandably, this line of thought has shocked many historians. To give up the distinction between fact and fiction seems to imply that one no longer acknowledges the special and crucial authority of facts, a position that Reinhart Koselleck opposes, pointing out the "Vetorecht der Quellen" (the veto exercised by the sources). The literary scholar Dorrit Cohn, on the other hand, also insists on the distinction between reality and fiction, or between referential and non-referential discourse, not only to preserve the authority of the historical account, but also to protect and preserve the special role that fictional works play in human life.

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A rather different approach to the issue of the relationship between history and literature may be ascribed to the New Historicists, amongst whom Stephen Greenblatt is the key figure. New historicism insists on "the historicity of texts and the textuality of history" (Montrose, 1989: 20). Seeing a culture as a text, they acknowledge the crucial role that the study of discourse plays in any historical period while also insisting on the historicity of the text itself, fictional or non-fictional. Rather than denying the distinction between history and fiction, they define their field of study in such a way that both are necessary for the study of each of them. Of necessity, this field of research thus becomes interdisciplinary, and the uniqueness that a work of art may have is understood not by isolating the text from the context, but by placing it more deeply within it:

"The house of the imagination has many mansions, of which art [...] is only one. But the new historicist project is not about 'demoting' art or discrediting aesthetic pleasure; rather it is concerned with finding the creative power that shapes literary work *outside* the narrow boundaries in which it had hitherto been located, as well as *within* these boundaries." (Gallagher/Greenblatt, 2000:12)

This is hardly the place to adjudicate between these various positions, but the point is that the debate itself is an important backdrop to recent developments in the field of autobiographical writing. The rapprochement of the fields of literature and history has allowed this special kind of fictional works, i.e. those based on documentary experiences, to contribute to contemporary history, and especially to the topic of the Holocaust, in a more specific way than before. Literary works have always been accepted as valuable meaning for understanding life and going beyond facts and political analysis, although on quite a different level from historiography with its ideals of objectivity and scientific rigour.

There have been specific changes within literature as well. Many contemporary authors are well read in history, sociology, anthropology, philosophy etc. They compose their works with an eye to supplementing academic historiography written by scholars who belong to another tradition and follow different criteria in their presentations. At the same time, we can observe an ongoing change in the genre of autobiography, as more and more highly ordinary individuals, e.g. politicians, football players and singers, are writing (or dictating!) their autobiographies. However, that is a very different phenomenon that is a consequence of 'democratic' levelling of all values. The kind of autobiographical writing I am interested in consists of stories written by authors of literary fiction and usually marked as novels, short narratives, or sometimes given no indication of genre in an effort to underline the documentary nature of the story. It started after the World War II and saw a real breakthrough in the 1970s after the student revolution in Europe, where the so-called second generation, born during and after the war, wanted to know more about their parents and their political activities - or their lack of political alignment, and their passivity towards the Nazi movement and later the Nazi regime. The other group of writers on autobiographical topics consists of the victims of and eye witnesses to the Nazi crimes, especially the Jewish authors, who play the

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most important role for the cultural memory and our knowledge of 20th century history. The analysis of their narratives is therefore a central part of the work to be done within this project.

In Der Vorleser (1995, in English The Reader), a book that has been translated into many languages and also filmed, author Bernhard Schlink (\*1944, professor of Law and Moral philosophy) mentions this generation's feeling of responsibility for what their parents did or were involved in as the main motivation for writing his book. He also shows the developments leading to reunification and the permanent necessity of facing up to the past. That obligation now also affects all those who believed in the state ideology of the DDR, a state that suddenly vanished and left its people with broken dreams and beliefs. As we know from the many books published in recent years, it took about 40 to 60 years from the time the most horrifying things happened until eye witnesses were able to tell or to write about them. But that raises the question: What kind of texts do we expect when reading narratives about the Holocaust or the problems of Jewishness told by second and third generation Holocaust survivors and victims who were not eye witnesses themselves and therefore cannot make claims of authenticity? How are we to react to the stories they tell about the Holocaust?

The field of narrative investigation is a wide one and it encompasses questions such as: How is remembrance (re)constructed? Who tells the story and how is it told? As readers, what do we expect from the text of an eye witness? What does authenticity mean and how is it to be recognised in the narrative? How does historical representation relate to narrative form?

These are questions that arise in connection with the case of the 88year-old Austrian writer and survivor of several concentration camps, Fred Wander, who wrote a novel about his time in the concentration camps, *Der siebente Brunnen* (1971, in English *The Seventh Well*), who said that the only motivation that kept him alive was his determination to tell everybody about it when it was over! It took him 40 years until he was able to write the narrative. He also published his autobiography *Das gute Leben* (1996, in English *The Good Life*) and edited a new version earlier this year<sup>1</sup>. Reviewers prefer the autobiographies, perceiving the novel as overly fictional, while Wander says that only fiction enabled him to be totally honest and open. A comparison of the three books could possibly show the specific differences between the fictional and the autobiographical approaches as means of attempting to tell about these nearly untellable events.

The fact that many authors work on their subject in different modes (fiction, autobiography, report, interview or with a theoretical approach) gives us information about their way of writing, i.e. the poetic process, such as the transformation of documentary material into fiction by means of narrative. I mention two authors whose books are translated into English and Norwegian: Hans-Ulrich Treichel's *Der Verlorene (Lost)*, published in 1998, and Uwe Timm's *Am Beispiel meines Bruders (In My Brother's Shadow)*, published in 2003. Neither author calls his work a novel or a short narrative. They do not consider them to be mere fiction because they both use documentary material *and* reflect on the necessity of using

<sup>1:</sup> New title: Das gute Leben oder Von der Fröhlichkeit im Schrecken, Göttingen 2006.

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rhetorical techniques to tell their stories, especially when struggling with memory and the time gap between an event and the process of writing about it. In his lectures, Treichel gives an interesting presentation of what happened when his parents were expelled from Silesia and lost their baby while escaping to the West, and how his whole childhood was influenced by this accident and the parents' mourning their lost child. That allows us to see the difference between the factual event and the construction of an autobiographical narrative, not so much in the sense that we want to know whether or not the story is 'true', but in that we can follow the author's process of self-construction throughout the story. For example, he feels free to put in invented episodes where he wants to give a realistic portrayal of the cheerless immigrant-reality in the post-war West Germany of the 1950s. In this context, fiction creates an impression of reality and authenticity based on the author's own experience, but we never know where the line runs between fiction and reality in the narrative as a whole. Sometimes it is also difficult for us to determine if we are dealing with a post-modern attitude in the sense of 'anything goes', e.g. every combination is allowed and everything is non-committal and contingent. I think it depends on what we know about the author/narrator, as well as on what he is writing about.

Personally, I am convinced that many writers do not follow the trend of post-modern contingency when they recount events from their own lives, as these are often burdened with feelings of guilt, damage and deprivation. That is the case with most of the subjects related to World War II and the Holocaust. These issues were taboo for many years because they were associated with feelings of guilt and shame on the perpetrators' side, and suffering and sorrow on the part of the victims. When many contemporary authors use autobiographical techniques to tell their stories, it is because they want to emphasise the authenticity of their experiences and to contextualise them historically in the political and socio-cultural forces of the time. To show *how* they do so is one of the objectives of this project.

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# Judgments, Progression, and the Rhetorical Experience of Narrative

# Introduction

When we first begin reading narratives (or having them read to us), we learn both that they typically have good guys (or gals) and bad guys (or gals) and that the narratives themselves typically signal which characters are which. Consider this passage from Ring Lardner's "Haircut" (1926) in which Lardner's narrator, Whitey the barber, tells his new customer from out of town a little about Jim Kendall and his wife:

"As I say, she'd of divorced Jim, only she seen that she couldn't support herself and the kids and she was always hopin' that some day Jim

would cut out his habits and give her more than two or three dollars a week.

They was a time when she would go to whoever he was workin' for and ask them to give her his wages, but after she done this once or twice, he beat her to it by borrowin' most of his pay in advance. He told it Professor James Phelan Department of English, Ohio State University, USA E-mail: phelan.1@osu.edu CAS Fellow 2005/2006



all round town, how he had outfoxed his Missus. He certainly was a caution!"

What stands out here is not only that we judge Kendall much more negatively than Whitey does (we recognize Jim's selfishness and meanness; Whitey regards him as an entertaining trickster), but also that we judge Whitey negatively as well (though not mean and selfish himself, he is so morally imperceptive that he does not recognize Jim's meanness and selfishness). But as we judge this character and this narrator negatively, we are also approving the moral vision of Ring Lardner because we feel he is guiding us to make those judgments. In addition, we are tacitly registering Lardner's skill in communicating these judgments to us while using only Whitey's discourse. We regard Kendall as cruel and therefore dangerous, Whitey as obtuse and perhaps therefore dangerous, and Lardner as a skilled practitioner with whom we'd like to collaborate further.

Extrapolating from this brief example, I offer three broad claims.<sup>1</sup> (1) The judgments we readers of narrative make about characters and tellers (both narrators and authors) are crucial to our experience – and understanding – of narrative form. By form, I mean the particular fashioning of the elements, techniques, and structure of a narrative in the service of a set of purposes. (2) Narrative form, in turn, is experienced through the temporal process of reading and responding to narrative;

1: For some substantiation and elaboration of these claims, see *Experiencing Fiction*.

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consequently, to account for that experience of form we need to focus on narrative progression, that is, the synthesis of both the textual dynamics that govern the movement of narrative from beginning through middle to end, and the readerly dynamics that both follow from and influence those textual dynamics. (3) As key elements of narrative experience, narrative judgments and narrative progressions are responsible for the various components of that experience, especially the significant interrelation of form, ethics, and aesthetics – although judgments and progressions do not totally explain everything we might want to know about ethics and aesthetics.

#### Three Kinds of Judgment

These claims in turn open the door to more specific theses about the interrelation between judgments and progressions. I have space here to consider just this one. *Readers make three main types of narrative judgments, each of which has the potential to overlap with or affect the other two: interpretive judgments about the nature of actions or other elements of the narrative, ethical judgments about the moral value of characters and actions, and aesthetic judgments about the artistic quality of the narrative and of its parts.* Corollary 1: a single action may evoke multiple kinds of judgments, readers often judge characters' judgments. The following short tale provides an opportunity for us to see what this thesis means in practice.

The Crimson Candle, by Ambrose Bierce (1899):

A man lying at the point of death called his wife to his bedside and said:

"I am about to leave you forever; give me, therefore, one last proof of your affection and fidelity, for, according to our holy religion, a married man seeking admittance at the gate of Heaven is required to swear that he has never defiled himself with an unworthy woman. In my desk you will find a crimson candle, which has been blessed by the High Priest and has a peculiar mystical significance. Swear to me that while it is in existence you will not remarry."

The Woman swore and the Man died. At the funeral the Woman stood at the head of the bier, holding a lighted crimson candle till it was wasted entirely away.

The man's initial request is based on a so-called religious principle which he interprets in his own way, and our judgment of that interpretation has consequences for our ethical judgment of him. He interprets the principle to say that the test of whether he has "defiled himself with an unworthy woman" is not his behavior while alive but rather his wife's behavior after his death. Not only do we judge his interpretation as offbase, we can, in retrospect, legitimately wonder whether his wife made a similar judgment and so felt freer to act as she did. In addition, we can see that the husband's interpretation fits with his ethical character as someone who assumes that his wife's role is to serve him in both life and death.

The husband and wife also make different interpretive judgments about the nature of the commitment entailed by her oath, and these interpretive judgments overlap with ethical ones. In fact, their interpretive judgments are about the ethical obligation the wife incurs with her sworn promise.

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The husband assumes that her promise binds her to remain unmarried indefinitely. The wife finds a loophole in the language, one that allows her to fulfill the letter of the promise at the funeral and then be liberated from it. We readers need to make an interpretive judgment about the characters' judgments; we need, that is, to decide about the validity of the wife's interpretation of her oath.

Not surprisingly, since the characters' interpretive judgments overlap with ethical judgments, the audience's judgments are also overlapping. Indeed, it is possible that the force of one judgment will determine the other. If, for example, we say that the wife has found a valid loophole in her promise, we may also be inclined to say that it is an ethically just fulfillment of that promise. And the other way around. Similarly, if we say that the wife's interpretive judgment is not valid, we may also be inclined to say that she is guilty of breaking her promise. And, once again, the other way around. However, since it is also possible to separate the legal and the ethical, we may decide that the wife's interpretive judgment is not legally valid because she knew that her husband would not regard her burning the candle at the funeral as a fulfillment of her promise. But we may simultaneously make a positive ethical judgment of her action because we see it as an appropriate response to the husband's ethically deficient actions of misinterpreting the principle for his selfish ends and of insisting on her promise.

The decisions we make about these ethical questions will have consequences for our aesthetic judgments, by which I mean our assessments of a narrative's quality. Indeed, for us to make a positive aesthetic judgment of the story, we need to make a positive ethical judgment of the wife, since the story gets its punch from the sudden revelation of the wife's response to her husband's selfish act of extracting the promise. If we judge the wife as acting in an ethically deficient manner, we will not take nearly the same pleasure in that revelation, and will regard it as a slighter aesthetic achievement.

In short, focusing on judgments and progressions provides a way into worthwhile questions about the interrelations of form, ethics, and aesthetics—and into our complex experiences with narrative.

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# International Climate Agreements: How Economists Think

# Economic efficiency – perfect competition

A key issue in economics is how resources actually are used, as opposed to how they should be used to obtain economic efficiency. According to a fundamental result in economics, a perfectly working economy, henceforth referred to as 'perfect competition', provides efficient use of all resources. Whereas other institutional arrangements may also lead to efficiency, our starting point below is perfect competition, partly because this market structure is at the core of how economists think and partly because these alternative arrangements are of limited relevance in respect of our main focus, i.e., international climate agreements.



# Senior Research Fellow Rolf Golombek

The Ragnar Frisch Centre for Economic Research, Norway E-mail: rolf.golombek@frisch.uio.no CAS Fellow 2005/2006 Perfect competition is based on a number of assumptions. Some of them are i) there are markets for all goods, ii) all agents take all prices for granted (which can be rationalized since it is assumed that there are many agents, all being small), and iii) all agents are rational. In economics, there is more than one definition (or

understanding) of rationality. Typically, the minimum requirement for an agent to be termed rational is that he has a clear purpose to his actions and behaves consistently. Under the assumption of perfect competition, rationality is operationalized as a) consumers maximize their well being, represented by their preferences, which depend solely on their own consumption of goods, and b) producers maximize profits.

Under perfect competition, the social optimal level of production is reached for all goods. Moreover, production of each good is cost efficient, that is, it is not possible to provide the same level of production at a lower total cost. Prices play an important role. In particular, they reflect the preferences of consumers as well as the technologies of producers. Under these prices, agents make choices that lead to an economic efficient outcome.

# **Deviations from perfect competition**

The concept of perfect competition is a theoretical construction that is frequently useful as a benchmark. In a strict sense, the assumptions of perfect competition are hardly satisfied for a whole economy, but might be satisfied for a number of goods/markets. For example, some producers might be aware that if they cut back on their production, the market price will rise. In the corner case of only one producer (a monopolist) supplying a good, production will be (much) lower than under perfect competition, and thus the market price is highest under a monopoly. Yet, the government may provide incentives to the monopolist to make the monopolist

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supply the socially optimal level of production. This can be done through a subsidy on production, thereby making it more profitable to produce goods. If the government has complete information, the subsidy that will make the monopolist produce exactly the quantity that would have been supplied under perfect competition (without any subsidy) can be calculated.

Under perfect competition, actions taken by one agent affect all other agents through market prices alone. However, in the real world, actions taken by one agent might have a direct impact on other agents, and not through prices alone. For example, a firm emitting harmful gasses into the air has direct negative impact on the consumers living in its neighbourhood. Because the firm is assumed to care only about its profits, it overlooks the harmful effects it causes. The problem is that there is no market for clean air (the price of clean air is actually zero, but should have been positive). Thus, the firm is not charged for causing harmful effects on people. The standard suggestion in economics to solve this problem is to introduce a market for clean air by imposing a tax on all agents emitting the harmful gas. Through the tax, the firm gets an incentive to take into account that people suffer from the emissions, and thus the firm will reduce its emissions.

## **Domestic emissions**

Suppose there are two producers in a country (termed producers 1 and 2) that emit a harmful gas,  $CO_2$ , into the air. Each producer can reduce its emissions in a number of ways; i) install equipment that captures the  $CO_2$ , which is then stored safely, ii) reduce the level of production, iii) change the production process (less emission-intensive technology), and iv) change the type of product (less emissions per unit of product). Each producer finds the combination of actions that, for each level of reduced emissions, minimizes his costs.

Suppose that for producer 1, the cost of reducing emissions by one unit is always 2. For producer 2, the cost of reducing the first unit of emission is supposed to be 1, the cost of reducing the second unit of emission is supposed to be 2, and cost of reducing the third unit of emission is supposed to be 3. Assume further that the government in the country has decided that emissions should be reduced by, say, 3 units (The reduction may reflect that the country has signed an international agreement that imposes this emission reduction). How much should each firm reduce its emissions in order to obtain a total emission reduction of 3 units at *the lowest possible cost* for the country? The first unit should be reduced by firm 2 (cost is 1). For the two remaining units, either emissions should be reduced solely in firm 1 (cost is always 2), or one unit should be reduced in firm 1 (cost is 2) and one unit should be reduced in firm 2 (cost is 2). Hence, the optimal solution is characterized by equal costs for the two firms of reducing the last unit of emission.

How can this solution be implemented in a market? As explained above, by the government imposing a tax on emissions, each firm is given an incentive to reduce its emissions. A key result in environmental economics is that the optimal solution for the country can be achieved by imposing this tax on both (all) firms (The tax that achieves the optimal solution can be calculated if the government has all the relevant information).

#### International Climate Agreements: How Economists Think

Alternatively, the optimal solution can be achieved through tradable credits, that is, i) each unit of emission a firm wants to emit requires a credit, and ii) credits can be bought and sold in a market. Assume that initial emissions in each firm are 10 units. The government can then distribute  $(2 \times 10-3=)17$  credits among the firms in order to reach the goal of reducing emissions by 3 units. Assume the credit market works perfectly. The price of credits will then be equal to the optimal emission tax, and hence the optimal reduction of emissions between the firms will be achieved.

#### International climate agreement

Above, we examined the case of reductions in emissions from firms in the same country. In the real world, there are emissions of  $CO_2$  in all countries. If, hypothetically, there were a legal body with jurisdiction over all firms in the world, that body could impose a tax on  $CO_2$  emissions from all firms or impose a tradable credit system for all firms. That would solve the global pollution problem.

However, there is no legal body with jurisdiction over all firms in the world. Yet, if all countries sign an international climate agreement, the problem will still be solved. The agreement could commit each country either to impose a common tax on CO<sub>2</sub> emissions or to participate in an international system of tradable credits. However, countries are independent units and free to choose whether or not to sign agreements. If a country signs an agreement, it will bear some costs as emissions are reduced. Moreover, total emissions of CO2 will be reduced since it is the sum of CO<sub>2</sub> emissions, not the distribution of emissions between countries, which matters for the climate costs of a country. In other words, all countries will benefit from lower emissions. Hence, by participating in an international climate agreement, a country bears the full costs but receives only part of the benefits, whereas if the country does not sign, it has no costs but still receives benefits (as long as other countries participate in the agreement). Hence, based on pure self-interest, each country prefers not to sign the agreement (although collective rationality implies that all countries should participate). This is probably the main reason why only 36 countries have accepted emission reductions under the Kyoto Protocol.

There is no easy way to solve this problem, that is, to make countries subscribe to climate agreements. The key to resolving the problem is to find a mechanism that allows each country to benefit from participating in the climate agreement. At present, there are several proposals under discussion. Of particular interest are technology agreements: Through research and development (R&D) on climate-friendly technologies, the cost of reducing emissions will be reduced, making countries less reluctant to reduce their emissions (See Golombek and Hoel, 2006).

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# **Self-Serving Moral Reasoning**

The self-serving individual is a key building block of economic theory. Adam Smith famously remarked that: "It is not from the benevolence of the baker, butcher and the brewer that we expect our dinner, but from their regard for their self-interests." The baker does not produce bread of good quality at decent prices to be kind, but he knows that if the quality is too low or the price too high he will make a poor living since we will not buy his bread. Similarly, in environmental economics we do not count on the benevolence of consumers or producers to avoid pollution. Rather, since the 1920s, economic theory has argued that environmental taxes should be used in such a way that individual self-interest coincides with the social good.

Neither Smith nor most other economists claim that individuals are

selfish in all walks of life, but simply that economic transactions do not rely on their benevolence. The object of study is not the mother who cares for her child, often sacrificing her own good for that of her child. But as she enters the marketplace to buy goods and services for herself and her family, her behavior is explained only with

## Senior Research Fellow Kjell Arne Brekke

The Ragnar Frisch Centre for Economic Research, Norway E-mail: k.a.brekke@frisch.uio.no CAS Fellow 2005/2006



reference to self-interest. Still, in recent decades there has been growing concern that the selfishness assumption may be an obstacle to explaining the economic behavior we observe. Moreover, the scope of economics extends beyond pure market transactions. For example, many people voluntarily provide both time and money to public goods and charities, a fact that is hard to reconcile with pure selfishness. The demand for environmentally friendly products is another example of behavior that seems inconsistent with pure self-interest.

Over time, an increasing volume of experimental evidence conflicts with the view of human beings as self-serving. For a survey, see Camerer (2003). Here I only provide a brief illustration of the type of results common in the literature. For this purpose, consider the 'dictator game'. In this game, there are two players, a dictator and a recipient. The dictator simply decides how to share an amount of money with the recipient. For a dictator who is maximizing monetary payoff, it is against his self-interest to give anything more than zero to the recipient. But, in the experiments, less than half the subjects allocate nothing to the recipient, with a mean allocation of about 20 percent, depending on the details of the experiment.

But self-interest does not require that preferences be narrowly defined to maximize monetary payoff. A dictator may feel bad about displaying selfish behavior (contributions are somewhat lower when the experimenter

#### Self-Serving Moral Reasoning

takes extreme care to protect the participants' anonymity). However, the dictator may also find it worth the money to maintain a self-image as a fair person by splitting the pot.

When we take into account that dictators may be concerned with more than maximizing monetary payoff, it is possible to explain the dictators' behavior. Fehr and Schmidt (1999) and Bolton and Ockenfels (2000) argue that adding preferences for fairness will explain not only the dictator's behavior, but most of the behavior we observe in experimental games. Similarly, Andreoni (1990) explains contributions to public goods such as impure altruism, assuming that people get a 'warm glow' from giving. Thus by giving to charity, people get a 'warm glow' as a private good, well worth paying for. This allows an interpretation of seemingly altruistic behavior as a selfish behavior concerned with deriving monetary payoff as well as a warm glow.

As pointed out in Brekke et al. (2003), behavior consistent with models like Andreoni's 'warm glow' may not be seen as selfish, but may reflect a sincere attempt to do what is morally right. In Brekke et al. (2003), we assume that individuals want to consider themselves morally responsible and as performing a 'morally ideal' action through ethical deliberations. In our model, an individual defines the ideal as the action that has the best consequences for everybody (more precisely, the action maximizes total utility) provided everyone behaved like him or her. Given this ideal, the actual behavior is assumed to be a tradeoff between the demand ensuing from the moral ideal and their self-interest. Thus, the model makes a distinction between striving toward the moral ideal and acting in one's own self-interest. Formally, the model predicts the same kind of behavior as Andreoni (1990), although the predictions are richer as the moral ideal is derived from the model. In extension of the line of reasoning in Brekke et al., the 'warm glow' may just as well be the absence of a cold shiver. (See also Nyborg, this volume.) People want to think of themselves as good and morally responsible and they want to do what is right. They are even willing to sacrifice their self-interest to do so. Yet this also gives them incentives to seek out moral principles that minimize the cost of behaving in a morally responsible manner. When there is ambiguity about what is morally right, individuals may pursue self-serving moral reasoning. Selfserving moral reasoning refers to what happens when they choose the moral ideal that best serves their private interests. Is there any evidence of such self-serving moral reasoning?

In a recent experiment (Krupka and Weber, 2005), participants were asked to play a variety of the dictator game where the dictator has only two choices: Either he proposes an equal split – USD 5 to both – or he takes USD 7 for himself while the total is reduced so the second player gets only USD 1. They label the dictator's two options 'unselfish' and 'selfish'. The game was first played as stated, but in a second round, the dictators got to observe the choices of four players from the first round. Those who observed two or more selfish choices, chose the selfish option themselves more than twice as often as those who observed one or no selfish choices. The player seems to have a tendency to go with the majority, but the group that observed two selfish choices out of four is of particular interest. Observing equal numbers of selfish and unselfish choices offered no information about what the majority chose. It seems as

though some participants wanted to believe that most people are selfish and used this to justify their own selfishness. Only clear evidence of the opposite would change their behavior.

To test the effect of similar tendencies in a real life situation, Brekke, Kipperberg and Nyborg (2006) studied the determinants of voluntary recycling behavior in Norway. In a representative survey, we asked Norwegian households about their behavior with respect to the recycling of glass (excluding components included in deposit/return arrangements). At the same time, we asked about the cost of recycling, the time taken and distance to collection site, as well as whether they considered recycling a personal responsibility, how common they thought recycling is in their peer group and how certain they were about this assessment.

We find that those who believe that recycling is common or very common among their friends and relatives are more likely to recycle glass and also that those who consider recycling a personal responsibility are much more likely to recycle all or most of their glass. The question is then: what determines peoples' perception of responsibility?

The concept of responsibility needs some extra discussion. In a modern complex society, there are so many tasks that should be done that no single individual has the capacity to even recognize all of them. As a consequence, we require a division of labor, i.e. some tasks are my responsibility and others are yours. While some responsibilities are legally defined, many are informally defined through customs and norms. For recycling in a society, it may be the case that households are responsible for sorting their waste, or the central authorities may be responsible for dealing with the relevant environmental issues through regulation or abatement, or the environmental problem caused by a lack of recycling may be defined as being too minor to merit attention, so no one is called upon to do anything about it. Thus an individual needs to see what others are doing to figure out the informal norm. In other words, individuals need to pose the question: "what do people like me do in a situation like this?" Those who think recycling is common among friends and relatives (people like them) will then have to conclude that in this society at this point in time, each household is supposed to contribute to environmental quality though recycling. Consistent with this reasoning, we find that those who think that recycling is common among friends and relatives are much more likely than those who think recycling is uncommon to see recycling as a personal responsibility.

Where there is a tendency toward self-serving moral reasoning, we would further expect that while people want to do good, they would happily endorse information that allows them to be good at the least possible private cost. We asked a follow-up question about their assessment of how common recycling is: How confident are you in this assessment? For any given assessment of what others are doing, we found that the more uncertain people are about others' recycling behavior, the less likely they are to consider recycling a personal responsibility. One possible interpretation to explain this note is that their assessment of what others are doing should imply that recycling is a responsibility, but they are not certain and that gives them an excuse for not accepting that responsibility. For more details, see Brekke et al. (2006).

Admittedly, it would be premature to draw a confident broad conclusion, and while the literature is richer than what is surveyed in this brief

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article, much more research is needed. Still, the results do lend support to a view that moral behavior is not just an opportunity to buy a private good that could be labeled a 'warm glow'. People do make sacrifices to do what they think is right. However, as these are real sacrifices, they may also endorse any ambiguity as it allows them to conclude that they need not make those sacrifices after all.

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# **Consider If This Is a Man** – Primo Levi's Conception of the Human

# What is a human being?

In his classic description of the conditions of the camp in Auschwitz, *If This Is a Man* (1987 [1947, 1958]), Primo Levi seems to claim that the devastated prisoners who end up in the gas chambers die twice: They die as human beings before they die as biological creatures. He describes the demolished prisoners as "non-men" (Levi 1987, p. 96). Whether they live or die is no longer of any ethical significance, i.e. it can be decided "with no sense of human affinity" (Levi 1987, p. 33). Levi seems to go a long way in the direction of accepting the Nazis' description of them as

subhuman, or even stronger, as nonmen, not as a reason for treating them as they were treated, but as an effect of the way they were treated. How are we to understand these passages? Is he not running the risk of buying into a line of thought that in fact has a lot in common with Nazi thinking?

The following is a way of formu-

Associate Professor Anniken Greve Department of Culture and Literature, University of Tromsø, Norway E-mail: anniken.greve@hum.uit.no

CAS Fellow 2005/2006



lating what the two lines of thought have in common: They both assume that our status as human beings is contingent on certain traits or capacities that human beings characteristically exhibit: we qualify as humans by having these traits or capacities, and they in turn become criteria for our humanity. It is by virtue of these capacities that we are considered individuals. Our individuality is marked by the fact that we are given our own personal names, as individuals who are to be respected, to be treated in this or that way, etc. According to this line of thought, we can establish the ontology first by answering the question: "What is a man?", and then draw the ethical consequences. This is perhaps the standard philosophical approach to this issue, and it is, I think, the intuition underlying Levi's description of the prisoners as non-men. Actually, the passage in which he explicitly calls them non-men shows an impressive awareness of the standard philosophical criteria for regarding others as human beings:

Their life is short, but their number is endless; they, the Muselmänner, the drowned, form the backbone of the camp, an anonymous mass, continually renewed and always identical, of non-men who march and labour in silence, the divine spark dead within them, already too empty to really suffer. One hesitates to call them living; one hesitates to call their death death, in the face of which they have no fear, as they are too tired to understand. [Levi 1987, p. 96]

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In effect, what we have here is a short catalogue of the various criteria that different philosophers and philosophies have identified as what marks us out as human beings, and upon which our being human are dependent: rationality, capacity for thought and understanding, affinity with divinity, capacity for goodness, consciousness of death. The prisoners start out being judged subhuman *by the standards of the perpetrators*; they end up being subhuman *by widespread philosophical standards*.

# What is wrong with the "standards" conception?

This 'standards' conception of the human being is shared by the Nazis and many philosophers. The difference lies in the standards by which we are measured. The Nazis were concerned with eye colour, nose shape, sexual orientation and skin colour. These were the criteria by which you were measured. If you failed to meet their standards, you did not qualify for treatment as a human being, but were regarded as a commodity and appreciated solely for your utility value.

I believe most of us consider the standards that encourage us to perceive the prisoners as non-humans as *an effect* of their treatment far more acceptable than the Nazis' standards, and they are. In Kantian philosophy, what distinguishes a human being as a human being is rationality. It is as rational beings that we fall within the moral concern of each other and it is as rational beings we earn each other's respect. But this is a dangerous line of thought in that it seems to make our status as objects of moral concern fragile indeed: It is only insofar as we can display this rationality that we are regarded as subject to moral concern. In a sense, Kant is not advocating respect for human beings, but rather respect for the rationality of man.

The problem with the "standards" conception as applied to human beings is not that we never give standards this place in our thinking about each other. The problem is rather that *if* we were to relate to each other in the ways indicated by this line of thinking, something has gone seriously wrong. We are not actually relating to the other as a human being, but rather as a holder of this or that capacity. In practice, it may be that we do not relate e.g. to a severely retarded person as a human being in the full sense of the term, or to a close relative who, due to illness or age, no longer has the personality we once knew. However, I suspect that all of us, or at least most of us, acknowledge that as *a failing* on our part, and my recognition of e.g. the retarded person as a human being is expressed in this acknowledgement. <sup>1</sup>

I think we can be brought to realize that there is something deeply wrong with the 'standards' conception of the human being by returning to the idea that the prisoners die twice and to the thought that this explains the double sense in which the camp is an extermination centre. The idea that accompanies this in Levi's account, i.e. that they are no longer the objects of moral concern (he claims that "their life and death

<sup>1:</sup> I have drawn attention to the common denominators between the Nazis' and the Kantians' conception of the human being but also emphasized that the standards they measure the human being by differ. It must be said, however, that this difference makes a difference that cannot be overestimated: The Nazis' standards opened the door to and gave an ideological underpinning for genocide on an unprecedented scale, while the Kantian standards would have revealed it as just that.

can be decided lightly without a sense of human affinity"), seems to imply that it does not really matter to us how the prisoners die, and the fact that they die in a gas chamber is not a significant part of their tragedy. On the contrary, this assumption seems to take for granted that, under normal circumstances, all considerations connected with someone being a human being stops at the point of death. In our normal responses, however, this does not seem to be the case. We do not stop considering people as human beings when their hearts stop beating. Quite to the contrary, it matters a great deal to us that a corpse is the (dead) body of a human being. Its being so still imposes limits or strictures on how we treat it. We do not regard a dead body as a piece of meat that can be turned into dog food, for instance. We perform some sort of burial ritual, i.e. we do not simply shovel a body into a dump. The relevance of the concept of the human being in our dealings with each other extends beyond the moment of death. At least as long as there is a corpse to relate to, we relate to the other as a human being. In other words, we still relate to the other with a sense of human affinity.

#### **Representation and response**

In order to do justice to Primo Levi, this short discussion of his conception of the human being in *If This Is a Man* should be read within the context of the work as a communicative act. I would argue that the act responds to the prisoners robbed of their individuality even if they are represented as non-human beings. Seen in this light, Primo Levi avoids the moral trap with which this kind of philosophical confusion is often connected. More importantly, however, it seems to be part of the structure of Levi's seminal work to bring *the reader* to respond to the question whether the ravaged prisoners are still to be regarded as human beings. The unfinished hypothetical clause in the title of the work is transformed into an explicit challenge to the reader in the title of the poem that precedes the narrative: *Consider if this is a man*. The philosophical reflections articulated in this short piece should be seen as an attempt to meet that challenge and thus as being grounded in rather than departing from Levi's seminal work.

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# Americans, Cars and Fuel Economy (and Economists)

One striking cultural difference between Europeans and Americans involves their relationships with their cars. Europeans can't imagine commuting to work in a Hummer any more than Americans can imagine cramming themselves into a SmartCar when the kids have to be taken to soccer practice (I mean, football, but that's another cultural difference). While most vehicles on both continents come in sizes between these extremes, it is undisputed that Americans drive more, own more cars, and that those cars are much less fuel efficient. But why is that so, and what are policy makers doing about it?

Since the turn of the century when Henry Ford developed the



**Dr. Carolyn Fischer** 

Energy and Natural Resources Division, Resources for the Future, USA E-mail: fischer@rff.org CAS Fellow 2005/2006 assembly-line method for massproducing cars at affordable prices, Americans have become reliant on the automobile. While European cities and towns were already well established when the automobile was invented, large parts of the United States developed alongside the automobile, and this interdependence has

resulted in land-use patterns that take advantage of and reinforce the need for cars. Thus, although the U.S. is twice as densely populated as Norway, Americans own 50% more passenger cars per capita, while the Norwegian car ownership rate is only slightly higher than that in much more densely populated Europe.<sup>1</sup>

Over the past century, passenger vehicles have evolved a great deal in terms of weight, safety and comfort features, but not in fuel economy. Henry Ford's Model T, introduced in 1908, got 13-21 miles per gallon (city-highway);<sup>2</sup> today, the popular Ford Explorer also sports a V8 engine, albeit an improved one, but at nearly three times the curb weight, it gets about the same mileage.<sup>3</sup>

Weight is a big part of the story of trans-Atlantic vehicle differences; American cars are almost 50 percent heavier on average. The rest of the difference in fuel economy can be explained by the fact that Europe relies

1: Source: World Resources Institute Earth Trends, United Nations Statistics Division Demographic Yearbook, and the World Bank Group World Development Indicators 2006.

2: Ford Motor Company. "Model T Facts,"

http://media.ford.com/article\_display.cfm?article\_id=858

3: www.edmunds.com

#### Americans, Cars and Fuel Economy (and Economists)

much more on diesel-powered cars, and that official test cycles differ.<sup>4</sup> Thus, the question does not seem to be one of differences in sophisticated technologies, but rather differences in consumer preferences.

Why are consumer preferences so different? Land-use and transit options are one issue, but economists will point to another: gasoline prices. Compared with the US, Europe imposes much heavier taxes on petrol (seven times heavier in the UK, for example), resulting in prices at the pump that are more than double those paid by their American counterparts.<sup>5</sup>

Still, recent increases in oil prices, concern about energy security, and apprehension over global climate change have turned attention to fuel economy policy. In the U.S., the primary mechanism is the set of Corporate Average Fuel Economy (CAFE) standards. Paralleling current concerns, Congress was worried in 1975 about increasing imports of crude oil, especially from politically and militarily unstable parts of the world. One response was the Energy Policy and Conservation Act of 1975, in which Congress mandated for the first time that passenger cars and so-called light-duty trucks (pickup trucks, minivans, and sport utility vehicles) had to meet fleetwide CAFE standards. Congress itself set the target for passenger cars at 27.5 miles per gallon (mpg), nearly double the pre-1975 average. (That translates into 8.6 liters per 100 kilometers.) The National Highway Traffic Safety Administration (NHTSA) was assigned the responsibility of setting fuel economy targets for light-duty trucks, which now stands at 20.7 mpg, nearly a 50 percent increase over 1975, and is due to increase to 22.2 mpg by 2007.

Working in concert with sharply increasing gasoline prices in the early years of the program, the CAFE standards resulted in significant improvements in fuel economy for passenger cars and light-duty trucks alike. As a

consequence of conservation measures in transportation and other sectors, between 1977 and 1986, imported oil fell from 47 percent to 27 percent of total oil consumption. However, since 1986, fuel consumption rates have been rising again due to a combination of low gas prices, the plateauing of fuel economy standards, and a general shift from cars to sport utility vehicles (SUVs), which fall into the light truck category and are subject to less





Source: USEPA (2005) "Light-Duty Automotive Technology and Fuel Economy Trends: 1975 Through 2004"

Presentation by Dr. Simon Godwin, DaimlerChrysler, to the Center for Transatlantic Relations, October 20, 2004.

The Automobile Association compares gasoline prices around Europe and the US: http://www.aaroadwatch.ie/eupetrolprices/default.asp (accessed October, 2006).

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stringent fuel economy standards. The recent spike in gasoline prices has prompted a public call for an increase in CAFE standards—and possibly a reform of the program.

One important feature of the current CAFE program is that it requires each manufacturer separately to meet the standards for each of its own car and light truck fleets. Many economists point out that the program would be more cost-effective if manufacturers were allowed to trade CAFE compliance credits, much like in Europe companies can trade carbon permits or green certificates.

To understand the benefits of trade, we should recognize that with an alternate means of compliance, some carmakers might prefer to specialize in the large-vehicle segment of the passenger car or light-duty truck markets because of a comparative advantage they feel they have in manufacturing or marketing such vehicles. They cannot do so now; if an automaker is able to sell 1 million passenger cars that average 26 mpg, it has to sell another million such vehicles averaging 29.2 mpg in order to hit the 27.5 mpg standard. This has resulted in a situation in which at least some carmakers end up producing and selling for little or no profit (or even at a loss) significant numbers of smaller cars or light-duty trucks to enable them to produce the larger cars or trucks on which they make their money. They may also find it easier to convince consumers to buy SUVs than to increase the fuel economy of station wagons, which are subject to the car standard.

Because fuel is fuel, no matter what kind of vehicle burns it, this system makes little sense. If fuel economy credits were fully tradable, an automaker would have another option open to it. If it could not profitably compete in the small car (or light-duty truck) market, it could use any fuel economy credits that it had generated in the other segment of the new vehicle market, or it could purchase credits from another automaker that had exceeded its passenger car or light-truck targets in a previous year. Automakers purchasing credits would be those that find it difficult to manufacture and sell enough smaller vehicles to offset their largevehicle sales. The automakers choosing to sell credits would be those for which exceeding the standard is less expensive than purchasing credits. Both companies would benefit from the exchange. Furthermore, lower manufacturing costs from better specialization and more effective allocation of technologies for fuel economy will translate into lower prices for consumers. Meanwhile, the overall fleet of passenger vehicles will meet the same fuel economy goals.6

While economists support making CAFE standards tradable, there is still no clear consensus on whether the benefits of raising those standards would actually outweigh the costs. Incorporating technologies to improve fuel economy entails its own costs, either in terms of the price of the vehicle or in tradeoffs with other features that consumers may value more, e.g. horsepower or acceleration. Furthermore, while fuel economy improvements would lower overall fuel consumption, they also lower the cost of driving. The resulting 'rebound effect' not only eats up some of the fuel savings, but it also generates more congestion and accidents, which

<sup>6:</sup> For more information, see Fischer, C. and P. Portney (2004) "Tradable CAFE Credits," in New Approaches on Energy and the Environment: Policy Advice for the President, Richard D. Morgenstern and Paul R. Portney, Ed. Washington, DC: RFF Press.

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are costly. And, since tailpipe emissions are regulated on a per-mile basis, conventional air pollution increases with miles traveled, so improving fuel economy can in theory deteriorate air quality in some areas. Although the rebound effect is relatively minor, these costs all weigh against the benefits. Many economists note that if the sought-after benefits are reductions in greenhouse gas emissions or oil security costs from gasoline consumption, there is already a gasoline tax to compensate for them. Furthermore, since autos account for only 20% of US carbon emissions, and 45% of oil use, broader policies would be more cost-effective for combating these problems.

Ultimately, whether the benefits of fuel economy regulation outweigh the costs is crucially dependent on whether consumers 'value' fuel economy. If they 'rationally' recognize the fuel savings they will achieve, they will be willing to pay for improved fuel economy, making manufacturers want to offer it, and regulation is unnecessary. If, despite this recognition, other vehicle features are more important than fuel economy, then regulation can impose a significant burden on consumers in the form of less desirable cars. However, some argue that consumers do not fully value potential fuel savings when they make their auto purchase decisions, due to the difficulties of such calculations and the relative importance of other features. If consumers are not willing to pay more for fuel-saving technologies, then manufacturers will be unwilling to invest sufficiently in them. In this case, fuel economy regulations can be justified in their own right (even ignoring climate and energy security benefits), as they force manufacturers to incorporate technologies that are worthwhile from society's perspective and that would not be adopted in the absence of regulation. However, little solid evidence exists on the extent to which consumers value or undervalue fuel savings.

In general, economists on both sides of the Atlantic will argue that problems should be tackled as directly as possible, using mechanisms that signal the costs to society, but allow markets the flexibility to respond in the most cost-effective manner. The costs of greenhouse gas emissions from driving are best signaled by a carbon tax on the fuel. The costs of congestion can be signaled by tolls. Other costs, such as accidents or conventional air pollution, which accrue with miles traveled, can be addressed by a per-mile charge (indeed, some advocate making auto insurance paid by the mile). Fuel economy regulation may help curb oil consumption, but from an efficiency standpoint, it is best designed to improve the choices of consumers—assuming they need some help.<sup>7</sup>

<sup>7:</sup> For more information, some additional non-technical and technical papers are available at http://www.rff.org. See, e.g., Parry, Ian W.H. (2005) "Should Fuel Economy Standards Be Raised?" *Resources* 159 (Fall issue): 16–19, as well as Parry, I.W.H., C. Fischer and W. Harrington (2004) "Should Corporate Average Fuel Economy (CAFE) Standards Be Tightened?" *RFF Discussion Paper* 04–53.

# Telling the Holocaust: Questions and Connections

A narrative is the semiotic representation of a series of events meaningfully connected in a temporal and causal way. (Onega and Landa 1996, 3)

Driven by thirst, I eyed a fine icicle outside the window, within hand's reach. I opened the window and broke off the icicle but at once a large, heavy guard prowling outside brutally snatched it away from me. "Warum?" I asked him in my poor German. "Hier ist kein warum," (there is no why here), he replied, pushing me inside with a shove. (Levi 1996, 29)



# Professor Jeremy Hawthorn

Department of Modern Foreign Languages, The Norwegian University of Science and Technology (NTNU), Norway E-mail: jeremy.hawthorn@hf.ntnu.no CAS Fellow 2005/2006 Narrative, the telling of stories, is premised upon rationality, upon understanding a sequence of events by relating its sequentiality to processes of cause and effect – processes that are, as Onega and Landa put it, "meaningfully connected." But the reality of the Holocaust was one in which the

Nazis attempted to deny their victims the ability to make any such meaningful connections. In their 'Editors' Afterword' to Sara Nomberg-Prztyk's *Auschwitz: True Tales from a Grotesque Land*, Eli Pfefferkorn and David M. Hirsch note that "[t]he cause and effect link, for example, that defines our relationship to our surroundings was rendered inoperative in the concentration-camp environment. The relative freedom that enabled a person to arrange his life within a causal context was brutally denied to the concentration-camp inmate" (Nomberg-Prztyk 1985, 166–7). As a result, imposing narrative order upon what happened in and around the camps often seems to be difficult or impossible, both for survivors and for others. "It is one of the still unresolved problems of that body of writings called Holocaust literature that the events seem to overwhelm all attempts to impose formal order, either of literary history or literary criticism" (Nomberg-Prztyk 1985, 165).

That word 'order' has a certain chilling force. "Ordnung muss sein!" How often survivors quote these words when recounting some piece of insane logic on the part of their Nazi persecutors! It is ironic that the most accessible 'formal order' traceable in the Holocaust is the inhuman one imposed by the perpetrators, planned out in detail, and executed rigorously by those who would later claim that they were "only obeying orders." Must narratives of the holocaust choose between experience that excludes order, and order that excludes the experience of victims?

#### Telling the Holocaust: Questions and Connections

In the event, survivor accounts typically combine a report of the total absence of logic experienced in the camps with heroic attempts to understand why victims were being treated as they were.

This was the very worst thing that had ever happened to me. I could not see why I should be put into prison or why, at the age of fifteen, I was such an undesirable person because I was Jewish. It was all a senseless persecution and I felt very bitter. I wished I knew why this was all happening to us. (Schloss 1998, 58)

It is because that impulse to know 'why this was all happening' is fundamental to narrative that survivors' attempts to tell stories about their experiences constitute a fundamental challenge to the Nazi attempt to establish realms from which the word 'why' has been expelled. This is not to say that the survivors' stories ever fully explain why; it is, rather, to recognize that even in a situation in which the desire to know why was never satisfied, survivors found ways to adapt narrative's powers to their own valuable ethical and aesthetic ends. These adaptations produced narratives that reproduce that sense of being in a black hole in which 'there is no why' while recording that their authors challenged, and continue to challenge, this prohibition by asking questions and drawing connections. The question and the connection - the two issues raised in my opening quotations - are central to the rational (and thus the moral) force of such accounts. I stress 'questions' - not necessarily answers, and 'connections' - not necessarily a comprehensive sequence of cause-and-effect. Such narratives repeatedly confront the reader with work to be done: rather than providing comprehensive accounts, they require the reader to attempt to answer questions, to make connections, and thus to seek an understanding of that which seems incomprehensible.

Let me conclude with a couple of examples. First, questions. Consider the following account by Norwegian Jew Julius Paltiel of an event that took place while he and others were being transported in appalling conditions through Germany on their way from Auschwitz to Buchenwald at the end of the war.

We are standing in open cattle trucks, with dead eyes and weary in spirit. It is cold – certainly more than 20°C. below zero. We cross the border into Germany. The train stops under a pedestrian bridge, on which a group of young German boys stand and laugh at the extraordinary train cargo.

A prisoner shouts out to them: "Have you any food for us?"

The boys stare at us, then run away. Shortly afterwards they return with stones, which they throw at us. What sort of young Germans are these that throw stones at starving human beings in open cattle trucks? How can they behave in such a hateful manner to us? Had we been animals they certainly would not have thrown stones. Are they totally devoid of morality? They cannot avoid seeing that we are human beings in extreme need. The boys laugh. I am shocked. (Komissar 2004, 103 [my translation])

Fifty years after the event (his account was first published in 1995), Paltiel insists on posing the same questions he posed at the time. Time and

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again, the moral force of survivor accounts can be located in this refusal to accept that "Hier ist kein warum," a refusal that forces readers as much as the survivor-writers to search for explanations.

Secondly, connections. Consider the following passage.

After emerging on to the road you have to pass a little house with green shutters. Awkward little hearts have been roughly cut out in their centres, and white ruffled curtains are half-drawn over the windows. Under the windows grow delicate, pale roses. A mass of funny little pink flowers peeks out of the window-boxes. On the steps of the veranda, shaded with dark-green ivy, a little girl is playing with a big, sulky dog. The dog, obviously bored, lets her pull him by the ears, and only from time to time shakes his heavy head to chase away the flies. The girl wears a little white dress, her arms are brown and suntanned.

In isolation the scene has a fairy-tale quality to it, a quality that even in isolation carries along with its sickly 'charm' a faint but distinct sense of dread. The passage continues as follows.

The dog is a black Dobermann Pinscher. The girl is the daughter of the Unterscharführer, the boss of Harmenz, and the little house with its little window-boxes and its ruffled curtains is his house. (Borowski 1976, 60–61)

The passage is from Polish Auschwitz survivor Tadeusz Borowski's semi-fictional story "A Day At Harmenz," and the narrative sequence forces the reader to make some unsettling and disturbing connections. No questions are overt here, but many are implicit (and their being implicit makes them only more urgent and unavoidable). How can we reconcile the first seven sentences with the final two? What possible way is there of connecting the kitschy sentimentality, the clichéd domesticity, the petitbourgeois niceness, with the gas chambers and the crematoria? Here is another Norwegian Auschwitz survivor, Herman Sachnowitz, writing about Kommandant Schöttel, the chief executive of the Buna camp: "Whenever Schöttel heard music, however, he became soft as butter. He had tears in his eyes and seemed to dream himself far, far away" (132). We are left with the disturbing thought that the horrors of the Holocaust took place not in spite of the awkward little hearts, the window boxes and the cloying fantasy world of sentimental tears-in-the-eyes musical appreciation, but in part because of them. Faced with a fairy-tale world of sentimentality and kitsch we should suspect that a repressed world of bestial violence and horror is not so very far away. And it is a narrative that has forced us to confront this possibility.

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# Event History Analysis: An Overview and some Areas of Current Research

Event history analysis is a set of statistical concepts, models and methods for studying the occurrences of events over time for a number of subjects. The subjects are usually humans or animals, while the events may be deaths, onsets of a disease, divorces, etc. The aim of an investigation may be to study the effect of a medical treatment, to establish risk factors for a disease, to monitor a demographic phenomenon, or to make predictions on future occurrences of an event. Modern event history analysis has been developed over the last 30–40 years, motivated mainly by medical



# Professor Ørnulf Borgan Department of Mathematics, University of Oslo, Norway E-mail: borgan@math.uio.no CAS Group Leader 2005/2006

research, but also by problems in econometrics and technical reliability.

# Single events

Traditionally, research in event history analysis has focused on situations where the interest is in a single event for each subject under study, which is commonly denoted *survival analysis*. A *survival time* 

is the time elapsed from an initial event to a well-defined end-point; e.g., time from birth to death, time from disease onset to death, or time from marriage to divorce. A special feature of survival data is *censoring:* all subjects will not experience the event of interest during the course of a study, and for some subjects it will only be known that their true survival times exceed certain censoring times.

Two basic concepts in survival analysis are the *survival function* and the *hazard rate*. The survival function S(t) is the probability that a survival time will exceed t (in the study time scale: age, duration of marriage, etc.). Thus S(t) describes the proportion of the population that has not yet experienced the event by time t. The *hazard rate* h(t) is the instantaneous probability of the event per unit of time, i.e. h(t)dt is the probability that the event will happen between time t and time t+dt (for a small dt) given that it has not happened earlier.

To illustrate these concepts, we consider data from Statistics Norway on divorce for couples married in 1960, 1970 and 1980. Figure 1 shows empirical hazard rates (rates of divorce) and empirical survival functions for marriages contracted in 1960, 1970, and 1980. The increase in divorce risk with marriage cohort is clearly seen. Furthermore, the hazard rates show an increase with duration of marriage until about 5 years, when a slight decline occurs. The survival functions show how the proportions still married are decreasing in the different marriage cohorts.



**Figure 1**. Rates of divorce per 1000 marriages per year (left panel) and empirical survival functions (right panel) for marriages contracted in Norway in 1960 (green lines), 1970 (red lines), and 1980 (blue lines). Based on data from Statistics Norway.

Hazard rates that are first increasing and then decreasing are found, e.g., for divorce rates and for the mortality rates of many cancers. It is tempting to interpret a decreasing hazard rate as a reduced risk at the *individual level*. However, in many cases it is more likely to be due to selection caused by *unobserved heterogeneity* between individuals. By this we mean that, for reasons unknown to us, there is variation in the hazard rates among the subjects (e.g. couples in the marriage example). Then the subjects with a high hazard rate will tend to experience the event earlier than those with a lower hazard rate. The population of subjects who have not yet experienced the event will therefore change over time, and it will eventually contain a large proportion of subjects with a low hazard rate yielding a decreasing hazard at the population level. The study of statistical models that may be used to better understand such effects of unobserved heterogeneity is an important topic of current research (e.g. Aalen *et al.* 2007).

#### Regression models

In most studies one would like to assess the effect of one or more *covariates* (or explanatory variables) on survival. As in other parts of statistics, regression models are called for at that point. We will discuss regression models for censored survival data by means of an example.

In the period 1962–77, a total of 205 patients were operated for malignant melanoma (cancer of the skin) at Odense University Hospital. Based on survival data for these patients, one may assess the effect of covariates on the rate of cancer death. For the purpose of illustration, we restrict our attention to the covariates sex (coded as 0 for females and 1 for males) and tumour thickness (in mm), and refer to Andersen *et al.* (1993) for a detailed analysis. The most common regression model for censored survival data is Cox's model, which for the malignant melanoma example takes the form  $h(t) = h_0(t) \cdot \exp(\beta_1 \cdot \sec + \beta_2 \cdot \text{thickness})$ . Once the function  $h_0(t)$ and the parameters  $\beta_1$  and  $\beta_2$  have been estimated from data, one may use the fitted model to predict the survival of future patients. To illustrate, Figure 2 shows the predicted survival functions for male and female patients with tumour thicknesses of 1 mm and 5 mm.

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**Figure 2.** Predicted survival functions for female (red lines) and male (blue lines) patients with malignant melanoma. Left panel: tumour thickness 1mm; right panel: tumour thickness 5 mm. (Based on a fitted model with sex and the logarithm of tumour thickness as covariates.)

An alternative regression model is Aalen's model, which for the malignant melanoma example takes the form

 $h(t) = h_{\theta}(t) + \beta_1(t) \cdot \sec + \beta_2(t) \cdot \text{thickness.}$  One important part of any statistical analysis is to assess whether a model gives a reasonable fit to the data. For censored survival data in particular, one has to choose between Cox's and Aalen's models (and other regression models for censored survival data). How to assess the fit of a regression model and how to choose between alternative regression models is an important area of current research (e.g. Martinussen and Scheike, 2006; Gandy and Jensen, 2006).

#### Internal time-dependent covariates

Regression models for censored survival data may include covariates that depend on time. This causes no problems for *exogenous* covariates, but care has to be exercised when including *endogenous* time-dependent covariates in a regression analysis.

To illustrate this, we consider data from a clinical trial where 488 patients with liver cirrhosis at several Copenhagen hospitals were randomized to treatment with prednisone (a hormone) or placebo in the period 1962–69 and followed-up until 1974 (see Andersen *et al.* 1993, for details). A number of covariates were measured at randomization, and the prothrombin index (a measure of liver function) was recorded at followup visits to a doctor. The main aim of the study was to assess the effect of treatment. However, in order to understand better how the treatment is functioning, it is also of interest to study the effect of the prothrombin index. As earlier analyses of the data suggest that there is interaction between ascites (excess fluid in the abdomen) and treatment, for our illustrative purpose, we will restrict our attention to the 386 patients with no ascites.

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 Table 1. Estimated regression coefficients (with standard errors) for two Cox regression

 models for patients with liver cirrhosis. Model I: all covariates measured at randomization;

 model II: as model I, but with the prothrombin index measured at randomization replaced by its last recorded value.

Covariate	Model I	Model II
Treatment (0=placebo; 1=prednisone)	-0.28 (0.14)	-0.06 (0.14)
Sex (0=female; 1=male)	0.27 (0.16)	0.31 (0.15)
Age (in years)	0.041 (0.008)	0.043 (0.008)
Acetylcholinesterase concentration	-0.0019 (0.0007)	-0.0015 (0.0006)
Inflammation (0=absent; 1=present)	-0.47 (0.007)	-0.43 (0.15)
Baseline prothrombin (in percent of normal)	-0.014 (0.007)	
Current prothrombin (in percent of normal)		-0.054 (0.004)

Table 1 shows estimated regression coefficients (with standard errors) for two Cox regression models for the liver cirrhosis patients. In model I, all covariates are measured at randomization, while in model II, the last recorded value of the prothrombin index is used instead of the one measured at entry. Model I estimates the *total treatment effect*, and shows that mortality is reduced among those treated. However, since treatment mainly has an *indirect effect* operating via the time-dependent covariate current prothrombin, the *direct effect* of treatment estimated in model II is substantially lower. How to handle endogenous time-dependent covariates and how to define precisely concepts such as total, direct and indirect effects are challenging areas of current research (e.g. Fosen *et al.*, 2006).

# **Event histories**

Connecting several events for a subject as they occur over time yields *event histories*. As an example, consider the model in Figure 3 for leukaemia patients who have undergone bone marrow transplantation (Keiding *et al.*, 2001). All patients start in remission (i.e. without clinical symptoms of the disease) in state 0 at transplantation, and they will ultimately either relapse (R) or die in remission (D). As intermediate events, patients may experience acute (A), chronic (C), or both acute and chronic (AC) graft-versus host disease. People are typically interested in the probability of relapse free survival, i.e. the probability of being in one of the states 0, A, C or AC, and how this is affected by treatment and other covariates. One way of approaching this problem is to fit Cox or Aalen models for the transition rates between the states, and then 'piece together' these estimates to obtain estimates of the probability of relapse-free survival (e.g., Keiding *et al.*, 2001; Aalen *et al.*, 2001). One problem with this approach is that the

'local modelling' of transition rates may fail to be a good 'global fit' for the probability of relapse-free survival. An alternative currently being investigated is direct regression modelling of the probability of relapse-free survival (e.g. Andersen and Klein, 2007; Scheike and Zhang, 2007).



**Figure 3:** A multistate model for events after bone marrow transplantation (see text for details).

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## **Concluding comments**

The aims of this paper are to convey 'what event history analysis is all about' and to point out some areas of current research. A number of other areas could have been mentioned; important examples being sampling designs for event history data (e.g. Langholz and Goldstein, 1996) and the handling of the high dimensional data of modern genomics (e.g. van Houwelingen *et al.*, 2006).

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# Approaches and Limitations of Model Checks

Models are used in almost all branches of science. Sometimes they are very well established, used over and over again, sometimes they are just *ad hoc* choices. Especially if the particular setting has never been investigated previously, a standard regression model is often used and it is clear that the model can only be a crude approximation of reality. However, especially in medical statistics, a wrong decision based on using an incorrect model can have serious real-life implications.

The purpose of this article is to give a brief non-technical introduction to how models can be checked using statistical methods. We shall consider what type of problems occur and point out the possibilities for direct model checks to detect discrepancies

**Dr. Axel Gandy** 

Lecturer in Statistics,

Imperial College London, UK

E-mail: a.gandy@imperial.ac.uk CAS Fellow 2005/2006

of particular interest.

Throughout the article, we consider the following simple example: Consider repeatedly tossing a die with faces numbered from 1 to 6. Suppose one observes the following sample:

1,1,5,3,1,4,1,6,1,3,1,2

Does this sample come from inde-

# pendent tosses of a fair die? How can one test this? The term *fair* means that all numbers are equally likely, and *independent* means that the tosses do not influence one another. We shall only consider classical hypothesis testing. Other approaches, e.g. Bayesian approaches, will not be considered.

## Statistical hypothesis testing

Before proceeding with this example, let us recall the basis for statistical tests. Typically, one wants to decide between two hypotheses: the null hypothesis (denoted by  $H_0$ ) and the alternative hypothesis (denoted by  $H_1$ ). Because the hypotheses are treated asymmetrically, we will see that the hypothesis that needs to be 'proven' should always be inserted into alternative  $H_1$ .

As an example, consider the case where one wants to decide between two treatments (OLD, NEW) for a certain disease. Here, the usual null hypothesis  $H_0$  is that NEW is not better than OLD and alternative hypothesis  $H_1$  is that NEW is better than OLD. This setting is called a non-inferiority study.

After observing a sample, one has to make a decision, either rejecting  $H_0$  or not. The following table illustrates the possible situations:

	not reject $H_0$	reject $H_0$
$H_0$ correct	Correct	type I error
$H_1$ correct	type II error	Correct



#### Approaches and Limitations of Model Checks

A statistical test to a certain level  $\alpha$  (typically  $\alpha = 5\%$ ) is a decision rule which states that the probability of rejecting  $H_0$  if  $H_0$  is true is not greater than  $\alpha$ . More to the point, the probability of a type I error is bounded by  $\alpha$ . Rejecting  $H_0$  guarantees the low error bound  $\alpha$ . Accordingly, rejecting  $H_0$  is evidence in favour of  $H_1$ .

In contrast, there is no specific requirement attached to the type II error. Indeed, the probability of a type II error can generally only be bounded by 1 -  $\alpha$ . This is because  $H_0$  and  $H_1$  need not be separated, as is the case in our example: It can be the case that NEW is only slightly better than OLD. Using the typical level  $\alpha=5\%$  it can be the case that even though  $H_1$  holds true, the null hypothesis  $H_0$  is only rejected with roughly 95% probability. Consequently, not rejecting  $H_0$  is not 'proof' that  $H_0$  is true.

Hence, the only hypothesis for which 'evidence' can be gathered is  $H_1$ . It should therefore contain the hypothesis one wants to 'prove'. The above example was intended to show that NEW is better than OLD and therefore this is chosen as alternative hypothesis  $H_1$ .

#### Goodness-of-fit testing

Goodness-of-fit testing is concerned with two hypotheses: a given model is either correct or it is wrong. By the above, we would like to use the hypothesis that the model is correct as alternative hypothesis  $H_1$ . However, this setup implies that the probability of accepting the model if it was true would only be  $\alpha$ . This is because the probability of not rejecting the model if it were only slightly wrong would have to be bounded by  $\alpha$  and thus, by continuity, the probability of accepting the model if it were true would only be  $\alpha$ . As a result, the following setup has to be used:

 $H_0$ : Model is correct,  $H_1$ : Model is wrong.

Hence, the only information to be gained from a goodness-of-fit test is that the model is wrong. The model cannot be 'proven' to be correct.

The first example of a goodness-fit-test is the  $\chi^2$ -test ascribed to Pearson (1900): It rejects the model if the squared difference between the observed frequencies and the expected frequencies is 'too large'.

In our example of tossing a die there were 12 tosses. Thus each number is expected to appear twice. The test statistic is therefore:

$$T = (O_1 - 2)^2 + (O_2 - 2)^2 + \dots + (O_6 - 2)^2 = 20$$

where, for i=1,...,6, we let  $O_i$  denote how often the number *i* has been observed.

Is this value of T not consistent with the model? Assuming the model is true, one can compute the so-called *p*-value, which in this case is the probability of observing a value at least as large as 20 if the model is true. This can be done either by simulations or by large sample results. If the *p*-value does not exceed the level  $\alpha$  of the test, the model is rejected. For the example, the *p*-value is 0.084 and thus the model is not rejected at the 5% level, but it is rejected at the 10% level.

## **Directed goodness-of-fit**

The  $\chi^2$ -test is only one of many tests that may be used to check the model of independent tosses of a fair die. Suppose you are playing a game in which high numbers are advantageous and your opponent always uses

#### Approaches and Limitations of Model Checks

one specific die. You suspect that this is not a fair die. Depending on the situation, other tests than the  $\chi^2$ -test may be more suitable. Consider the following two situations:

- 1. Your opponent is a professional gambler: You are interested in finding out whether the die gives excessively high results.
- 2. In the attic, you find the die your grandparents always used when playing against you. Did they let you win by using a die that is biased towards low numbers?

Now we can use different test statistics. Again we reject for large values of those statistics:

- 1. Test statistic for the professional gambler:  $(O_4-2)^++2(O_5-2)^++3(O_6-2)^+$
- 2. Test statistic for your grandparents:  $3(O_1-2)^+ + 2(O_2-2)^+ + (O_3-2)^+$

where  $x^+=x$  if  $x\geq 0$  and  $x^+=0$  otherwise. In the first case, we reject if there are too many high numbers, whereas in the second case we reject if there are too many low numbers.

If we apply these tests to our example, we get the following result: If the test statistic for the professional gambler is used, we do not reject both at the 5% and at the 10% level. If the test statistic for the grandparents is used, we reject at the 5% level (p-value 0.011).

The  $\chi^2$ -test could also be used in both these situations. The advantage of using the other tests is that they will result in less type II error for the alternatives of particular interest.

# **Limitations of model checks**

Does

look too regular? It seems to violate the assumption that tosses are independent! However, the  $\chi^2$ -test will not detect this, i.e. it does not check this assumption.

This is by no means a coincidence. There are theoretical results that basically say the following: For a given fixed sample size, any goodness-offit test only has high power against a finite-dimensional subspace, see e.g. Janssen (2003). In other words, there will always be certain model discrepancies which one specific test will fail to detect well.

#### Statistical model

Typically, models are not simple since they include unknown parameters. Accordingly, it is necessary to check whether a particular one of a certain set of models is correct. The basic idea is to pick one of the models first, typically the one that is 'most likely', and then compare the observed counts with the expected counts in the model selected.

Fisher (1924) realized that the way in which one picks one of the models has to be taken into consideration as it alters the distribution of the test statistic.

## Model checking for regression models in event history analysis

One of the goals of event history analysis is to study the effects on survival of a number of variables (covariates). Consider the melanoma example also considered by Borgan in his contribution to this book. The covariates in the melanoma example are sex, tumour thickness, etc. Several regression models can be used, e.g. the proportional hazards model attributed to Cox or the additive model attributed to Aalen. Furthermore, a set of covariates has to be chosen for each of those models.

More than 20 model checks have been suggested for the Cox Model. The most popular idea is to start with the differences between the observed and the expected number of events per individual, and then to aggregate these differences.

Directed tests for regression models have recently been proposed. For example, it is possible to devise tests that are good at rejecting when another regression model is true, see Gandy (2006), Gandy and Jensen (2005a), Gandy and Jensen (2005b).

#### Alternative approach

There are other tests besides the  $\chi^2$ -test, especially for continuous observations. Instead of mentioning them, reference is made to the classical book by D'Agostino and Stephens (1986).

There is one fundamentally different approach which tries to circumvent the problem entailed by the fact that models can only be proven wrong. It makes it possible to show that the chosen model is close to the true model: The basic idea is to define a certain distance M on the space of all models. The null hypothesis  $H_0$  is that the true model is more than a given distance away from the model being checked. In this setup, a rejection means that the model is not further away than a given distance from the true model. However, this approach is more complicated to execute, and therefore rarely used in practice.

## Remarks

All models are wrong, some models are useful. (G. E. P. Box)

In the example of a die, we are relatively certain about the model. The same applies to certain models in physics. In medical statistics, however, although it is safe to assume that the model is wrong, one still hopes that it approximates reality. Model checks are a useful and important tool for detecting whether a model is 'very' wrong.

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# **Analysis of Time to Pregnancy**

## Introduction

In this paper, I will review some ongoing work on how to study time trends in human fertility. The basic situation is that it is of interest to study and monitor developments in human fertility, but data that can give insight into this is hard to come by because human fertility is influenced by a myriad of important socioeconomic factors generated by society. It is well known that current trends in modern life as well as the economic situation can influence birth rates quite dramatically.

Despite the difficulty in collecting data that contains information solely on biological fertility, it is clear that national and local birth registries might contain relevant information on this. Birth registries typically contain information on all successful pregnancies and how long

the couples waited to achieve this pregnancy. Given that the time-topregnancy (TTP) contains relevant information on biological fertility, the aim of this review is to describe how one should analyse such data to learn about time trends and covariate effects such as smoking that may also change over time. It turns out that the

## Associate Professor Thomas Scheike

Department of Biostatistics, Copenhagen University, Denmark E-mail: T.Scheike@biostat.ku.dk CAS Fellow 2005/2006



sampling method in such birth registries must be taken into account to perform such an analysis.

If data had been prospectively observed, we would simply do a standard logistic regression analysis and then the covariate effects represented by the log-odds-ratio would summarise how smoking or calendar time changed the chance of pregnancy in a particular menstrual cycle.

However, when data are obtained from birth registries and are thus retrospectively sampled, there are various sampling issues to deal with.

**Figure 1.** Lexis diagram of retrospectively ascertained TTPs. The initiation times are denoted  $\tau$ , the TTP waiting times *T*. The full dots indicate TTPs that are sampled and included in the study and open circles indicate TTPs that are not included in the study.



#### Analysis of Time to Pregnancy

It is easiest to illustrate this point by fixing the initiation time,  $\tau$ , for a given TTP denoted T. Consider an observation period in calendar time from [0,S] where all conceptions are asked to recall their TTPs and thus also their initiation times. Now, given the initiation, we only observe the TTP when it results in a conception within the period of observation, formally the restriction is that  $\tau + T \in [0, S]$ . For TTPs initiated at time  $\tau$  before time 0 they will be observed to be subject to both left truncation (being larger than  $-\tau$ ) and right truncation (being shorter than  $S - \tau$ ). A TTP initiated during [0,S] will be subject to right truncation only ( $T < S - \tau$ ). When looking for time trends, based on retrospectively ascertained TTP, it is obviously crucial to correct for the sampling biases that will lead to long TTPs for those initiated before time 0 and short TTPs for those initiated just before time S.

#### Models

The basic set-up is as follows. In the ideal setting, we would record the TTPs forward in time from the time of initiation, thus making a prospective study. For a prospective study of TTP, the basic regression model may claim that given a set of covariates then the chance of achieving pregnancy in a given menstrual cycle 't' is modelled by the (discrete time hazard)

$$\lambda_{i}(t) = P(T_{i} = t \mid T_{i} \ge t) = h(x_{it}\beta)$$
(1)

where *h* is a link function and  $x_{it}$  are possible time-dependent covariates for subject *i* that may include information about the initiation time. With the complementary log(-log) (CLL) link we get

$$\lambda_{i}(t) = 1 - \exp(-\exp(x'_{it}\beta)).$$
<sup>(2)</sup>

When the covariates do not depend on time, the time index is omitted, that is  $x_i = x_{it}$ . A particular model is given by  $\beta = (\gamma_1, ..., \gamma_m, \alpha_1, ..., \alpha_m)$  where m, q > 0,  $x'_{it}\beta = \gamma_t + x'_i\alpha$ .

The probability function and the survival probability are given by the following expressions

$$P(T_{i} = t) = \lambda_{i}(t) \prod_{j=1}^{t-1} (1 - \lambda_{i}(j))$$
(3)  
=  $\lambda_{i}(t) \exp(-\sum_{j=1}^{t-1} \exp(x'_{ij}\beta))$   
=  $\exp(-F_{i}(t-1)) - \exp(-F_{i}(t)).$ 

where

$$F_i(t) = \sum_{j=1}^t \exp(x'_{ij}\beta),$$

with the definition  $F_i(0) = 0$ , and it follows that  $P(T_i \ge t) = \exp(-F_i(t-1))$ .

For these formula it is relatively easy to compute maximum likelihood estimates using iteratively reweighted least squares. Standard software can be used to do this.
## Analysis of Time to Pregnancy

# **Retrospectively ascertained TTP**

The retrospectively sampled TTPs are not observed from the distribution given by  $\lambda_i$  but are observed from this hazard and, subject to the observation being in some interval [0,S] are thus given by

$$\begin{array}{rcl} \lambda_i^O(t) &=& P_{x_i}^O(T_i = t \mid T_i \geq t) \\ &=& P_{x_i}(T_i = t \mid T_i \geq t, \ T_i \leq S_i) \end{array}$$

that can be expressed in terms of the original prospective model presented in (1) above. Given this representation in terms of the regression effects of the underlying prospective model, a maximum likelihood analysis can be carried out and will give regression effects that are corrected for possible truncation biases.

The above model for the hazard of achieving pregnancy in each cycle leads to the observed probabilities

$$P(T_{i} = t_{1}) = \lambda_{i}^{O}(t_{1}) \prod_{j=1}^{t_{1}-1} (1 - \lambda_{i}^{O}(j))$$

Using the specific structure for the underlying prospective model with the CLL link we get

$$\begin{split} P_{x_i}\left(T_i = t \mid T_i \geq t, \ T_i \leq S_i\right) &= -\frac{P_{x_i}\left(T_i = t\right)}{P_{x_i}\left(T_i \in [t, \ S_i]\right)} \\ &= -\frac{\exp(-F_i(t-1)) - \exp(-F_i(t))}{\exp(-F_i(t-1)) - \exp(-F_i(S_i))} \,. \end{split}$$

We can maximise the likelihood by iteratively reweighted least squares, but there are no standard programs that can do this.

Obviously, when evaluating a time trend, it is crucial to deal with the sampling issues. On the other hand, one pragmatic and simple approach may be to simply limit the data to initiation times within the sampling window and within, say, five years before the end of the study. This should remove any major effects of sampling problems and, if it is possible to disregard a five-year period then it is very simple to do so, and the study can then be thought of as an historically prospective study containing only information on subjects that achieve pregnancy.

If covariate effects such as smoking are evaluated based on birth registries, it is obvious that sampling issues may also lead to biases on the effect of smoking due to the fact that smoking habits are changing over time. If smoking is increasing over time then the one may erroneously conclude that smoking leads to shorter TTPs because the short TTPs are oversampled towards the end of the time period.

## Conclusion

The study of time to pregnancy is an important component of reproductive epidemiology. Here, I have presented two main designs with the aim of showing how retrospectively collected data can be analysed. What still remains is to deal with additional sources of bias such as those mentioned in the introduction.

## Analysis of Time to Pregnancy

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# Double Dividend from Climate Policies: Can Climate Policies also Reduce Unemployment?

# Introduction

Global warming is probably the most important environmental problem of this century. According to IPCC (2001a), concentrations of atmospheric greenhouse gas emissions (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, etc.) have increased as a result of human activities, and this will have negative impacts on the economy and human welfare.

What should we do about this? Apart from doing nothing, there are two strategies. The first is to reduce greenhouse gas (GHG) emissions.

The second is to adapt to new climatic conditions, e.g. by building dikes, improving infrastructure, adapting economic structure, etc. While the optimal strategy will be a combination of these two, the focus of this short paper is on national policies to reduce emissions and the costs of these reductions.

Senior Research Fellow Snorre Kverndokk

The Ragnar Frisch Centre for Economic Research, Norway E-mail: snorre.kverndokk@frisch.uio.no CAS Fellow 2005/2006



# National policies to deal with global warming

The main policy instruments to reduce GHG emissions are carbon taxes (making it more expensive to emit  $CO_2$ ), standards (e.g., non-tradable permits that put a cap on emissions), tradable permits, and subsidies for non-polluting substitutes such as renewable energy. While some of these instruments are revenue raising, others are not.

National climate policies will result in changes in welfare due to the following effects:

- An environmental gain related to reduced emissions (environmental dividend);
- 2. Changes in production such as gross domestic product (GDP);
- Distributional effects such as effects on households income distribution and sectoral and regional impacts;
- 4. Ancillary benefits such as reduced traffic accidents, congestion, and reductions in  $SO_2$ , NOX,  $PM_{10}$  having positive effects on environment, health, corrosion etc.

# **Double dividend**

Let us focus on point 2 above, namely, the welfare effects due to changes in production (economic efficiency). Assume that there are distortionary taxes in the economy, meaning that some inputs are taxed harder than others in order to finance a public sector. Assume also that the public sector wants the same budget after the introduction of climate policies

## Double Dividend from Climate Policies: Can Climate Policies also Reduce Unemployment?

(revenue neutral policy changes). In this case there are three factors that contribute to the aggregate cost of GHG emissions reductions via the tax system, see, e.g., Goulder and Parry (2000):

*Direct costs:* Cost to the regulated sectors as they need to reduce pollution through changes in production methods or installation of pollution abatement equipment;

*Revenue recycling:* Efficiency gain from using carbon tax revenues to reduce other distortionary taxes;

*Tax interaction effect:* Taxes increase prices on commodities reducing real prices on factors such as labour and capital and function like an increase in factor taxes.

If the revenue recycling effect is higher than the two other effects, costs are negative (positive effect on economic welfare). In this case, we get two dividends: an environmental benefit via reduced GHGs and an economic dividend via higher economic efficiency. This is called a (strong) double dividend. Studies for Europe show the possibility of a double dividend if labour taxes are reduced, but double dividend is less common in US studies, see IPCC (2001b). Few studies exist on developing countries.

There are several conditions for achieving a (strong) double dividend: First, there must be revenue-raising policy instruments, i.e., carbon/ energy taxes or auctioned permits. If, for instance, permits are allocated for free there is no revenue recycling effect. Second, there must be prior distortions in the tax system, i.e., some input factors are more heavily taxed than others. Finally, the burden of taxes should be equalised.

The concept of double dividend refers to efficiency. However, we often see a trade-off between efficiency and distribution. One example is that carbon taxes are regressive in most studies, i.e., they fall most heavily on poor households. The most efficient recycling of tax revenue is not necessary the best due to distributional effects. But efficiency and distribution may not always be opposed. For instance, van Heerden et al. (2006) find a triple dividend (decreasing emissions, increasing GDP and decreasing poverty) for South Africa if environmental taxes are recycled through a reduction in food taxes.

# Employment dividend

Another concept in the literature is employment dividend. This is defined as an increase in employment or a decrease in unemployment ensuing from the recycling of tax/permit revenues. This can be achieved by reducing taxes on labour but also other taxes (van Heerden et al., 2006). The employment dividend is easier to obtain than the efficiency dividend, as employment can increase even if production slows down.

One recent study on employment dividend is Fæhn et al. (2004) who study the possibility of reducing Spanish unemployment by recycling carbon permit revenues. Spain faces two severe challenges. As part of EU, Spain participates in the Kyoto Agreement on GHG control, and faces a serious challenge in fulfilling its commitment. Unemployment rates are also very high, and there is deep concern for the unemployment consequences of imposing emission costs on firms. The following questions arise: Can a system of carbon permit auctions accentuate Spanish unemployment, and how can revenues be recycled in order to minimise unemployment effects?

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Four different policy options are considered, namely, recycling carbon permit revenues lump sum to households, and reducing payroll taxes on all labour, unskilled labour and skilled labour, respectively.

We find that under lump sum recycling (pure abatement effects), adverse unemployment effects are avoided for both groups of labour, as the labour share is low in carbon-intensive sectors, and the economy is able to absorb the redundant workers through expansion in other relatively labour-intensive industries. By using revenues to reduce distortions in the labour market, unemployment falls compared with no climate policy. This indicates that an introduction of a carbon permit system can actually reduce unemployment in Spain. The highest aggregated effect is found when payroll tax reductions are targeted at skilled labour. There are three reasons for this, partly due to stronger stimulation of the demand for labour and partly due to a weaker supply response to rising wages.<sup>1</sup> First, payroll tax reductions provide more stimulation of demand for skilled labour than unskilled as there is relatively less skilled labour in the economy. Less skilled labour means higher cuts in taxes per worker, and the costs of skilled labour will fall more than would the costs of unskilled labour. Second, while more demand for labour will result in higher wages and therefore a higher labour supply, labour supply for skilled is less sensitive than for unskilled (smaller labour supply elasticity). This means that the labour supply will increase less when tax reductions are targeted at skilled than unskilled labour. Finally, skilled labour work is a less capital intensive part of the economy than the service sectors. This means that less capital needs to be employed in other parts of the economy (aggregate capital is fixed in the model). However, it should be noted that recycling revenues to skilled labour causes a dilemma as the gap between the two skill groups will deepen in terms of unemployment rates and wages.

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<sup>1:</sup> Note that unemployment is equal to the labour supply minus labour demand. An increase in the labour supply will increase unemployment, while an increase in labour demand will reduce unemployment, all else being equal.

# Combating Global Warming – A Contribution from Developing Countries

# Introduction

Man-made emissions of so-called greenhouse gases may severely affect the climate on earth. As a measure to combat the problem of the continuous increase in global emission of greenhouse gases, the Kyoto Protocol was negotiated in 1997. The Protocol specifies quantified emission targets for all industrialized countries for the period 2008–2012. All industrialized countries except the USA and Australia, which did not ratify the protocol, will receive an endowment of emission permits corresponding to their



Post Doctorate Fellow Cathrine Hagem Department of Economics,

University of Oslo, Norway E-mail: chagem@econ.uio.no CAS Fellow 2005/2006 emission target for the period 2008–2012. The emission permits can be traded. By making the permits tradable, the distribution of cost can be separated from the distribution of emission reductions (abatement). Any overall target for emission reductions is achieved in the least costly manner if the emission reduction is carried

out where it is less costly (cost-effectiveness). Tradable permits ensure a cost-effective distribution of emission reductions across the industrialized countries participating in the agreement. Countries with low-cost abatement options reduce their emissions below their endowments of permits and sell excess permits on the market. Countries with high abatement cost abate less and become net buyers of permits. The distribution of the cost of the agreement is a factor of the countries' abatement costs and the distribution of the endowment of permits among the participating countries.

Developing countries do not have binding emission reduction requirements, so they have no permits to trade. Many developing countries have low-cost abatement options (compared with industrialized countries). The total cost of achieving a certain reduction in global emissions could therefore be reduced if some of the abatement measures were carried out in developing countries. To take advantage of cheap abatement possibilities in developing countries, the Kyoto Protocol states that industrialized countries with quantified emission targets are allowed to meet part of their reduction commitments through investments in emission abatement projects in developing countries. This is referred to as the clean development mechanism (CDM).

In this paper, I discuss some features of the CDM mechanism and compare the mechanism with another option for generating an abatement contribution from developing countries, i.e. that they accept a cap on their emissions and be given the opportunity to trade permits. I refer to the latter as the cap & trade option.

# Abatement contributions from developing countries – CDM vs. cap & trade

A CDM project implies that an investor from an industrialized country invests in a specific abatement project in a developing country (the host). A CDM executive board has been established. Its task is to approve CDM projects and issue certified emission reduction units (CERs), corresponding to the emission reduction achieved by a given CDM project. The CERs can be used by the investor to offset own emissions, or they can be sold to other industrialized countries. Hence, CERs have the same value for investors as ordinary emission permits.

There are two specific prerequisites for the approval of CDM projects: (i) the CDM mechanism should help developing countries achieve sustainable development, and (ii) the reduction achieved by the projects should be *additional* to any that would occur in the absence of the project activity (see UNFCCC (1998), Article 12).

The first prerequisite ensures that the CDM mechanism will also be of benefit to the host (developing country). The CDM mechanism could ease the transfer of new technology from industrialized to developing countries. The second prerequisite is to ensure that the CERs are based on real emission reductions so that the CDM mechanism does not lead to higher global emissions. However, this can be difficult to guarantee, since it may give both the investor and the host of a project an incentive to overstate the emission reduction ensuing from the project. Since investors can use the CERs to increase their domestic emissions, overestimating the emission reductions ensuing from CDM projects could lead to an increase in global emissions compared with a situation without the CDM mechanism.

From developing countries' point of view, the advantage of being a host depends on the financial transfers received from the investor and/or the transfer of new technology. Investors are not willing to pay a higher price for emission reduction through CDM projects than the price they have to pay for ordinary permits. Potential investors' efforts to draw up CDM proposals, along with the resources used to verify and certify emission reductions, can lead to rather high transaction costs for acquiring CERs. (See *inter alia* Michaelowa et al. (2003) for an overview of the estimated transaction costs of different kinds of CDM projects). Due to the transaction costs associated with acquiring CERs, financial transfers to the host, measured per unit CER produced by the CDM project, may be much less than the price of ordinary emission permits.

The high transaction costs of CDM are an argument for including developing countries in an environmental agreement based on the cap & trade option instead. A cap & trade option implies that a developing country accepts a binding cap for its emissions. A country receives an emission allowance (permit) corresponding to its cap for emissions and is allowed to participate in permit trading. If the cap for emissions is generous, developing countries will reap a net gain by implementing lowcost abatement options and selling excess permits on the permit market.

Developing countries may be better off under the cap & trade option than with the CDM mechanism. Consider, for instance, the case where developing countries were given emission permits corresponding to their business-as-usual emissions (BaU emissions). Compared with the CDM mechanism, developing countries may become better off for the following reasons: (1) all low-cost abatement options can be utilized, i.e. not only

## Combating Global Warming – A Contribution from Developing Countries

large investment projects as is the case under the CDM mechanism, and (2) emission reductions do not have to be verified by a CDM executive board, meaning lower transaction costs.

However, developing countries have been reluctant to accept binding commitments. One reason for this is that uncertainty about whether the BaU emissions may result in less advantages than expected. If BaU emissions turn out to be higher than expected, and/or the international price on permits turns out to be lower than expected, the advantage of the cap & trade option may be less than a CDM option, in which emissions reductions are calculated based on a project-specific baseline. Kallbekken and Westskog (2005) explore the cost and benefit of taking binding commitments for developing countries. They find that the efficiency gain from joining the emission trading option compared with the CDM option might not be very large compared with the risk they incur. This implies that as long as the CDM-mechanism is an option for developing countries, they may demand very large endowments of permits to voluntarily choose the cap & trade option.

### Conclusion

One conclusion from this discussion is that since the CDM mechanism involves high transaction costs and limited abatement efforts on the part of developing countries, the total cost of global emission reductions can be reduced if the developing countries instead accept a (generous) cap on their emissions and participate in emission trading. However, as long as the CDM mechanism is an option, developing countries may demand a very large cap on emissions to voluntarily choose the cap & trade option. If their cap on emissions is set higher than their BaU emissions, fewer permits will be given to industrialized countries in order not to increase global emissions. This may become too costly for industrialized countries. One solution to this problem is to put an end to the CDM option for developing countries and let cap & trade be the only option for developing countries to earn a profit on their abatement efforts.

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# Causality and Mechanisms: Between Statistics and Philosophy

Causality is a fundamental concept both in science and in daily life. We are constantly seeking causal explanations of disease, divorce and conflicts between people. This is something we do in our own lives, maybe especially when things go wrong. We want to understand, to have an explanation, to try to make sure that things go better next time. In some cases seeking causal explanations is part of trying to place the blame for some untoward event.

Causal explanations may be based on an (attempted) understanding

of underlying mechanisms, or they may be based on a pure experience without deeper understanding. Clearly, human beings have always had a lot of knowledge about the dangers lurking in the world around us. People have known, for instance, that eating certain mushrooms is dangerous and may lead to illness and death, and consequently

#### **Professor Odd O. Aalen**

Department of Biostatistics, University of Oslo, Norway E-mail: o.o.aalen@medisin.uio.no CAS Group Leader 2005/2006



they have avoided these mushrooms. For most of human existence there has been little understanding of the mechanisms behind these dangers. Hence, causal understanding has mostly had its basis in simple experience. Only the growth of modern science during the last two or three hundred years has allowed an understanding of the underlying mechanisms in many fields.

In fact, the great idea of natural science is to uncover mechanisms, to look behind the phenomena, to understand in a rational sense what is taking place. Natural science has been a great success, leading to a tremendous number of innovations that has changed the world. And science marches on, uncovering new understanding of natural phenomena every day. In the field of medicine in particular, this has resulted in treatments for illnesses that used to be the scourge of mankind.

# **Causality in medicine**

In fact, the field of medicine is an interesting place to look for the status of causal understanding today. The development of drug treatments will in many cases be based on a mechanistic understanding of underlying biological principles. One example is Tamiflu which is a treatment for influenza, and is also thought to have an effect against a possible pandemic influenza (in fact the Norwegian government has in 2005 acquired 1.4 mill. treatment courses for the value of 150 mill. NOK in preparation for a pandemic outbreak). Tamiflu acts by blocking the activity of the enzyme neuraminidase, thereby preventing new viral parti-

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cles from being released by infected cells. The details of this action appear to be quite well understood. However, this mechanistic explanation is not in itself sufficient to be sure that Tamiflu actually works as intended. For a new medication to be registered for general use, it is necessary that clinical trials be conducted so that the medication can prove its efficacy and safety.

The concept of a clinical trial is fundamental in modern medicine. It is carried out in such a manner that it can prove the causal effect of a medication in a purely statistical way. The basic principles are randomization (patients are distributed randomly between treatment groups) and blinding (neither doctor nor patient knows which treatment the patient actually gets). If a sufficient difference between treatment groups is observed in a properly conducted clinical trial, the effect can be ascribed to the treatment. The degree of certainty in this conclusion can be given a precise mathematical value (the statistical p-value). The conclusion is based on the experiment and does not depend on any mechanistic knowledge one has about the treatment effect.

Returning to Tamiflu, there are several clinical trials of relevance. Much of the material was summed up in a *Lancet* paper<sup>1</sup> where considerable uncertainty was demonstrated regarding the effect on a possible pandemic originating with bird flu (avian influenza), although the effect on ordinary seasonal influenza is clear. Hence, in spite of the mechanistic principle underlying the medication, its actual effect has not been clearly demonstrated.

This example demonstrates that there are two types of causal thinking that underlie the development of new medications. On the one hand, there is the mechanistic understanding which is often the creative part, and the reason why the medication was proposed in the first place. On the other hand, there is the strict empirical testing in a clinical trial. This latter part can be seen as a scientific extension of the age-old human experience-based understanding of the world. A clinical trial can demonstrate an effect or lack of same, even in the absence of a deeper understanding of why the medication should work.

In fact, the strict requirements that all new medications be tested in clinical trials attests to a lack of complete trust in a mechanistic biological understanding. The mechanistic view is important, but it has to be checked against experience in a systematic trial to see whether it actually predicts the right effect in sick people. And quite often the effect is not as intended.

The validity of mechanistic understanding in medicine varies a lot. In some cases it is quite good; there is e.g. a detailed knowledge about the function of the heart and its diseases. The mechanism behind cancer is much less understood, although theories abound. In psychiatric disease, mechanistic understanding is mostly non-existent. Many theories concerning psychiatric illnesses do exist, of course, from psychodynamic to biological ones, but they are typically highly controversial. There are some medications in the area that are quite effective, but the understanding of why they work is limited. For example, the original antipsychotic drugs were stumbled upon by chance, and although it is an empirical fact that they work, no one really understands why.<sup>2</sup>

<sup>1:</sup> Jefferson, T. el al. Lancet 2006; 367: 303-313.

<sup>2:</sup> Preskorn, S.H. Journal of Psychiatric Practice 2001; 7: 209–213.

#### Causality and Mechanisms: Between Statistics and Philosophy

# **Causality and statistics**

The clinical trials referred to above play a fundamental role in developing medical therapy, especially new medications. The tools of randomization and blinding actually allow proof of a causal connection by statistical means. This is one of the major reasons why statistical methods are currently central in medical research; in fact, in an editorial in the millennium year 2000, a leading medical journal, the *New England Journal of Medicine*, presented "Application of statistics to medicine" as one of the eleven most important developments in medicine in the last thousand years.<sup>3</sup>

In studying the medical effects of lifestyle factors such as smoking or eating habits, the principle of randomization cannot be used. However, one sees today the interesting development of new schools of statistics with original and fruitful approaches to analysing causality in more complex situations. One particularly interesting example is the counterfactual school represented by J. Robins at Harvard University and his co-workers.<sup>4</sup>

A statistical view of causality also opens for a more general nondeterministic view of causal relationships. In medicine, it is obvious that risk factors generally do not with certainty lead to disease, they merely increase the risk. The concept of probabilistic causality is an important tool in this area.<sup>5</sup>

## Causality in a broader sense

In medicine, causality is all-important because the doctor has to act in relation to the situation of his patient, either suggesting a treatment or a preventive measure, and this should ideally be based on a causal understanding. In the natural sciences, causality is connected to a mechanistic understanding of the underlying principles. In psychology and the social sciences, the causal understanding is a far more difficult issue and often very controversial. For instance, while a malfunctioning heart can be studied in a laboratory with large numbers of specific tests, the same cannot be done with a dysfunctional marriage.

Hence, there is a large variation in the level, or even possibility, of mechanistic and causal understanding. Furthermore, causality is also connected in a deeper sense to our view of the world, and causality has for centuries been one of the major themes in philosophy. Kant asserted that causality is one of the categories, in addition for instance to space and time, that is necessary for our understanding of the world. However, these categories may not be a part of the underlying reality; "das ding an sich" is unknown.

Causality is also closely connected to the issue of free will and consciousness. If everything that happens has a cause, then where does free will come into the picture? The issue may also be phrased in a scientific setting: Scientists often tend to view themselves as independent observers of the external world, drawing conclusions about the principles

Editorial: Looking back on the millennium in Medicine. New England Journal of Medicine 2000: 342: 42–49.

A good starting point for studying this work might be Robins J.M., Hernan M.A. & Brumback B. *Epidemiology* 2000; 11: 550–560.

<sup>5:</sup> Suppes P. A Probabilistic Theory of Causality. 1970, North-Holland, Amsterdam.

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that govern the surrounding world on the basis of their experiments or observations.<sup>6</sup> But if everything is determined by cause and effect, then this must also hold for the statements and beliefs of the scientist. A particular conclusion formulated by the scientist, perhaps a book he writes, must in this world view be the result of a causal chain, originating far back, possibly at the start of the universe in the Big Bang. If this is so, why should the statement of a scientist be a true statement about the world? Of course, this holds for all of us, not just scientists. In a purely deterministic causal world, we would all be automatons and no meaning could be attached to anything we say or do.

It is interesting to note that science itself refutes the most simplistic view of causality. In quantum physics the prevailing view is that causality is not present on the most fundamental level of the physical world. In fact, in a recent essay in Nature<sup>7</sup> it is stated:

"The discovery that individual events are irreducibly random is probably one of the most significant findings of the twentieth century. But for the individual event in quantum physics, not only do we not know the cause, there is no cause. The instant when a radioactive atom decays, or the path taken by a photon behind a half-silvered beamsplitter are objectively random. There is nothing in the Universe that determines the way an individual event will happen. Since individual events may very well have macroscopic consequences, including a specific mutation in our genetic code, the Universe is fundamentally unpredictable and open, not causally closed."

Returning to the field of medicine, it is interesting to note that even events with potential medical consequences, e.g. a mutation that gives cancer, may happen in a fundamentally non-causal way.

Hence, in spite of all scientific progress, the concept of causality, as well as the associated concepts of free will and consciousness, is full of paradoxes and uncertainties. These philosophical aspects often tend to be ignored by scientists, but considering them would enrich their understanding as well as point to the limitations of present knowledge. In fact, scientific knowledge does not represent a consistent and non-contradictory view of the world in any complete sense. The scientific world view may be a success, but its power of explanation is still fundamentally limited.

<sup>6:</sup> This idea of an independent observer has been thoroughly challenged in quantum physics where it has been demonstrated that performing an observation changes the whole system.

<sup>7:</sup> Zeilinger, A. Nature 2005; 438: 743.

# In the Shadows of the Atomic Holocaust – Japan's War-Time Memories

# Introduction

It has often been pointed out how the actual ending of the war, the horrific bombing of the two cities of Hiroshima and Nagasaki, together with the subsequent American occupation of Japan, allowed Japan to take on the role of victims of World War II rather than the role of the principal aggressors. Unlike Germany, Japan has been reluctant to face up to and apologize for its misdeeds during the war. Lisa Yoneyama, for example, writes in her analysis of the memorialization of Hiroshima that

"Hiroshima memories have been predicated on the grave obfuscation of the prewar Japanese Empire, its colonial practices, and their consequences," (Yoneyama 1999, 3) and subsequently links this to what has, by progressive critics in Japan, often been referred to as 'A-bomb nationalism'. My focus today will be first of all on how memo-

Research fellow Anne Helene Thelle

Department of Culture Studies and Oriental Languages, University of Oslo, Norway E-mail: a.h.thelle@ikos.uio.no CAS Fellow 2005/2006



ries of Hiroshima have shaped, and been shaped by, modern Japan, and second on the many stories that seem to have been repressed or held back in the shadows of this monstrous event.

# Memorialization

The literature of Hiroshima is often coupled with a national memorialization of Hiroshima as a site for the commemoration of world peace. In this process, there are important aspects of the 'big picture' that remain hidden. As Ian Buruma points out in a comparison of the notion of 'guilt' in Germany and Japan, Japan never experienced any clear break with the pre-war regime. Whereas "Germany lost its Nazi leaders," writes Buruma, "Japan lost only its admirals and generals" (Buruma 2002, 63). The American occupational forces in Japan decided to keep the Emperor as the symbol of the state and of the unity of the people, and as a result quite effectively blocked any possibility for the nation to take full responsibility for its war-time aggression. Sure, many of its military leaders were convicted and executed, but as long as the Emperor remained in place (albeit with his powers reduced, as he was forced to publicly renounce his god-like status), the nation's sense of taking responsibility for its actions was somehow pulverized. Japan has never unequivocally owned up to its crimes committed during its many years of aggression towards its neighboring countries, and the results of this can still be seen today, including the recent reactions seen in China to the Spielberg film Geisha, and other similar incidents.

# The 'forgotten' stories

Since the 1980s, however, there has been a marked increase in the number of testimonial accounts being produced, both orally and in writing. Organizations have been formed to promote testimonial accounts, through public lectures, and through 'witness tours' of Hiroshima for school classes. The general public also seems more interested in war testimonies in general, not just testimonies from Hiroshima. This fact can be seen from the enormous response newspapers such as the Asahi Shinbun received when they invited readers to submit their own war-time stories: more than 4200 contributions were sent in, and the series, initially planned for only a few months, was extended several times and ultimately lasted for well over a year (Buchholtz 1998, 10).

There are many possible reasons behind this very marked increase in both production and interest in people's war-time testimonies. On the one hand is the growing global interest in nuclear disarmament, the focus on nuclear disarmament talks, and the spread of anti-nuclear protests worldwide. As such, the Pope's visit to Hiroshima in 1981 also contributed to this focus. Furthermore, the textbook controversy in the 1980s about the representation of Japan's war crimes in school textbooks sparked a public debate on the representation of war in Japan, perhaps inspiring more people to stand up and tell their stories. Another important factor is the age of the witnesses themselves. By this time most were of retirement age, and many had become grandparents. While the birth of a new generation perhaps inspired many to start speaking of their experiences for the first time, they were also of an age where the social stigma related to being an a-bomb victim had lost its hold. They were, after all, no longer on the marriage market, and most had stopped working as well.

# 'The association for narrating'

One of the associations that appeared in the 1980s was the Kataru Kai, which literally means 'the association for narrating'. The association's founding philosophy is for its members to convey their experiences orally to future generations. Their testimonies, the association claims in an introductory leaflet, stand "as proof of our determination to engage in testimonial practices, a responsibility of those who survived" (Yoneyama, 103). Through its choice of words, the association makes a clear shift away from previous testimonies of suffering. First of all, the association avoids the use of the term *hibakusha*, the term most often used to identify survivors of the a-bomb. Hibakusha quite literally means "a person who suffered the atomic bomb," thus making it difficult for the subject to see her/himself as anything but a victim. The association instead speaks of *ikinokotta mono*, meaning 'those still alive' i.e. the survivors. This gives their role a different focus, as Yoneyama points out, a focus that stresses how "one could have been a part of, but was in fact decisively severed from the collectivity of the dead" (Yoneyama, 103).

With this broader focus, it became possible for survivors to find a setting in which to tell their stories, where the sole focus was not their victimization. This allowed for a broader range of stories. One witness who found her place within this organization was Numata Suzuko. Numata's testimonial account focuses not only on her personal experiences of the a-bomb, in which she lost a leg (she has also been operated several times for cancer), but rather she tries to put her story into a larger picture by

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focusing on the many things she did not know at the time of the bombing. In other words, Numata incorporates, retrospectively, knowledge about the historical circumstances for the dropping of the bomb. For example, recalling the way in which she as a young girl blindly supported the war, and believed the war propaganda she was subject to, she says "In those days, [the soldiers were] objects of our romantic admiration. And we paraded with lanterns in our hand, celebrating 'Nanjing surrendered!' 'Singapore surrendered!' Did we ever imagine that such horrible things [as massacres and tortures] were happening behind those scenes?" (quoted in Yoneyama, 121) Having devoted her retirement years to travel and narrating, Numata has visited many of the former colonies, incorporating the knowledge she gains from such visits into her narrative accounts of the war's end.

Matsuda Go is another witness who tries to give his own personal experience a broader perspective. Whereas witness accounts almost always begin with the blast coming out of nowhere from the innocent and clear blue august skies, Matsuda begins his story with stories of war-time education, showing parallels between educational practices of the day and the school system that his audience is still a part of. He also shows photographs from Japan's aggression in China, photos from the Nanjing massacre, pointing out to the young people in his audience that the gleeful young men on the picture might well be their grandfathers. And then he will tell about his experiences in Hiroshima. In that way, writes Yoneyama, "Matsuda's narrative reminds his audiences that his approaching death is not a matter of course. It was caused, or could have been prevented, by the decisions of people in power [...] his narrative shows young listeners that power produces knowledge, action, and historical consequences" (Yoneyama, 133).

# Narrative purpose

James Phelan gives a rhetorical definition of narrative as "somebody telling somebody else on some occasion and for some purpose that something happened" (Phelan 2005, 323). With regard to the testimonial practices of the A-bomb survivors, it seems beyond any doubt that the last bit of the definition "for some purpose" plays a very important role not only in the shaping of the narrative, but in the way in which it is received as well. It is impossible to regard a testimonial account of the A-bomb isolated from the circumstances of its production. The way in which the story is told will always affect also the way in which the bombing of Hiroshima is understood as a historical event. Having for a long time been deeply inscribed in a universal peace movement, there now seems to be a growing concern that the larger picture, Japan's own war-time responsibility, has perhaps gotten lost along the way. Consequently, a new context has been created for narration, inviting a more critical stance. And within this new context, other kinds of stories are being told. Not just of Hiroshima. Last year, at the age of 88, for example, Hidaka Rokuro published his memoirs from his childhood in Manchuria, entitled "What I thought during the war: the tale of one family." His family, he says, had always spoken out against the war, but only within the confines of the home. Sixty years had to pass since the end of the war before he could bring these thoughts to the public. The urgency felt in Japan today, then, is not only due to the fact that the many witnesses of the war-time Japan

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are disappearing. It is that these witnesses will disappear without the full story having been told. The urgency, then, is also instilled by a fear that their many still *untold* stories will disappear with them.

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# Introduction

In his January 2006 presentation to the Centre for Advanced Study, Professor Jeremy Hawthorn discussed the variety of narrative styles provided by Holocaust survivors recounting their experiences. Part of the subsequent discussion focussed on the observation that only the survivors can tell of what happened, and it could be that in some way the survivors are different from the large number of people who did not survive. In his book *This Way for the Gas, Ladies and Gentlemen*, survivor Tadeusz Borowski makes this point explicitly, in that the question "But how did it happen that you survived?" is important to those with his experience, although it

is impossible to answer. Was he more healthy and stronger than others? Or was he more selfish and cunning? Or was it just random chance?

In statistical terms, this is an example of a *selection effect* for longitudinal or event history data. Statistical methods are used to draw inferences from samples and of course

this means that the sample needs to be representative of the population in question. This is straightforward for cross-sectional data, but the picture becomes more blurred whenever there is longitudinal follow-up, i.e. where people are followed over time to see how responses change. There is then the possibility of losing contact with people, which can happen for a

variety of reasons. If the study is of the elderly or very ill, then a number

may die before the follow-up period is complete. If the study is a clinical trial of a new treatment, then some patients may withdraw as a result of side-effects. Or people may choose not to visit clinics since they consider themselves healthy. Others may be too ill to attend out-patient clinics, and so on. In all of these circumstances, the people who complete the study will be a subset of those who began it, and no matter how careful we are to ensure that our original sample is representative, there is no guarantee that the same will be true of our closing sample.

Figure 1 provides a concrete example, using data from a clinical

#### **Professor Robin Henderson**

School of Mathematics and Statistics, University of Newcastle upon Tyne, UK E-mail: Robin.Henderson@newcastle.ac.uk CAS Fellow 2005/2006





**Figure 1.** Observed means for schizophrenia data. The numbers in the legend give the group sizes at the beginning and end of the trial.

trial on the treatment of schizophrenia. The graph is based on results from 518 patients who began the trial, of whom 88 received placebo, 85 were given a standard treatment, and 345 were given a new experimental treatment, at one of four dosage levels. For the sake of simplicity, the dose is not considered here. A measure of mental health, the positive and negative symptom scale (PANSS), was then obtained at weeks 0, 1, 2, 4, 6, and 8 of the trial. On this scale, high values reflect worse condition. Unfortunately, a large number of patients dropped out before completion for a variety of reasons. Within the experimental treatment group 58 per cent of patients participated in the whole trial, 48 per cent in the standard treatment group and 33 per cent in the placebo group.

The plot shows the mean PANSS score at each point in time for the patients remaining in the trial. Within each group, there is evidence of a decline in the mean score over time and hence an improvement in mental health. This could be real, reflecting benefits of treatment. Improvement even in the placebo group might be plausible since recruitment into the trial may upset fragile people and their original scores may have been uncharacteristically high. On the other hand, it could be a selection effect as described above, as we could argue that the most ill patients tend to drop out, meaning that the average mental health of the continuers is better. Thus the observed drop in the mean may be an artefact since we do not compare identical groups at all time points. The people who make it to the end of the study may not be representative of those who began it.

## Rubin's taxonomy for missing data

We will return to the schizophrenia data later, but first it may be useful to describe how missingness mechanisms can be classified. For this, we will follow the standard taxonomy (e.g. Rubin 1976) using a numerical example for illustration.

Suppose that measurements are scheduled at week 1 and week 2 of a trial. We will call these  $\Upsilon_1$  and  $\Upsilon_2$  and we assume that each can be either 0 or 1. We begin with 200 patients, half of whom have  $\Upsilon_1 = 0$  and half  $\Upsilon_1 = 1$ . These are all observed at week 1 but unfortunately a number of patients drop out before their week 2 measurement is obtained. How can we estimate the mean response at week 2? Table 1 gives three scenarios to consider. In each case, we give a  $2 \times 2$  table of outcomes for the people who are observed on both occasions (the 'completers') and for the true but unobserved outcomes for the others (the 'dropouts'). The final part of each block summarises the data actually observed.

In Block A, the probability of dropout is 0.5 for all individuals, irrespective of their  $\Upsilon_1$  and  $\Upsilon_2$  values. This is the so-called *missing completely at random* (MCAR) situation, which causes no problems for the analysis. On inspection of the table, we see that a total of 140 people from the 200 have  $\Upsilon_2 = 1$ , observed or not, and so the true mean is 0.7. If we consider only the 100 people observed at week 2 we find 70 have  $\Upsilon_2 = 1$ , and so the observed mean is 0.7, the correct value.

It would be nice if things were always that simple but the problem becomes murkier when we move to Block B. Here, people with  $\Upsilon_1 = 0$ have probability 0.8 of dropping out but those with  $\Upsilon_1 = 1$  have probability 0.2 of dropping out. In both cases, the value of  $\Upsilon_2$  does not affect dropout. This is an example of data *missing at random* (MAR), where the dropout probability can depend on quantities which are always observed

Completers						Dropouto				Observed Data		
	Completers					Dropouts				Y1 = 0	no $Y_2$	50
A.	<i>Y</i> <sub>2</sub>					<i>Y</i> <sub>2</sub>		Y1 = 1	no Y <sub>2</sub>	50		
		0	1				0	1		$Y_{1} = 0$	$Y_2 = 0$	25
$Y_1$	0	25	25	50	$Y_1$	0	25	25	50	$V_{1} = 0$	$V_2 = 1$	25
	1	5	45	50		1	5	45	50	$V_{1} = 0$	$r_2 = 1$ $v_1 = 0$	25
		30	70				30	70		I = I	$I_2 = 0$	5
							1			Y I = I	$Y_2 = 1$	45
	Completers						Dropouts			Obse	rved Data	1
B.	$\dot{Y}_2$						Y			Y1 = 0	no $Y_2$	80
		0	- 1				0	- 1		Y1 = 1	no $Y_2$	20
$V_1$	0	10	10	20	$V_{1}$	0	40	40	80	Y1=0	$Y_2=0$	10
1	1	0	72	20	1	1	- <sup>-0</sup>	10	20	Y1 = 0	$Y_2 = 1$	10
		0	12	00			2	10		Y1 = 1	$Y_2 = 0$	8
		18	82				42	58		Y1 = 1	$Y_2 = 1$	72
	Completers						Dropouto			Observed Data		
0	Completers					Dropouts			Y1 = 0	no $Y_2$	50	
C.	$Y_2$					Y <sub>2</sub>		1	Y1 = 1	no $Y_2$	26	
		0	1		-		0	1		$Y_{1} = 0$	$Y_2 = 0$	10
Υ <sub>I</sub>	0	10	40	50	$Y_{1}$	0	40	10	50	$Y_1 = 0$	$Y_2 = 1$	40
	1	2	72	74	_	1	8	18	26	$V_{1} = 0$	$V_2 = 1$ $V_2 = 0$	.0 2
		12	112				48	28		I = 1 $V_1 = 1$	$r_2 = 0$	
										$r_{1} = 1$	$r_2 = 1$	12

Table 1. Some dropout patterns.

 $(\Upsilon_1)$  but not on observations which may be missing  $(\Upsilon_2)$ . Examining the table, we see 100 people have observed  $\Upsilon_2$  but their mean is 0.82 instead of the true 0.7. Very simple estimation methods no longer work. Fortunately, there are a variety of solutions, one of which uses the so-called inverse probability of observation weighting.

This is a method familiar in social surveys for over 50 years but popularised for longitudinal analysis by Professor Jamie Robins and colleagues (e.g. Robins et al. 1995). The idea is to take the fully observed patients but give more weight in the analysis to those who we think are more rarely observed, to let them stand as a type of proxy for unobserved people. Thus in Block B we have an 80 per cent dropout rate for those with  $\Upsilon_1 = 0$  or, with a change of scale, an observation rate of only one in five. This means we assign the observed people at week 2 a weight of five if they have  $\Upsilon_1 = 0$ : one for themselves and four for missing people. For  $\Upsilon_1 = 1$ , the observation rate is 4/5 and those people are assigned a weight of 5/4. Our estimated week 2 mean is then

$$(5 \times 10 + 5 \times 72/4)/200 = 0.7$$

as required.

The final category is *missing not at random* (MNAR) or, more elegantly, *informative dropout*. This is illustrated in Block C, where the dropout rate is 80 per cent for those with  $\Upsilon_2 = 0$  and 20 per cent for those with  $\Upsilon_2 = 1$ ,

irrespective of  $\Upsilon_1$ . Both the simple and inverse probability methods would give the wrong answer in this case, and we can make progress only by making further assumptions about how the data are generated.

# Joint analysis of longitudinal and event history data using random effects

Moving beyond the simple example, suppose now that we are interested in the development over time of a measure of the health of an individual, such as kidney performance after a transplant operation. This is not observable and instead snapshots,  $\Upsilon_1$ ,  $\Upsilon_2$ ,..., are obtained at times as determined by the experimenter. The snapshots may be subject to measurement error or may only indirectly measure the true state, such as creatinine levels as markers for kidney function. Together, the  $\Upsilon$  measurements provide a longitudinal profile for each subject.

Alongside the measurement schedule, we assume there is a sequence of event history data S: stochastic points in time whose intensity may also be related to the underlying value of the subject's 'true health'. These could be recurrent events such as rejection episodes for a kidney transplant recipient, or a single event whose occurrence terminates observation of the measurement sequence, such as kidney failure or the death of the patient.

The purpose of the analysis is to determine the relationship between  $\mathcal{X}$  and S and how both are influenced by factors such as age, sex, treatment and so on. Adjusting for selection effects as described in the previous sections is a special case of this problem, where our interest is primarily in the  $\mathcal{X}$  measurements and dropout times (S) are a nuisance. Another special case has the alternate priorities, with the main interest focussed on the event processes S, with  $\mathcal{X}$  being a time-varying and error-prone marker of underlying intensity. This is extremely important given the explosion of recent interest in biomarkers, which are measures of disease progression, sometimes obtained at the cellular level. How well do these predict subsequent outcomes, such as longevity?

Hogan et al. (2004) provide a nice overview of the methods available, most of which are rather complicated. We will mention briefly just one class of methods, a *random effects* approach, where the interesting association between the  $\Upsilon$  and S components is obtained by their shared dependence on an unobserved patient-specific quantity W, a so-called random effect. We then make modelling assumptions about W and use these with the data to estimate parameters of interest.

A simple illustration will close this section. Referring to the schizophrenia data, we assume that individuals have their own intrinsic mental health W, which we assume has a normal distribution. People with high W have high PANSS scores, and people with low W have low PANSS scores. We then assume that the chance of dropping out also depends on W. Since W is not observed, we have to average over its possible values, using modern computationally intensive methods. This is feasible and leads to results like those given in Figure 2, which adjusts the PANSS means to account for selection effects. In this example we see that the mean stays roughly constant in the placebo group, that there is improvement in the standard treatment group but more improvement under the new treatment. These suggestions were in fact confirmed by formal statistical testing (Henderson et al. 2000).

# A cautionary comment

Methods for dealing with missing data are now widely available and the field is maturing quickly. However, almost all methods rely on making assumptions about the mechanism that causes the data to have missing values. Unfortunately, these assumptions are invariably not testable based on observed data. We may see strong positive correlation between successive observed values, for instance, and it is tempting to assume that missing ones would follow a similar pattern. (In fact this is the basis for most of the methods.) But it is quite possible that an observation



Figure 2. Observed (dotted) and adjusted (solid) means for schizophrenia data.

is missing precisely because it *did not* follow the regular pattern: something went wrong and that caused the dropout. We can never tell for sure. As a failsafe, *sensitivity analyses* are recommended to assess the robustness of conclusions across a variety of models, methods and assumptions. These are not perfect and it is always useful to bear in mind that the best way to deal with missing data is not to have them in the first place.

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# Innovation and sustainable growth

Though nowadays economic growth is as easily taken as given, or otherwise considered as a thermometer for the health of the economy, when looked upon on a scale of centuries, the current economic growth rates constitute a rather surprising and abrupt event.<sup>1</sup> In North America, Western Europe, Japan, Australia, and in many other countries, income has grown more than tenfold over one century, and there is still no end in sight. The rise in income was made possible by a series of scientific and technological innovations, each successively increasing the productivity of labour, and along with it, the power of mankind over nature. Ford's devel-



## Professor Reyer Gerlagh School of Social Sciences,

University of Manchester, UK E-mail: reyer.gerlagh@manchester.ac.uk CAS Fellow 2005/2006 opment of the assembly line, which streamlined production processes in factories and was copied all over the world, is a famous stepping stone in the continuing process of technological advancement. Remarkably, though innovations have long been recognized as the fundamental source of long-term income growth (Solow

1957), it still took a long time thereafter before economists started to study the sources of innovations, leading to the so-called endogenous growth literature (e.g. Romer 1987, Aghion and Howitt 1992). Only subsequently, environmental economists started to study the role of technology in environmental policy. The link between technology and environmental policy is thus a relatively recent subject of research.

Growth in production and consumption has brought fortune to many citizens, but it has also caused caution regarding the sustainability this seemingly ever-increasing burden lays on the environmental systems. Climate change is a case in point and has received ample attention over the past years. But it is certainly not the only pressing environmental problem. The global fishing beyond eco-system recovery of the coastal and high seas will become a subject of public concern as well, sooner rather than later. The increased productivity has thus contributed to the common good in terms of wealth, and also to the common bad in terms of the potential overtaxation of nature. One likely question to ask is whether the historic record of coupled economic growth and more environmental pressure is really a necessity in the sense that technological progress is always biased towards increasing resource inputs, ultimately

Before the industrial revolution, world-wide per capita economic growth was estimated at well below 0.2 per cent per year, increasing to about 1 per cent per year in the period between the industrial revolution and WWII, and exceeding 2 per cent per year for the post-WWII period (Jones 2002, Fig. 1.3).

exhausting nature's capacity to supply raw materials. Alternatively, the historical record might rather reflect our ignorance or lack of steering ability. To answer this question, one needs to investigate the relationships between economic growth, technological change, its direction, and the use of natural and environmental resources.

The first studies that applied the endogenous growth theories to environmental economics addressed the issue of growth and environmental conservation (cf. Bovenberg and Smulders 1995). The conclusion from this literature is that technological change makes it more probable that we can decouple economic growth from environmental pressure. The mechanism is not too difficult to understand. If we use economic incentives to increase the value of 'clean' innovations – e.g. pollution taxes will stimulate the use and thereby the value of clean technologies – then more clean technologies will be developed compared with 'dirty' technologies. Thus, from the outset, there is no reason for pessimism as to the possibility of resource-saving growth.

Though the study of innovation as the engine of growth may not have altered our understanding of the feasibility of growth combined with environmental conservation (as opposed to common practice), it has led to a certain spread in opinions regarding the need for environmental policy, and the timing of such policy. From the side of technology optimists, it is argued that higher income will boost environmental awareness, leading to greener innovations without the need to worry. On the part of pessimist environmentalists, it is argued that the markets do not reflect environmental scarcity and will not stimulate the development of greener technologies unless the government interferes. The common economist's view is that the government should create new markets for environmental use, e.g. for emission permits, so that prices on these markets reflect the social benefits of constraining the use of these environmental resources. During my stay at the Centre for Advanced Study (CAS), I specifically looked into the question of whether the government should do just that, create markets that reflect social environmental values, or the mechanism of greening through innovations warrant more, or less, action. This subject I worked on together with Snorre Kverndokk from the Frisch Centre and Knut Einar Rosendahl from Statistics Norway.

# Dynamics of innovation and environmental policy

Studying the interaction between innovation and environmental policy requires dynamic analysis, since both innovations and environment problems cannot be understood without understanding the dynamic processes behind them. I choose climate change as the environmental issue to be used for illustration of the economic analysis, because there is already much discussion on the efficient timing of climate change policy. When we want to prevent potentially dangerous anthropogenic interference with the global climate system, then in the coming decades radical policy interventions are necessary to bring a halt to the continuing increase in the atmospheric greenhouse gas concentrations. Though most scientists agree on the need for some abatement in the coming decades, they differ as to whether the majority of these abatement efforts should be pursued from the very start, or alternatively, whether the largest share of abatement efforts should be delayed for later. In the literature, various reasons are presented for preferring delayed action, but here I want to mention

the argument that delaying abatement efforts will allow us to benefit from cheaper abatement options that are available in the future, and added to that, delayed abatement will allow us to develop these options through innovation. This argument has raised a lively debate among economists studying technological change in relation to environmental policy. Our study contributes to this debate. We argue that the private sector will not develop innovations before these innovations are used. We thus consider the 'develop-and-wait' approach unfeasible, unless a public agent takes responsibility for the innovation process.

Since the largest share of greenhouse gas emissions comes from the combustion of fossil fuels for energy supply, energy system analysts have figured prominently in this debate. Energy system analysts have clear empirical evidence for so-called experience curves suggesting that new low-carbon energy technologies, which will define the major long-term options for carbon dioxide emission reduction, the need to accrue experience for costs to come down sufficiently to make these technologies become competitive with existing fossil-fuel based energy technologies. Based on these experience curves, the more general argument is made that there is a need for up-front investment in abatement technologies to make these technologies available at low prices, and thus, technological change would warrant early abatement action rather than a delay (Ha-Duong et al. 1997, Grübler and Messner 1998; van der Zwaan et al. 2002, Kverndokk and Rosendahl 2006). Models exploring experience curves are typically referred to as learning-by-doing models.

Though experience and diffusion curves have a strong empirical basis, many economists consider it a mechanistic view on technological development that hides the incentive-based structures that determine the level of research efforts by innovators. Many economists prefer models with an explicit representation of R&D efforts as the engine of innovation, and they have found that modelling innovation through R&D can lead to potentially very different outcomes of optimal timing of abatement policy. An important difference between learning-by-doing and R&D models is that the latter category of models does not assume from the outset that the technology needs to be used for costs to come down. Thus, through R&D, future cheap abatement options may be made available without the need to deploy them while costs are still high. In an R&D model, it is then most efficient to focus mainly on R&D in the early stages of abatement policy, without employing the abatement technologies, and to apply the technologies only after the costs have sufficiently come down. Indeed, Goulder and Mathai (2000) found this pattern an optimal environmental policy. They concluded that whereas learning-by-doing may warrant an advance of using abatement technologies compared with a situation without technological change, the presence of R&D unambiguously implies a delay in the use of abatement technologies.

Within the community of environmental economists, the abovementioned paper by Goulder and Mathai has created a divide between proponents of learning-by-doing models and early action, and proponents of R&D models and delayed action. During my stay at CAS, Snorre Kverndokk, Knut Einar Rosendahl and I conjectured that this divide was based on a premature analysis, and we decided to take a closer look. The R&D case for delayed action requires that policy-makers have the ability to first stimulate clean innovations, and at a later stage to stimulate the

use of these innovations. For this, policy makers need to have a tailored instrument available to bring environmental R&D efforts to their socially optimal level. In most cases, however, policy makers will use a generic R&D instrument such as R&D subsidies, and a generic environmental instrument such as environmental taxes. An R&D subsidy limited to environmental innovations is not likely to be feasible. Such a constraint on environmental instruments prevents the implementation of an innovationfirst, action-later policy.

Furthermore, we have to better understand the incentives that determine the functioning of the innovation market. Patents play an essential role, as they protect innovators from being copied without due payment. At the same time, patents disclose the knowledge base underlying the innovation, which can then be used by rivals to develop substitute technologies. Also, not unimportantly, patents have a finite lifetime and expire after a certain period. Since innovators need to secure revenues to pay for research costs - in this sense they are not different from other producers - innovations will only occur when innovators can appropriate their usevalue in production. That is, innovators will give priority to innovations that are used before the patents expire. Low or no priority will be given to research whose output becomes tangibly valuable only after expiration of possible patents. The patent system thus couples innovation and use. Innovation will only occur jointly with its use, which is very similar to the coupling in learning-by-doing models, where technology only advances if it is used.

In modern economics, it is required that arguments be given rigor by mathematical analysis to unveil the precise assumptions and data underlying the result. Snorre, Knut Einar and I have thus developed a formal analysis of a growth model along the lines of modern innovation theory (specifically, growth through expanding varieties, see Barro and Sala-i-Martin, 1995). In this model, we have shown that the R&D model gives results very close to (and in some cases precisely equal to) the learning-bydoing model. The early results of R&D models advocating a first-innovate then-take-action strategy, we have shown to be a peculiar consequence of some simplifying assumptions in the early models. To conclude, our research suggests that it is right to start with early policy action (e.g. environmental taxes) on emerging environmental problems, both when learning-by-doing and when R&D drives innovations.

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# To Read a Literary Work: Human Responsiveness and the Question of Method

The question of method is rarely raised within the field of contemporary literary studies.<sup>1</sup> The issue is seen as belonging to the heyday of logical positivism and scientism, and contempt for method is one of the forms taken by resistance to the unity-of-science ideology. We are not interested in adopting the objectives and methods of physics and other so-called exact sciences. Our field of research is of a completely different nature, and the aims and methods of the natural sciences cannot be transferred to the study of literary texts without damaging both the objects of study

and the point of studying these objects. There is no way the study of literature can be restricted to making objective observations about the work in question, and no way the significance of a literary work can be brought out solely by reporting such objectively observable facts about the text. Literary works belong to the realm of meaning, not to

Associate Professor Anniken Greve Department of Culture and Literature, University of Tromsø, Norway E-mail: anniken.greve@hum.uit.no CAS Fellow 2005/2006



the realm of fact, and the reading of a text requires not just the capacity to make observations in the text but also the capacity to respond to it as a human being.

One can share the view that the unity-of-science ideology that goes hand in hand with logical positivism is seriously flawed, as suggested above, and still think that the question of method ought to be at the centre of the meta-discussions and self-reflection of literary scholars. Together with Rolf Gaasland, professor of Comparative Literature at the University of Tromsø, as an expression of such self-reflection, I have developed a methodical system for the interpretation of literary works.<sup>2</sup> It recognizes the need for a systematic procedure for achieving a specified goal that we take to be both valid and central (although not the only valid or uniquely central goal) to literary studies: to establish the communicative value of the text considered as a whole. Establishing that requires an opinion about what the overall concern of the text is, and also about the

<sup>1:</sup> The questions have been replaced by the question of what role theory ought to play in scholarly readings of literary texts, a problem that is too huge to be even touched upon here.

The methodical system is published on the internet: http://textpraxis.uit.no, and is produced in Norwegian, but an English version will be published on the same address in the course of 2007.

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attitude to that concern, as expressed in the text. Normally we are in a position to draw conclusions about concern and attitude only towards the end of the reading process.

The methodical system offers a procedure for systematically paying attention to all the different aspects of a text that may influence its communicative value. It seeks to be as comprehensive as necessary and as simple as possible in relation to the stated goal. The system specifies a list of tasks with which the interpreter approaches the text in order to work out the contribution each of these aspects make to the overall communicative value of the text, then suggests a procedure for bringing observations relating to these various aspects together into an integrated interpretation. The system orders these tasks into three groups or three consecutive phases of the work: the initial phase of investigation, the phase of analysis and the phase of synthesis. While the order of the tasks within each of these phases is to some extent arbitrary and a matter of taste or convenience, the ordering of the three phases is crucial: One needs the information and insight into the text generated by the first sequence of tasks when working on the second sequence, and one cannot solve the tasks in the third sequence satisfactorily without having dealt with the two first groups of tasks.

Leaving all the theoretical problems involved in this way of thinking about the (study of the) literary text for another occasion,<sup>3</sup> allow me to clarify what this methodical system seeks to achieve and what it does not seek to achieve. It does not aim at 'objective interpretations', if that term is used to refer to interpretations that do not bear the mark of the person who made them. It is unlikely that two persons going through the procedure independently of each other would reach exactly the same results. It is even unlikely that the same person going through the procedure twice would arrive at the exactly the same conclusions. Making the result *reproducible*, which is one of the main purposes of method within the natural sciences, is not an issue here.

Furthermore, the methodical system is the bearer of what we may call *pitfall-awareness*: it is constructed to prevent certain potentially contraproductive tendencies from dominating the interpretive process. Without this kind of systematic approach, the interpreter will most likely build the interpretation on *initial intuition* about what is important in the text. This will typically draw attention to aspects of the text that lend support to the reader's initial intuition, and this intuition is very often coloured by the concerns that already have a strong grip on the reader's mind. The result is that one will see one's established preoccupations reflected in the text, and the features that point in the opposite direction of such preoccupations can easily escape him or her. The methodical approach seeks to establish a reading practice that acknowledges that every reading will be dependent on the reader having some intuition about what is important in the text,<sup>4</sup> but the reading procedure itself will not be structured by this intuition.

<sup>3:</sup> The list of problems is long. It includes the view of the literary text as essentially an act of communication, the idea of the literary text as a unified whole, the problem of intention, the notion of form involved, the understanding of the relation between theory and method, etc.

<sup>4:</sup> The reading process which the system suggests takes place within the hermeneutic circle, and is thus predicated upon one's initial understanding of the text.

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The system also seeks to make the interpretation as *open to criticism* as possible, preparing the ground for a detailed and comprehensive comparison of different and competing readings. The problem in a scholarly culture without this kind of methodical common ground is that each reading seems to establish its own premises, although exactly what these are and how the interpreter arrived at precisely this conclusion may be very hard to ascertain.

The methodical common ground also makes it possible for several people to work out interpretations together. Sharing a working procedure, we can take all the steps together and discuss every stage. This means that the challenge of producing the best argument to support one's view is placed at the heart of the reading process, and one is continually forced to relate not only to one's own observations and descriptions, but also to those of others.

Will this kind of methodical system give uniformity to the interpretations? Quite to the contrary: The tasks/questions merely indicate which aspects of the text the reader should pay attention to, but say nothing about the terms in which he or she is supposed to respond. This methodical approach means that the particularities of any given text stand a better chance of being grasped by the interpreter.

Another fear is that if all the different interpreters work by the same methodical procedure, we will no longer hear the individual interpreter's own voice. But this is incorrect, for the reason just stated. Using this methodical system, the interpreter will not be relieved of the task of finding the terms in which to respond to the text: That task is left to the interpreter. In responding to the tasks the system sets, the interpreter will need all her linguistic, intellectual, human and moral resources. Indeed, the quality of the interpretation will in most cases, at least in connection with rich and challenging texts, be a real test of one's own competence and intellectual resources. In other words, the interpreter's special qualities or lack of qualities in terms of understanding, perceptivity to details in the textual design, sensitivity to turns of language or storage of historical and philological knowledge relevant for the interpretation of the text in question, will be reflected in the way in which the various tasks are solved in each individual case.

Is such a methodical procedure a prerequisite for the scholarly interpretation of texts? It may be in practice if not in theory: Those of us who are not geniuses may need the assistance of the procedure to recognise all relevant features of the text. On the other hand, it is clearly also insufficient. Exactly because the questions or tasks are given in terms that for the most part do not suggest a set of alternative answers, readers are at the mercy of their own insights, responses and responsiveness in formulating these answers. One's human resources are crucial to the interpretation, as indeed are one's general theoretical and philosophical resources. On the whole I take the opposition between human responsiveness and method to be misleading. This methodical system *requires* such responsiveness; the methodical procedure seeks to assist it, giving it more observations in the text to draw on, and thus seeking to enrich the interpreter's personal involvement with the text.

# **Environmental Costs: Balancing** the Present and the Future

# Introduction

Many present day decisions will impact the environment far into the future. A good example is the climate development. Most scientists agree that with current and in particular increasing emissions of so-called greenhouse gases (of which carbon dioxide is by far the most important), we will experience significant climate changes in the coming decades and centuries. Moreover, there is not much we can do or not do to influence the climatic development over the next 30–50 years. However, present decisions regarding emissions in coming decades will strongly influence the climate during the latter half of this century. If little or nothing is done



Professor Michael Hoel Department of Economics, University of Oslo, Norway E-mail: m.o.hoel@econ.uio.no CAS Group Leader 2005/2006

to limit climate change, it will most likely have very severe adverse effects in the future. Many scientists argue that there is a significant probability of catastrophic climate change during the next one to two hundred years unless greenhouse gas emissions are reduced considerably.

Decisions that limit or prevent dete-

rioration in the quality of the environment in the future are usually costly in the sense that such decisions reduce current levels of material consumption. To reach good decisions, one must therefore balance such current costs against the future benefits of avoiding environmental degradation. This requires two types of measurement. First, we must in some way be able to measure environmental quality in the same units as we measure costs (often expressed in terms of 'money'). Second, we must be able to compare costs and benefits (measured in the same units) at different points in time.

# Measuring environmental quality

Can environmental quality be measured in 'money'? Standard economics responds 'yes' to this question. More precisely, it is usually assumed that a decision maker (politician, household, voter) can give an answer to the following type of question: "What do you prefer, 'low' material consumption and a 'good' environment or a 'high' material consumption and a 'bad' environment?" If such questions (with good/bad and low/high defined precisely) can be answered, one can in principle draw indifference curves in a diagram of the type illustrated in Figure 1, with some measure of environmental quality E on the horizontal axis and an aggregate measure of material consumption C on the vertical axis. All points along an indifference curve are valued as equally good by the decision maker,

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and indifference curves further out in the diagram represent better combinations of environmental quality and consumption than combinations further in.

Consider in particular point I in Figure 1 (forget about the red curve for now). The slope of the indifference curve going through this point tells us

something about the marginal valuation of environmental quality. More precisely: The slope tells us how much 'compensation' is needed in terms of consumption to just offset a deterioration of one unit in the environmental quality measure. In a sense, the slope of an indifference curve thus measures the price of the environ-





ment. Notice that this slope depends on the initial conditions, an important feature I will return to subsequently.

In practice there are obviously several important issues regarding whose preferences we are measuring, how to aggregate preference across different persons, and how to actually measure preferences. I ignore all these issues in the current presentation.

## Comparing costs and benefits at different time points

When economists add together costs and benefits that occur at different points in time, all items are typically calculated first in present value. This means that a cost/benefit item 10 years from now is discounted at some discount rate before being added to a cost/benefit item today. For example, at a discount rate of 5 per cent per year, an item valued at NOK 1 million 10 years from now is equivalent to just NOK 614 000 today. For cost and benefit items in the distant future, the effects are much more dramatic: NOK 1 million in 100 years is equivalent to only NOK 7 604 today. Even at the much lower discount rate of 2 per cent, NOK 1 million 100 years in the future is worth only NOK 138 032 today.

Why should the discount rate be positive? The answer involves a combination of technology and preferences. Figure 2 gives a very simple picture of a world consisting of two periods: present and future. The present is on the horizontal axis. The more we invest for the future, the less we consume at present (the lower  $C_1$ ), the higher the consumption in the future  $(C_2)$ . Moreover, in a productive economy, an investment will pay back more than the invested amount, at least if we start in a situation where consumption is equalized across periods as it is where the 45-degree line cuts the consumption possibility curve (the blue curve in Figure 2). Preferences regarding present versus future consumption are illustrated by the green lines in Figure 2. It is often assumed that these preferences have the following property: Starting in a situation where consumption is equalized across periods, we would prefer 1 unit more consumption now rather that in the future. This element of 'impatience', or discrimination against future generations, is captured by the slope of the indifference curve being steeper than the one on the 45-degree line.

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Given the assumptions about technology and the preferences described above, the tangent of the optimal point P in Figure 2 must be steeper than one. Denoting this steepness 1+R, R is the positive discount rate between

the two periods: if we give up one unit of consumption today, we must have 1+Radditional units of consumption in the future to be as well as off as before the change. This discount rate *R* is a compound rate, and is linked to the yearly discount rate *r* by the formula  $1+R = (1+r)^N$ , where N is the number of years between the present and the future.



Given that the discount rate is positive, its size is obviously of great importance for all decisions that are based on calculating the present value of all benefits and costs. As demonstrated above, a discount rate of e.g. 5 per cent per year implies that the present value of a cost item 100 years in the future will have a present value that is much lower than its future value. Estimates of discount rates are typically in the range of 3 to 8 per cent.

Given the reasoning above, the discount rate follows directly from the curves representing preferences (green lines) and technology (blue curve) in Figure 2. However, the locations of these curves are not in reality without problems. Regarding preferences, it is one thing to know the preferences of a single decision maker, but it is far more difficult to define preferences across different generations. Without consensus on such intergenerational preferences, the positions of the green curves in Figure 2 are not well defined. Moreover, for a given level of present consumption, future productivity growth and thus future consumption are uncertain. The position of the blue curve in Figure 2 is thus uncertain. Partly for these reasons, Martin Weitzman has argued that "While there is uncertainty about almost everything in the distant future, perhaps the most fundamental uncertainty of all concerns the discount rate itself"1 and "The most critical single problem with discounting future benefits and costs is that no consensus now exits, or for that matter has ever existed, about what actual rate of interest to use".2

## The future price of environmental quality

Whatever value the discount rate has, future cost and benefit items, for instance, future environmental damage, should be valued in real future prices. The future prices may be much higher than present prices. This is illustrated in Figure 1. As argued above, at point I the 'price' of environmental quality is given by the slope of the indifference curve at I. As time passes, material consumption will typically grow due to economic growth.

<sup>1:</sup> Weitzman M. L.: "Why the far-distant future should be discounted at its lowest possible rate." *Journal of Environmental Economics and Management* 36 (1998): 201–208.

<sup>2:</sup> Weizman M.L.: "Gamma discounting." American Economic Review 91 (1) (2001), 260-271.

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This will not usually be the case for environmental quality. It will at best be constant or increase only slowly, or even decline, as illustrated by the red curve in Figure 1. At a future date, we may therefore be at point F in Figure 1. At this point, the indifference curve is considerably steeper than at point I. This means that the price of the environment has increased over time. This has important implications for evaluating policies that affect environmental quality in the distant future. If the valuation today of a specific environmental change is  $V_0$ , the relevant price at a future date t is  $V_t = V_0(1+p)^t$  where p is the expected rise per year in the real price of environmental quality. Discounting this term to the present gives the expression  $V_0(1+p)^t(1+r)^{-t}$ . Even if r is positive and on the magnitude of 5 per cent, the combined effect of discounting and the relative price increase on environmental quality implies that the environmental impact of current actions may be of significant importance even if the impact only occurs in the distant future. This is explored in more detail in Hoel and Sterner (2006)<sup>3</sup>: Using realistic values for key economic variables and parameters, we show that that term  $(1+p)^t(1+r)^{-t}$  may be close to one – or even larger than one – even for large values of t. In particular, we show that this term may exceed one if climate change causes 'catastrophic change', implying that the effects of climate change should be given strong emphasis in the evaluations of alternative current policies, even if the most severe climate changes occur in the quite distant future.

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# Economic Evaluation of Environmental Policy Instruments: The Case of Voluntary Cooperation Agreements in Flanders

# Introduction

The purpose of this contribution<sup>1</sup> is to show how the effectiveness of policy measures can be evaluated *ex post*. The general approach is illustrated by a case involving voluntary environmental cooperation agree-



# Associate Professor Johan Eyckmans

European University College Brussels (EHSAL), COFSE, Belgium and Centrum voor Economische Studiën, Katholieke Universiteit Leuven, Belgium E-mail:

Johan.Eyckmans@econ.kuleuven.be CAS Fellow 2005/2006 ments between the Flemish environmental authorities and individual municipalities. These agreements aim at reducing the non-recyclable part of collected household waste. Methodologically, we apply a dynamic difference-in-differences estimator to a dataset of residual waste and socioeconomic variables covering all 308 Flemish municipalities for the period 2000-2004. The method tries to assess

whether municipalities subscribing to the voluntary agreement achieved a greater reduction of residual waste than what could be expected on the basis of their own performance prior to subscription and the performance of the non-subscribers.

# Voluntary agreements between the environmental authorities and municipalities

Under the Belgian constitutional system, the three regions (the Flemish Region, the Brussels-Capital Region and the Walloon Region) enjoy considerable responsibilities and autonomy in respect of environmental policy. In many environmental policy domains, the regions can set their own targets and implement a variety of policy instruments such as standards, taxes or subsidies. They are also responsible for the inspection and enforcement of these environmental policies.

<sup>1:</sup> This contribution is based on research conducted during my participation in the project "Environmental economics: policy instruments, technology development, and international cooperation" conducted at the Centre for Advanced Study (CAS) at the Norwegian Academy of Science and Letters in Oslo in 2005/2006. The financial, administrative and professional support the Centre provided for this project is much appreciated. Research assistance by Simon De Jaeger (EHSAL) and useful comments by an anonymous referee are also gratefully acknowledged.

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The basis of the Flemish regional waste management policy is the decree of 2 July 1981 concerning prevention and management of waste materials, known in Dutch as the 'Afvalstoffendecreet' and the coordinated ruling known as VLAREA ('Vlaams Reglement inzake Afvalvoorkoming en Afvalbeheer', 17 December 1997). The Public Waste Agency of Flanders (OVAM or 'Openbare Afvalstoffenmaatschappij') is responsible for preparing and implementing regional waste management policy. Important instruments in this context are the current and past versions of the implementation plan for the treatment of household waste. In practice however, local municipalities and city councils organize the collection and disposal of household waste. They decide on the practical details of the collection system (frequency of collection, payment schemes, e.g. per capita tax, payment per bag, etc.), recycling strategies and the disposal of collected waste. However, the policies chosen by these local authorities are to be in line with the principles of the higher level environmental authorities.

Against this complicated legal background, the Flemish regional government has set up a system of voluntary cooperation agreements with the local municipalities to assist them in the implementation of the regional environmental strategy in general and waste management strategy in particular. Municipalities can subscribe to the agreement on a voluntary basis. By subscribing, the municipalities commit themselves to performing certain tasks and to meeting well-defined goals. In exchange, they receive financial support if all targets are achieved. The cooperation agreement consists of eight different clusters and three ambition levels (level 1: entry, level 2: advanced and level 3: ambitious) and each participating municipality is to a large extent free to select the clusters and corresponding ambition levels to which it wants to subscribe.

We focus on the solid waste cluster ('Vaste Stoffen' in Dutch) of the voluntary agreement for the period from 2002 to 2004. The strategic goal for this cluster is to reduce the amount of solid waste generated by households and it specifies a detailed time frame and quantitative policy goals for what is called *residual waste*, which basically includes all non-recyclable household waste. To be eligible for a grant, subscribing municipalities are to reduce their residual waste production to 200 kg *per capita* per year for ambition level one and to 150 kg per capita per year for ambition level one and  $\notin 1.60$  per inhabitant for level two. Although final goals were to be met in 2004, transitional achievements are evaluated by means of specific intermediate targets.

As mentioned before, municipalities can enter into the cooperation agreement at three different ambition levels. However, the residual waste targets for level one are not very strict, meaning that the overall waste production for level one participants is quasi-identical to that of non-participating municipalities. Hence we pooled non-participating municipalities and participating municipalities at the lowest ambition level into one group: the non-subscribers. Municipalities which decided to subscribe at level two are hereafter referred to as subscribers. No municipality subscribed to level three for the solid waste cluster for the period under consideration. According to this classification, about 27 per cent of municipalities can be labeled subscribers.

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Figure 1 displays the evolution of residual waste over time. It reveals considerable differences between subscribers and non-subscribers before and after signing the voluntary agreement. Both in absolute and in relative terms, non-subscribers have reduced their *per capita* residual waste more than subscribers between 2001 and 2004.

# Difference-in-differences methodology

By comparing average residual waste levels one might conclude that

subscribers perform better than non-subscribers because their waste level is substantially lower. However, from this observation we cannot conclude that the difference in performance is due to the voluntary agreements. In particular, we observed in Figure 1 that subscribers were already on a lower level before the date of subscription. This might point to socalled endogeneity problems, meaning that the observed subscription behavior is



**Figure 1:** Evolution residential waste Legend: error bars denote +/- 2 times standard error

correlated with some unobserved latent characteristics such as, for instance, the 'green' preferences of the inhabitants of the municipalities. If subscribers have more favorable unobserved characteristics, the effect of the voluntary agreements would be overestimated by simply comparing average residual waste levels of subscribers and non-subscribers because subscribers can be expected to perform better, even in the absence of the voluntary agreements, see Blundell and Costa Dias (2000) or Verbeek (2000).

The real evaluation challenge is therefore: what would have been the performance of the subscribers, had they not signed the voluntary agreement? In other words, is the currently observed situation significantly different from the hypothetical situation without voluntary agreements? To answer this question, one needs to make assumptions on the counterfactual or business-as-usual scenario without voluntary agreements.

Figure 2 is a stylized graph of a possible evolution of residual waste

over time for subscribers and non-subscribers. It illustrates how the dynamic differencein-differences technique (for an introduction, see Moffitt 1991) constructs the counterfactual scenario. It uses information on the pre-treatment period to extrapolate a trend (dotted line in Figure 2) that the subjects would follow in the absence of the voluntary agreement. This counter-



Figure 2: Difference-in-Differences
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factual value is compared against the actual achievements. For instance, the subscribers' progress is measured by distance minus D, which is negative since they produce more residential waste than what could have been expected based on the extrapolation. For the non-subscribers, progress is measured by C. As a final step, the progress of the treated waste is corrected by deducting the progress of the non-treated waste to obtain the real treatment effect: -D - C in the case of Figure 2. The negative treatment effect means that the subscribers did worse, instead of better, after treatment taking into account their own pre-treatment trend and the performance of the reference group. The treatment should therefore be considered unsuccessful.

In De Jaeger and Eyckmans (2006), we implemented the dynamic difference-in-differences approach in a statistical regression framework in the same way as Bratberg et al. (2005) to test for statistical significance of observed differences in performance between subscribers and non-subscribers.

## **Results and conclusion**

Considering the whole time horizon of the program, our results indicate that municipalities subscribing to the voluntary agreement were, on average, characterized by less reduction in their residual waste levels than what could have been expected on the basis of their own performance prior to subscription and the performance of the non-subscribers. Sensitivity analysis has revealed that this negative result needs to be qualified since we did detect positive agreement effects for the very last year of the agreement. It might require more time before the positive effect of the agreement filters through to the data.

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# **Dynamic Competition**

In many important industries, a small number of specialized suppliers face a single large buyer. The buyer is often a government awarding construction projects such as airports, bridges, highways, or purchasing military equipment like airplanes. Alternatively, the buyer can be a shipping company ordering cruise ships, a telecommunication operator ordering network infrastructure, or a cohesive buyer group (for example, a national monopoly of alcohol sales) making large orders of wine or other commodities. In most cases competition among suppliers is oligopolistic, that is, the number of suppliers is small enough to imply strategic interactions and thereby some imperfections in competition among suppliers. Oligopolistic competition is found in most sectors of industrialized economies and it has therefore been extensively studied.<sup>1</sup> What has received



Dr. Matti Liski Department of Economics, Helsinki School of Economics, Finland E-mail: Matti.Liski@hse.fi CAS Fellow 2005/2006 less attention is the above-mentioned presence of a large buyer who can (and has incentives to) 'manage' the competition among suppliers to best exploit the economic value that suppliers can provide.<sup>2</sup>

Competition among suppliers is often dynamic by nature for two main reasons. First, large specialized projects take

time to complete so a supplier committing resources to a project today cannot participate in a competition tomorrow. Given suppliers' time-tobuild constraint, buyers can alter the competitive positions of sellers by timing their purchases based on how many suppliers are currently ready to participate in competition. The trade-off for the buyer is that waiting improves competitive positions but is also costly as projects should be started when needs arrive. The second reason for dynamic competition is that the economic value of a particular supplier usually depends on how often the supplier has been actively supplying in the past. In hightech markets such as data processing, aeronautics and defence, suppliers learn from their production experience which makes them more effective suppliers in the future. The trade-off for the buyer is then that using the same supplier frequently improves efficiency, but at the same time may make the supplier too dominant in competition with rival suppliers.<sup>3</sup>

It is important to understand how the above-described dynamic competition creates economic value for society. Competition may be too severe so that suppliers do not receive a proper share of the economic value they produce. This can distort the incentives to enter the industry or to make investments that would be valuable for society. On the other hand, the dynamic nature of the competition may provide paths to suppliers to

<sup>1:</sup> See, for example, Schmalensee and Willig (1989).

<sup>2:</sup> Bergemann and Välimäki (1996, 2006) are among the few exceptions.

<sup>3:</sup> This trade-off is explained and analyzed in Lewis and Yildrim (2002).

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extract an excessive share of the economic value in a way that is costly for society. It is particularly important for governments to understand how dynamic competition should be managed to minimize the costs of public procurement, or to design guidelines for the competition authorities.

One way to understand dynamic competition is to find regularities from past experience through case studies or more general empirical analyses. However, lessons from industries vary markedly, so it is extremely difficult to draw general conclusions without having a conceptual framework. Such a framework can pin down general principles applying across cases and provide structure for empirical work. Economists' approach to a conceptual framework is to use abstractions, reducing information and retaining only what is important for the purpose of understanding general principles of dynamic competition. Mathematical models are such abstractions. While they are widely used in other disciplines, for example, in studies of industrial processes, it is important to emphasize that economic modelling often seeks to abstract from institutional frameworks as well. This means that an ideal economic model of dynamic competition is not a model of shipbuilding or defence equipment procurement per se, but something more general, providing a tool for thinking about principles that apply across cases. Abstracting from institutions is important. First, institutional frameworks vary more than in most other disciplines that use mathematical modelling. Second, willingness to accept the institutional abstraction allows one to explore its usefulness in producing potential results and then later test if the results have validity across cases.

Let us illustrate the economists' approach by considering a simple model of dynamic competition with one buyer and two sellers. Each seller has one commodity to sell, but after making a sale it takes two periods before that seller can serve the buyer again. We can envisage that the good keeps well but needs time to mature. The buyer has a constant valuation for consuming the goods and sellers have no other costs of production than the cost of waiting. It is socially efficient to consume goods during every period and this can be achieved by letting the two sellers take turns supplying the goods. However, already within this simple framework, we can show that spot price competition among sellers leads to distributional inefficiency in the sense that sellers do not receive the true social value of their product as their payoff. The reason is that the buyer is tempted to delay purchases to enhance competition, allowing him to extract an inefficiently large share of the overall economic value of consumption.

The example illustrates that the buyer has incentives to destroy social value (that is, to postpone purchases) in managing dynamic competition to increase his share of the social value. The lesson is that competition among suppliers should not be organized as a pure spot price competition where money transfers are made only in connection with actual purchase. The reason is that under spot price competition, sellers not yet ready to supply cannot compete with suppliers in a mature state, implying that the market cannot intermediate the social value of goods still maturing. While we used a simple model of two producers and goods to find out the result, it is clear that the observation holds more generally in situations where the buyer is in a position to destroy social value in the above sense.

Liski and Välimäki (2006) have started a project where the focus is on the distributional aspects of dynamic price competition given suppliers' time-to-build constraints. The objective is to follow the above-described

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procedure of abstraction to eliminate all but the fundamentals determining the distribution of economic value. Preliminary results suggest that a new distributional pattern emerges from the dynamic demand-supply structure characterizing the timing of buyer's need for the service and the producers' production lags. The results can provide insights into what might be prudent public policy in procurement sectors with a certain dynamic demand-supply structure. For example, preliminary results suggest that we can identify situations where subsidizing weak suppliers is socially valuable or where the buyer's ownership of some suppliers should be separated from the management of these firms.

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The future of literary theory, its 'whither', depends on the future of literature. Let me explain what I mean by that. Literary theory is a secondary, subordinate discipline, as is 'theoretical physics'. Literary theory is ancillary. It is a handmaiden to literary study proper, just as theoretical physics depends on the empirical data gathered by physicists. People will need literary theory only as long as literature continues to exist and to have importance for societies and for individuals in those societies. If literature ceases to have great importance in a given society, literary theory will continue to be necessary to account for literature of the past. This will happen when new media become dominant, as, it can be argued, is currently happening, at least in the West. If literature becomes less a central social force, we will still need literary theory. We will need literary

theory, however, more for antiquarian purposes, that is, to help understand literature of past centuries. In those past centuries, receding further from us every day, literature still had a central cultural and individual role in the formation of citizens. Victorian novels, for example, played that role in Victorian England. Literature will go on being written and

#### Professor J. Hillis Miller

Department of English and Comparative Literature, University of California, Irvine, USA E-mail: jhmiller@uci.edu CAS Fellow 2005/2006



read for a good while yet. Nevertheless, film, television, popular music, video games, the Internet, and other tele-technological prestidigitizing media are replacing literature. What might be called (though with great caution) the 'literary' use of words or other signs is migrating to these new media. I say "with great caution" because any features of 'the literary' that I can think of also characterize non-literary uses of words or other signs. To call something 'literature' is a speech act: "I declare this is literature." If Shakespeare were alive today, I would wager that he would be writing film or television scripts, where the action is, just as he would have written novels if he had been a Victorian, or poetry if he had lived in the Romantic period. Shakespeare was a professional writer who wanted to make money and influence people.

## The function of literary theory

The theoretical component of cultural studies is quite different from literary theory. Why? Cultural studies' object of study is the totality of culture or of social life. Literature proper is an increasingly marginal aspect of what cultural studies study. Cultural studies comprise a branch of sociology or anthropology. More and more people nominally in the humanities have appropriated the subject matter and the protocols of these disciplines. These days, cultural studies are often made in what are still, sometimes misleadingly, called 'literature departments'. Nothing is wrong with this, since young scholars in the humanities, like my hypothetical twenty-first century Shakespeare, are shifting to where the action is,

that is, to film, television, video games, etc. It is, however, a big mistake to confuse literary theory with cultural theory. The data they are intended to account for are quite distinct.

The function of literary theory is to account for specific bodies of literature (in the old-fashioned sense of printed poems, novels, and plays). Literary theory characteristically works by way of formulations that, apparently, have a quite high degree of generality or universality. One example is Aristotle's definition of tragedy as "a process of imitating an action which has serious implications, is complete, and possesses magnitude; by means of language which has been made sensuously attractive, with each of its varieties found separately in the parts; enacted by the persons themselves and not presented through narrative; through a course of pity and fear completing the purification of tragic acts which have those emotional characteristics."<sup>1</sup> An example of literary theory from our own time is Paul de Man's apodictic assertion in "Allegory (*Julie*)" that:

The paradigm for all texts consists of a figure (or a system of figures) and its deconstruction. But since this model cannot be closed off by a final reading, it engenders, in its turn, a supplementary figural superposition which narrates the unreadability of the prior narration. As distinguished from primary deconstructive narratives centered on figures and ultimately always on metaphor, we can call such narratives to the second (or the third) degree *allegories*.<sup>2</sup>

In spite of the high degree of generalization in such literary theoretical formulations as those Aristotle and de Man make, however, literary theory is historically rooted. It belongs to a single time, place, and culture. Formulations such as literary theorists make promote good reading of specific literary works. Literary theories are an aid to reading, even if good reading, as de Man thought, means a discovery of the impossibility of reading. Literary theories have no other legitimate function than to aid the reading of literary works, though whether they actually do that is another question. This subordinate role is the true one even though it may be attractive to think of literary theory as an independent, self-enclosed discipline that can, as Edward Said put it, 'travel' from country to country. Literary theory, it appears, can be translated from language to language, from culture to culture, and still remain valid. It can remain performatively effective in a new place and in relation to new bodies of literature.

This is not really the case. The formulations literary theorists make look universal are in truth tied to the specific body of literature that generated them and for which they were originally intended to give an account. The paradigmatic example of that in the West is one of our oldest literary theoretical works, one I have already cited, Aristotle's *Poetics*. Aristotle's primary goal was to account for a specific body of literature, Attic tragedy: the plays of Sophocles, Euripides, Aeschylus, and others in fifth century B.C. Athens. As Renaissance and subsequent theorists discovered, it is extremely difficult, without considerable awkward twisting, to make Aristotle's formulations work for the more or less Christian tragedy of

Aristotle, *Poetics*, trans. Gerald F. Else (Ann Arbor: Ann Arbor Paperbacks, The University of Michigan Press, 1978), 25.

<sup>2:</sup> Paul de Man, Allegories of Reading (New Haven: Yale University Press, 1979), 205.

sixteenth and seventeenth-century Europe. Examples of the latter are Shakespeare's *Hamlet* (1603–4?), or his *King Lear* (1606), or Racine's *Phèdre* (1677). In a similar way, Paul de Man's goal, in the essay cited above, was to account for Rousseau's *Julie*. Bahktin's goal, in his works of literary theory, was to account for Dostoevsky or for a specific body of novels.

## The testing of literary theory

The close relation between a given literary theory and the literary work or works it is meant to account for may be further elucidated. A literary theory, like a scientific hypothesis, is of no use unless it is falsifiable, that is, capable of possibly being proven wrong. If I say the moon is entirely made of green cheese, scientists would want some proof of that, for example a piece of green cheese brought back from a voyage to the moon. If I bring back a moonrock, not cheese, my hypothesis would need to be revised. At least some of the moon is not green cheese. I have proved my initial hypothesis to be wrong. In a similar way, Aristotle's definition of tragedy is of no use unless it can be shown that it actually fits real Athenian tragedies. Aristotle primarily shows how well his theory fits Sophocles's Oedipus the King. De Man's formulation would take a lot of testing, since he says, "The paradigm of *all* texts . . . etc." That covers a lot of ground. Surely, there is some one literary text that does not fit this paradigm? If that can be shown, de Man's hypothesis will have been falsified. De Man's essay at least shows that his theory more or less works for *Julie*. That is not surprising, since the reading generated the theoretical statement in the first place. Even in these cases, however, that is, in my citations from Aristotle and de Man, the relation between literary theory and reading is not that of total congruence or confirmation, but that of disqualification and modification. This disjunction generally characterizes the relation between literary theory and the empirical data it is meant to explain, that is, actual literary texts as they are encountered in reading. Close reading may be motivated by theory, but it leads to the modification of theory, often its severe modification.

A longer version of this paper compares Thomas Pynchon's short story, "The Secret Integration" (1964) with Miguel de Cervantes's "The Dog's Colloquy" (1613) to show that the distinguishing features of 'post-modern' narrative posited by theorists like Fredric Jameson already characterize Cervantes's story. For example, a conception of the community as selfsacrificially turned against itself is, it turns out when you read both stories, a fundamental feature of both "The Secret Integration" and "The Dogs' Colloquy," though they are separated by three hundred and fifty years.

## Conclusions

What conclusions would I deduce from my juxtaposition of Pynchon's "The Secret Integration" and Cervantes's "The Dogs' Colloquy"? I draw five conclusions: 1) Theoretical definitions of postmodernism in literature by way of formal and structural features tend not to be valid, since they can be shown to characterize earlier literary works too. No doubt, an adept reader can easily tell, from thematic elements, from décor, from place names, and so on, whether he or she is reading Pynchon or Cervantes, but the repertoire of available narrative techniques is remarkably the same in both the exemplary tales I have discussed. It follows that the theoretical hypothesis of distinctive formal features in postmodern

narrative is disproved by an investigation of actual literary works. 2) My comparison of the two stories is evidence that the repertoire of narrative techniques used in Western narrative has not changed all that much since Cervantes. One way to define Cervantes's greatness is his mastery of those techniques already, at the very beginning of what today we call the history of the novel. 3) I conclude from this that definitions of period styles in literature, and even periodizations in literature generally, are highly problematic, always to be interrogated and viewed with suspicion. 4) I claim to have shown that the Derridean concept of the community's autoimmunitary logic has wide and provocative relevance for understanding the presentation of communities in works of fiction from Cervantes to Pynchon and, as I have elsewhere shown, Toni Morrison. Jacques Derrida's hypothesis that every community, including those represented in literature, exemplifies what he calls "auto-immunitary logic" is confirmed by the reading of at least two exemplary works. Further readings would be necessary to see whether this hypothesis has general heuristic value. 5) I claim to have shown an example of the peculiar disjunction between literary theory and the reading of literary works, in this case the disjunction between the theory of postmodernism in literature and what happens when you test this theory against the data of actual literary texts. The disjunction is 'peculiar' because the theory orients and motivates the reading that disqualifies that theory.

## Introduction

Statisticians have traditionally been very sceptical towards causality, but in the last decades there has been increased attention towards, and acceptance of, 'causal' methods in the statistical (and computer science) community (Rubin, 1974, 1978; Holland, 1986; Robins, 1986, 1987; Spirtes et al., 1993; Pearl, 1995, 2000). In this paper I give a brief overview over the particular challenges statisticians have to face when trying to infer causality and these recent developments.

#### Association versus causation

The main task when we want to carry out causal inference is to distinguish, conceptually and then based on data, between association and causation.

Association is meant to describe situations where phenomena occur more often together (or not together) than would be expected under independence. In a purely statistical sense these associations do not need to be in any way meaningful; that some seem 'funny' (Yule, 1926) is due to

#### **Dr. Vanessa Didelez**

Department of Statistical Science, University College London, UK E-mail: vanessa@stats.ucl.ac.uk CAS Fellow 2005/2006



the expectation that they reflect a causal relation. Consider the following examples:



Figure 1: The number of newborns and the number of storks are associated.

1) The number of storks per year nesting in small villages of a given country and the number of newborns in these villages are clearly associated – the more storks there are the more newborns per year (this example is attributed to Yule according to Neyman (1952); see also Höfer et al., 2004). Obviously there is no causal relation, so where does the association come from? A closer look reveals that the number of storks as well as the number of newborns reflect the size of a village: a larger village has more families producing more newborns and has more roofs allowing more storks to nest (cf. Figure 1).

2) Sober (1987) points out that the bread price in Britain and the sea level in Venice over the past two centuries are positively correlated. Most people would agree that neither is a cause of the other, so where does the positive correlation come from? The explanation is that both quantities

have steadily increased over time due to their respective local conditions which are not further related to each other (cf. Figure 2). Hence it is two unrelated time trends that induce an association.



Figure 2: Bread price in Britain and water level in Venice both exhibit a time trend.

There is no single agreed on definition of causality in the statistical and philosophical literature. In the statistical literature one can distinguish at least four broad approaches: (i) probabilistic causality, reducing the question of causality to probabilistic statements among suitably defined events; (ii) counterfactual causality, addressing the question of "what if something had been different in the past"; (iii) structural models, assuming that the system of interest is driven by stable (stochastic) mechanisms this approach addresses under which condition these mechanisms can be uncovered; (iv) decision theory, addressing the question of making optimal decisions under uncertainty.

Maybe except for (i) all of these approaches deal, more or less explicitly, with causation as the effect of an intervention in one (or more) variable(s) on some response variable. Typically, scientists are interested in causal relations *because they want to intervene* in some sense, to prevent diseases or to make life easier etc. Some examples:

1) It is well known that the increase of CFC use has been accompanied by ozone depletion, i.e. there is a clear association between the two. The underlying photochemical processes are by now studied and understood well enough to say that CFC is the cause of the ozone depletion. Hence we would expect that reducing the level of CFC (by some intervention!) will slow down or even reverse the ozone depletion. The Montreal Protocol signed by 43 nations in 1987 could be regarded as such an intervention to reduce and phase out the use of CFC.

2) We can be pretty sure that manipulating the number of storks in a village, e.g. setting it to zero by killing them, will not change the number of newborns in that same village – this association is not causal.

We now turn to the question of why associations can be observed without an underlying causal relation. A cause X and a response  $\Upsilon$  will be associated if X is indeed causal for  $\Upsilon$  but not necessarily vice versa, as demonstrated with the above examples. The following are alternative explanations.

**Common Cause – Confounding.** If *X* and *Y* have a common cause, as in the storks/newborns example, they can be associated without being causally related at all. The presence of a common cause is often called *confounding*.

**Reverse Causation.** In reality,  $\Upsilon$  might be the cause of X and not, as we think, vice versa. For example if X is the homocysteine level and  $\Upsilon$  is coronary heart disease then it could be that existing atherosclerosis leads to increased levels of homocysteine and not vice versa.

**Time Trends.** X and Y may only be associated because they are the results of two processes with time trends without these time trends being related to each other, as for example the bread price and water level in Venice.

**Feedback.** X and  $\Upsilon$  may be associated because they instigate each other. As an example consider alcohol abuse and social problems: does a person drink due to social problems, like problems in his job, or are such problems the consequence of alcohol abuse or both?

Of course one should never forget that observed associations may just be due to coincidence. Also, it would be presumptuous to claim that the above list is complete; there may be other reasons that scientists and philosophers have not thought of yet.

## Methods to assert causation

If we want to investigate what happens when we manipulate a variable, then an obvious method is to actually carry out such manipulations and observe the result. This is what is done in experimental studies. For instance in a clinical trial, patients are randomly allocated either to the treatment group or to the non-treatment (control) group. This random allocation ensures that X is not associated (except by coincidence) with anything that is not a consequence of X rendering most of the above explanations for association without causation very unlikely. In addition, clinical studies are often 'double blind' meaning that neither the patients nor the doctors or nurses know who is in which group. This is secured by formulating the investigational drug and the control (either a placebo or an established drug) to have identical appearance. Hence it is ensured that the psychological effect is the same in both groups. In other areas it is more difficult to design good experiments, but researchers are inventive, for instance sociologists when investigating discrimination by faking the names on CVs (Bertrand and Mullainathan, 2003).

In many subjects, in particular in epidemiology, it is impossible to carry out experiments. For instance if the 'cause' is smoking behaviour, alcohol consumption or education, we cannot randomly allocate subjects to different groups. Instead we have to make do with data on the behaviour as it is, but this will typically mean having to deal with confounding as, for example, smokers are likely to exhibit a life style that is different also in other respects from that of non-smokers (cf. Figure 3).

So how do we infer causation from non-experimental data? In some circumstances when a thorough knowledge of the subject matter is available one can identify the confounders and measure them in addition to the X and Y variable of interest. The causal effect can then be assessed within every level of the confounders, i.e. based on stratification. This yields valid causal inference if a sufficient set of confounders is used. There are many problems with this approach: one can never be sure about what the relevant confounders are and even then, there may be many different ways of measuring them; in addition, typical confounders are prone to errors, e.g. self-reported alcohol consumption is known to be unreliable. Hence, unlike experimental studies, causal inference from epidemiological data rests on a certain prior knowledge of the system under investigation. Graphical representations of background knowledge have been suggested to facilitate this task (Pearl 1995, 2000). Such graphs

represent the conditional independencies (i.e. purely probabilistic relations) but can, under certain assumptions, be informative about causal relations.



Figure 3: The problem of confounding in Epidemiology.

## The role of time

Recall that confounding is only one of the reasons why we may observe associations without the desired causation. Reverse causation, time trends and feedback all involve time but it is even more difficult to 'adjust for time' than the above 'adjustment for confounding'.

First of all we obviously need to have data over time – usually from so-called *longitudinal studies*. Secondly, we must be careful not to adjust for so-called *mediating (or intermediate) variables*. To explain this, consider the simple example in Figure 4.



Figure 4: Example for an intermediate variable.

The effect of smoking on developing lung cancer can plausibly be assumed to be mediated by the ensuing amount of tar deposit in the lungs – note that passive smoking may also result in tar in the lungs. The above graph even suggests that once the amount of tar is known, cancer risk and smoking are independent. If we mistakenly think of 'tar deposit' as a confounder and adjust for it, we may therefore wrongly find that there is no effect of smoking on lung cancer. This is because within every given level of 'tar deposit', whether the person is smoking or passive smoking makes no difference anymore to her probability of developing lung cancer. It is well known among epidemiologists that adjusting for mediating variables can 'hide' the causal effect in which we are interested (Weinberg, 1993).

Thirdly, we must further be aware that in longitudinal settings certain variables can be confounders for some treatments and intermediates for others. For example, consider a study where patients with operable breast cancer receive repeated cycles of chemotherapy, the number of which depends on the development of the size of the tumour as monitored by palpation and imaging methods, and the outcome is whether or not there are any malignant cells remaining at surgery (cf. Minckwitz et al., 2005). Obviously the tumour size is a good predictor of the outcome. The aim of this study is to identify the number of tumour cycles required to destroy

all cancer cells. The problem is that the tumour size is a mediating variable of earlier chemotherapy. Hopefully, once the first chemotherapy cycle has been given, the tumour should start to decrease. However, tumour size is also a confounder, because if the tumour is still large, more chemotherapy cycles might be given, or in bad cases the therapy is interrupted and surgery takes place immediately (cf. Figure 5, where only two stages are represented).



**Figure 5:** 'Size of tumour' is a mediating variable for first chemotherapy and a confounder for second chemotherapy.

The solution to this problem goes back to the groundbreaking work of Robins (1986, 1987) who showed that the key principle is to adjust at any point in time only for past observations and then 'piece together' the results for the individual time points to obtain the overall causal effect (cf. also Dawid and Didelez, 2005). This method is very plausible but still not widely understood. Also, it still has to cope with several other problems such as being computationally very involved, especially when measurements are taken continuously over time.

#### Conclusions

Statisticians can contribute to discovering causal relations in a variety of fields. In fact many old and recent advances in areas like technology and medicine are due to thorough experimentation, data collection and analysis. However, it seems that such advances are more pronounced in subjects where experiments can easily be carried out than in other subjects, e.g. in psychology, nutrition science or politics. These problems are clearly reflected in the challenges that statisticians face, as I have outlined in this article. It is much more difficult to infer causation from non-experimental data and it always requires prior background knowledge, e.g. on what could be potential confounders, and it often needs careful and patient observations over time.

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One significant aspect of the research project "Narrative theory and analysis" concerns the study of witness accounts of the crimes against humanity committed in Nazi concentration camps during the Second World War. The need to bear witness for these crimes is accompanied by the problems associated with doing so: How can a survivor talk or write about events so horrible that they threaten to defy description and render language unusable? Now in the beginning of the twenty-first century, a large number of the survivors of the Nazi concentration camps have passed away. However, the fact that many are still alive is a pertinent reminder of the proximity of World War II, and of the Holocaust as a historical event within that war.

I want to briefly discuss the issue of testimony by linking it to that of narrative, and I want to relate both of these issues to a book I have been editing with team member Anette Storeide in 2005–06. Entitled *Tidsvitner: Fortellinger fra Auschwitz og Sachsenhausen* (Time

Witnesses: Narratives from Auschwitz

#### **Professor Jakob Lothe**

Department of Literature, Area Studies and European Languages, University of Oslo, Norway E-mail: jakob.lothe@ilos.uio.no CAS Group Leader 2005/2006



and Sachsenhausen), the book features the stories of eight survivors of two of the Nazi concentration camps. Before commenting on the book and the stories it presents, I make some observations on the concepts of witness, testimony, and narrative.

## The concepts of witness, testimony and narrative

In present-day Norwegian usage, the phrase "time witness" refers to survivors of the Nazi concentration camps. Accordingly, texts written or stories told by such witnesses are commonly considered testimonies. The Italian philosopher Giorgio Agamben notes that the Italian word *testimone* is etymologically related to the Latin word *testis*: a third person's account of a conflict between two other persons. It is also linked to *superstes*: an account given by someone who has experienced an event and is therefore in a position to testify about it (Agamben, 14). Both these Latin words are applicable to the narratives of concentration camp survivors. Their narratives are examples of *superstes* because they report events from a period of imprisonment experienced by the survivor himself or herself. Moreover, they can be examples of *testis*, since a survivor's narrative can also deal with the brutal treatment and killing of other prisoners. In the narratives presented in *Tidsvitner*, both these facets are observable and, typically, they are combined in the narrative discourse.

As indicated already, the task of bearing witness to the atrocities committed by the Nazis in their concentration camps – and it needs to be specified that Auschwitz was also an extermination camp – is particularly

important and especially difficult. The survivors are witnesses, or more precisely: they become witnesses by telling or writing about their camp experiences. The French philosopher Emmanuel Levinas finds that the witness "testifies to what has been said *through* him. Because the witness has said 'here I am' before the other" (Levinas, 115, original emphasis). This dimension of testimony is very significant. At the same time, there is a sense in which the 'real witnesses' of the concentration camps are those who were murdered by the Nazis. Seen thus, the Holocaust is 'the event without a witness' as Shoshana Felman and Dori Laub put it in their influential book *Testimony* (Felman and Laub, 80). If that is the case, then the problem of adequately representing and remembering what occurred in the camps becomes acute.

Bearing witness is a communicative act, and the act of bearing witness often assumes narrative form. Testimony which is not communicated to someone else is not testimony. However, and this point is argued by many Holocaust scholars including Agamben, in the case of the Holocaust the communication between the witness and his or her audience is complicated by the fact that, using language, the witness is attempting to tell or write about an event radically different from normal life. The vastness and incomprehensibility of the Nazis' crimes seem to be located somewhere beyond the realm, and organizing power, of language. Yet I reiterate: this is not just a problem, it is also a challenge and a possibility.

Bearing witness is both a form of remembering and an act of remembrance. As Lawrence Langer notes in *Holocaust Memories: The Ruins of Memory*, "the faculty of memory functions in the present to recall a personal history vexed by traumas that thwart smooth-flowing chronicles. Simultaneously, however, straining against what we may call a disruptive memory is an effort to reconstruct a semblance of continuity in a life that began as, and now resumes what we would consider, a normal existence" (Langer, 2–3).

If the narratives told by the eight men in *Tidsvitner* illustrate the problem of remembering "a personal history vexed by traumas," they also reveal these men's insistent efforts to reconstruct what Langer calls "a semblance of continuity" in their lives. Seen thus, their stories provide a forceful illustration of narrative's capacity to communicate what is painful to remember and hard to express. Even though the narrators in *Tidsvitner* are aware of the difficulty of putting their experiences into words, they use the medium at their disposal – language – and in some ways their mastery of language, and of narrative, is remarkable. Paradoxically, this kind of linguistic and narrative competence becomes particularly striking at the points where it threatens to break down (for instance, when the witness's voice fails).

## The approach

Approaching the survivors whose stories we wanted to hear, and then to present as first-person narratives in *Tidsvitner*, we first sent them a letter of invitation. In this letter, we asked them to try to tell their story by responding to two questions: first, "what was the background for your arrest?" and second, "can you tell us something about the life inside the camp?" To these two questions we added a third: "considering your unique experience from the concentration camp from the vantage point of 2006, what strikes you as particularly important not to forget?"

These questions provided a basis for the time witnesses' narratives. Whether the questions were the 'right' ones is impossible to know, but at least they helped to make it possible for the men to talk, thus enabling them to become narrators engaged in the act of bearing witness. During a witness' act of narration, Anette Storeide and I said as little as possible. Our primary function was that of being listeners – two people to whom the time witness could talk, and who by virtue of their presence made the narrative act possible.

The narrators in *Tidsvitner* can be divided into three groups. First, there are three stories told by Norwegian men who participated in various kinds of resistance activities in Norway. (As is well known, Norway was occupied by Nazi Germany from 9 April 1940 to 8 May 1945.) This is another way of saying that they were arrested because, according to the representatives of the Nazi rulers, they had done something illegal. One prime example is the distribution, in the simplest possible manner, of a leaflet entitled "BBC Norwegian Service", giving summaries of news bulletins from the BBC.

In striking contrast to this first group of time witnesses, the second group was not arrested and deported because of something they had done but because of something they *were*. Since the Nazis were of the opinion that no Jew could satisfactorily explate the "crime" of being Jewish, there was very little they could do except try to flee. However, in most of the occupied territories – including, sadly, Norway in the autumn of 1942 – it proved very difficult to do so. As Samuel Steinmann puts it in his contribution to *Tidsvitner*: "I had nowhere to go, so I remained at home." Thus, he was arrested and deported to Auschwitz. Against all odds, Samuel Steinmann survived, but his brother, Harry Steinmann, was murdered in Auschwitz. Samuel Steinmann's witness account is also a testimony on behalf of his brother.

Those belonging to the third group of time witnesses in *Tidsvitner* occupy an intermediate position between the first two groups. This group consists of Simon Øvretveit and Anfinn Midttveit, who lived - and still live – in the village of Telavåg on the west coast of Norway. Situated on the island of Sotra outside Bergen, Telavåg became a centre of illegal traffic across the North Sea during WWII. In spring 1942, the Nazi authorities in Bergen were informed that two agents (who had come to Telavåg from the Shetland Islands) were in hiding in Telavåg. Two highranking Gestapo officers travelled to Telavåg to arrest the two men, who, acting in self defence, shot and killed the German officers. As an act of reprisal, the whole village was burnt down and the men between the ages of 16 and 60 were sent to Sachsenhausen, where nearly half of them died. What the Nazis did to Telavåg and its inhabitants can be seen as an example of state terrorism; it was an act of systematic revenge comparable to what they did in Lidice in the Czech Republic in 1942 and in Oradous-sur-Glane in France in 1944.

## Narrative theory and time witnesses

Seen in the light of narrative theory, the stories told by these eight time witnesses are very interesting. A narrative presents a series of events, and it typically has a beginning, a middle and an end. One reason why narratives are important to human beings seems to be that, in a fundamental sense, we communicate with others by telling stories. Perhaps we tend to do so because our lives resemble a story (complete with a beginning,

middle and end); and as human beings we are inclined to link the different parts to each other and to explain and justify the choices we make. Inside the concentration camp, opportunities to make choices were of course severely restricted, but that did not mean that the need for some kind of connection and meaningful life progression disappeared.

Since they refer the reader to, and are anchored in, an extreme situation, these narratives illustrate some of the basic mechanisms and problems of story telling. I offer two brief examples: One important issue in narrative theory is that of narrative beginnings. When exactly does a narrative begin? Is the beginning the title, the first sentence or the first event? And, as a corollary, how do we conceive of our own narrative beginnings? When asked why they were arrested, some of the time witnesses responded by telling us about their illegal activities in Nazioccupied Norway. But one of them simply said: "My name is Samuel Steinmann." Meaning: I was arrested because I am Jewish. Thus in his case the beginning – the reason for his arrest – stretches a long way back; and it is linked not just to his familial history but to the history of anti-Semitism in Europe.

My second example is the occurrence, or perhaps rather emergence, within these narratives of elements of subgenres of fiction such as the episode. An episode (from Greek *epeisodion*, meaning addition or insertion) is an event or action relatively independent of what precedes or succeeds it. The narratives in *Tidsvitner* feature a number of different episodes. One interesting aspect of them is that they tend to highlight a particular event to which it is difficult to ascribe meaning (in the normal sense of the word). This event often involves violence, and it tends not to be closely linked – as least not in a meaningful way – to what precedes and succeeds it. It is as though the episode simultaneously illustrates and reflects the problem of making connections, i.e. of establishing a sense of progress and meaning, inside the camp. But for precisely this reason it becomes meaningful – helpful to the reader – as a descriptive narrative tool.

The narrators in *Tidsvitner* tell their stories long after the occurrence of the events which form the basis for their narration. They are not historians. But they were there, inside the concentration camp, during a time (1942–43) when no one knew who would win the war. Their episodic, unavoidably fragmented narratives bear witness to events that have occurred, very recently, in Europe – events that they will never be able to forget. And in the event we may wish to forget or to ignore these events, their testimonies are there to remind us that we do so at our own peril.

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# Save the Seals? Are Causes of Threats Important?

## Introduction

Environmental economics is concerned with the broader picture of economics and focuses on the management of natural resources in relation to economic activities. In this context, the concept of value has to be extended to include the existence value or intrinsic value attached to certain species and to natural beauty. Economists basically argue that a price has to be attached to environmental goods and services to prevent excessive threats to their existence. In general, existence values cannot be derived from market observations so other techniques have to be developed to get an idea of these values. Contingent valuation, a survey tech-



Professor Aart de Zeeuw Department of Economics, Tilburg University, The Netherlands E-mail: A.J.deZeeuw@uvt.nl CAS Fellow 2005/2006

nique that determines willingness-topay (contingent on the description of a certain situation) became the standard approach. Many contingent valuation studies have been performed, and both design and econometric techniques improved considerably over time.

Results of contingent valuation studies are usually interpreted through

the lens of a purchase model in which utility is a function of outcomes or consequences only. This perspective has been challenged both by psychologists and economists who have recognized the importance of attributes of choices being made. For example, Kahneman and others (1993), Kahneman and Ritov (1994), DeKay and McClelland (1996) and Brown and others (2002) provide evidence that people are willing to pay (WTP) more to avoid an environmental problem if they think it is man-caused than if they think it is an outcome of nature. Kahneman and others (1993) refer to this as the 'outrage effect'. Their empirical results suggest that intentional harm caused by humans is considered more upsetting than unintentional harm, and therefore triggers a larger WTP response to ameliorate the problem. Another reason for the higher WTP response may be that people argue that human causes are easier to control. Therefore they may attach a higher probability to the actual provision of the public good, leading to a higher stated WTP. In this article, we will stick to Kahneman's explanation. The respondents in these studies are either museum visitors or students in a laboratory, and are thereby not really representative of the whole population. We use responses from a large representative panel of Dutch households to check the hypothesis.

<sup>1:</sup> This article is part of an article that was published in the *Journal of Environmental Economics* and Management (volume 49, pages 330–342, 2005) and co-authored by Erwin Bulte, Shelby Gerking and John List. I am grateful for the important comments of a reviewer.

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The specific case under consideration is the conservation of a locally threatened species (seals in the Netherlands). Our main objective is to test whether WTP indeed increases when humans instead of nature (a virus) cause the harm. We distinguish between two (unintentional) types of possible human causes: (i) global warming, where society-at-large is responsible (and arguably everyone, albeit only minimally), and (ii) drilling for oil and gas where, in their pursuit of profits, industry causes the damage. It should be noted here that mitigating global warming and oiland gas-drilling is not only beneficial for seals but has other positive effects as well, so that people may in fact be valuing a more comprehensive good. It should also be noted that people might not be valuing the species as such but the larger good of the habitat or even the ecosystem (see Veisten et al. (2004)). More research is needed to check these points or to disentangle the different possibilities. The outrage effect predicts that WTP for both human causes exceeds WTP for the natural cause. Outrage may also predict that the WTP to undo harm caused by oil- and gas-drilling firms will be higher than WTP to undo harm caused by global warming. However, a counter-effect may be at work here. Walker and others (1999) hypothesize that WTP is driven by the degree of responsibility people feel for the damages and that may be higher in the case of global warming.



Harbour seal in the Waddenzee.

Photo: Seal Research and Rescue Center of Pieterburen (SRRC)

### Data and experimental design

Data were obtained from a survey of participants in the CentERpanel (www.centerdata.nl), which consists of more than 2 000 households in the Netherlands. Panel members are selected to be representative of the Dutch population.

The analysis focused on declines in the seal population in the Waddenzee (an estuary in the north of the Netherlands), a problem that has been widely publicized in the Netherlands for many years. The seal population reached a low point of about 300 animals in the 1970s. Currently, the number of animals has recovered to some 2 000 seals, but that number is still much lower than the 18 000 seals that lived in the Waddenzee in the beginning of last century. The seal population is

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threatened by three possible and distinct developments. First, new diseases (especially certain viruses) have taken a severe toll on the population in the past and continue to pose a serious threat. Second, climate change and the associated rise of the sea level might trigger the disappearance of the seal's breeding grounds. Third, commercial oil and gas drilling may have the same effect, not because the sea level rises, but because the land level falls. The threat from viruses represents the case in which the seal population may be harmed by natural causes for which no societal group is responsible, whereas with oil and gas drilling, actions undertaken by a comparatively small group of people for private gain contribute directly to the species' hardship. Climate change represents an intermediate situation in which virtually everyone is to some extent responsible for the problem.

The survey began with a brief introduction, in which attention was directed to the declining seal population. Then, panellists were presented with a description of one of the three types of threats along with a plausible mitigation measure. These scripts are shown below.

- 1. *Virus:* A number of factors continue to threaten the seal population. One important threat is a new virus that undermines the species' resistance to various diseases. The origins of the virus are unknown, but it is regarded as a 'natural enemy' of the seal population. The spreading of the virus is a natural process, independent of human actions. It is possible that, without any preventive actions, the seal population in the Waddenzee will fall by some 50 per cent. An effective preventive measure would be a vaccination program.
- 2. *Climate change*: A number of factors continue to threaten the seal population. One important threat is climate change, mainly caused by our burning of fossil fuels. An important risk of climate change and the associated rise of the sea level is that breeding grounds will be submerged for longer periods. This will have an adverse impact on the ability of female seals to deliver and feed young seals. It is possible that, without any preventive actions, the seal population in the Waddenzee will decline by some 50 per cent. An effective preventive measure would be to elevate the existing sand banks.
- 3. *Oil and gas drilling*: A number of factors continue to threaten the seal population. As regards drilling for gas by oil and gas companies in the Waddenzee, one important risk of gas exploitation is that the land level will fall so that breeding grounds will be submerged for longer periods. This will negatively impact the ability of female seals to deliver and feed young seals. Barring any preventative actions, it is possible that the seal population in the Waddenzee will decline by some 50 per cent. One effective preventive measure would be to elevate the existing sand banks.

Panellists were asked to value conservation measures to protect seals from further harm. In each case, panellists were asked one discrete choice valuation question where they were to respond yes or no to a specific amount of money. Information (income, education, age, gender, family size, province of residence) about panellists was not collected in the survey because it was already available.

### Results

The dichotomous choice responses obtained can be modelled parametrically by specifying the linear WTP function as follows:

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## $\Upsilon = \beta_0 + \beta_1 DRILL + \beta_2 CLIMATE + \zeta \gamma + u.$

WTP to protect seals ( $\mathcal{I}$ ) is expressed in terms of treatment effects (*DRILLING*, *CLIMATE*), a vector of controls for panellist characteristics ( $\mathcal{Z}$ ), and an additive stochastic preference term (u). In this equation, the  $\beta_{j}$  and the elements of  $\gamma$  are coefficients to be estimated and u is assumed to have a normal distribution. The constant,  $\beta_{0}$ , is interpreted as WTP to avoid the virus threat.

Does the source or cause of an environmental problem affect WTP or, in other words, does the outrage effect exist? As typically applied, standard utility theory holds that utility depends solely on outcomes, and that the cause is unimportant. If people value only outcomes and do not care about the cause, then the equation is  $\beta_1 = \beta_2 = 0$ . This joint hypothesis is rejected at the 5 per cent level using a likelihood ratio test. Also, t-tests reject the individual null hypotheses that  $\beta_1 = 0$  and  $\beta_2 = 0$  at the 5 per cent significance level. Thus, the oil and gas drilling and the climate change treatments differ from the virus treatment: people are willing to pay more to avoid man-caused environmental harm than if the harm is caused by an act of nature. These results broadly support the existence of an outrage effect and are consistent with earlier work using museum visitors and undergraduates as subjects.

The results do not reject the null hypothesis that  $\beta_1 = \beta_2$  at the 5 per cent level. Thus, WTP is not significantly different at conventional levels when the harm is caused by a specific group of people (oil and gas firms), compared with when it is caused by society as a whole (climate change from greenhouse gas emissions). An explanation for our result could be that the two effects cancel out. On the one hand, people may consider harm caused to increase a corporation's profits to be more 'unfair' than harm caused by society-at-large, triggering more 'outrage' and a larger contribution to offset the damages. On the other hand, people may also be driven by moral responsibility for their own actions, which is stronger in the case of global warming. More research is needed here.

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# Testimonies of Survivors and Research on World War II

Testimonies<sup>1</sup> of the survivors of the Nazi persecution and extermination represent a crucial part of our knowledge and understanding of what happened during World War II. In this essay, I will outline the history of the 'witness literature' on WW II, focusing on its place in the research history on WW II.

# Legal investigation and historical research: the quest for the truth

The first testimonies of camp inmates were written already during the war and imprisonment in the form of reports, diaries, notes, drawings,



Research fellow Anette Storeide Department of Literature, Area Studies and European Languages, University of Oslo, Norway E-mail: anette.storeide@ilos.uio.no CAS Fellow 2005/2006 etc., as testimonies of the crimes of the Nazis. One motive for this was to cover the contingency that the writer did not survive to testify in person. Immediately after WWII, many survivors felt the need and obligation to bear witness, not least to contribute to the documentation of what took place in the Nazi camps. In addition, the

collection of witness reports (both oral and written) took place as part of the preparation for the trials against the persons responsible for the crimes committed in the camps. Common for the mode of writing in these early testimonies is the focus on the transmission of facts, descriptions and observations. The focus in these early testimonies was on the crimes committed in the camps (abuse, mistreatment, punishment, medical experiments, executions, extermination, etc.) and the perpetrators. The texts can also be seen as part of the attempted illumination of the general public about the Nazi crimes. Also, in Germany, the Allied forces were afraid that their own reports of the Nazi crimes might be interpreted as propaganda and rejected by the German population, so they started publishing testimonies written by German survivors of different camps (as books and in newspapers and magazines) as part of the denazification of the German population (Peitsch 1999).

Historical research, e.g. the research pursued in connection with the different Camp Memorial Sites, focuses on the testimonies of former inmates as part of the attempted reconstruction of the events in the camps. The research focuses on *what* the texts can tell about the construction of the camp, the everyday life, the work, the prisoners, the barracks,

A testimony can be defined as 1) a sign that can be used to reconstruct the past or as
a result of a testimonial process, that is, of the transmission of a memory of an experienced event like for example a concentration camp survivor's telling of his or her own experiences in imprisonment.

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the executions and extermination, and so on. The testimonies are seen as material and a source of knowledge about the camps, and they are viewed as more or less trustworthy when it comes to the accuracy of details and facts.

### The writing of testimonies: phases and characteristics

There have been two waves of written primary testimonies: 1) Shortly after the war until the end of the 1940s, and 2) Since the 1980s, with an explosion in the number of publications since the 1990s. After relative 'silence' in the 1950s, the interest in the WW II and in the Nazi camp system rallied in the late 1950s/early 1960s. This increasing interest was inspired by two events: The trial against Adolf Eichmann in Jerusalem in 1961 and the Auschwitz trials in 1963-65 in Frankfurt am Main. These events focused world-wide attention on WW II as something more than a military war. During the period, testimonies were published that ultimately formed the canon of "witness literature": Primo Levi If this is a man? (1958)<sup>2</sup>, Elie Wiesel La Nuit (1958), Jorge Semprun Le Grand Voyage (1963), Jean Améry Jenseits von Schuld und Sühne (1966). New aspects in the testimonies written since the 1980s include less focus on crimes and more focus on everyday-life in the camps, on the feeling of being a prisoner and on existence as an inmate. In addition, the testimonies written in the 1980s devote more attention to reflection (about the camp and about the process of witnessing) than to 'pure' observation and description. A plurality of writing witnesses has also emerged. Shortly after the war, the majority of writing witnesses consisted of former political prisoners. Since the 1960s, however, more and more Jewish survivors have written about their experiences. Since the 1990s, witnesses from other prisoner groups, e.g. homosexuals, Jehovah's witnesses and Gypsies, have presented their testimonies.

Why this extreme rise in number of written and oral testimonies since the 1990s? First, the many years that separate the witness from the events that he or she will witness about, may make it easier to write or talk about experiences because the events have grown more distance, or because the witness has now worked through his or her traumas. Second, it may be a survivor's last chance to bear witness before dying. Third, the enhanced focus on oral history, the history of everyday life and autobiographical writing since the 1970s may have helped increase interest in testifying helped make it easier to bear witness. Fourth, the interest in testifying helped make it easier to bear witness. Fourth, the interest in WWII in general has picked up since the end of the cold war. This conflict probably overshadowed and thus obliterated important questions and discussions about the war. Last, the change of climate of discussion, more public interest in WWII and the fact that some survivors told their stories may have inspired or encouraged others to write or talk about their experiences.

# Philosophical and literary debates: the death of the witness and the failure of language

At the same time as the testimonies of the Nazi camps survivors were closely connected to the quest for the truth about the camps in legal investigations and historical research, there is some discussion about 1)

The book was first published by a small publishing house in 1947, but did not receive broad public attention until it was republished in 1958.

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who the 'real' witnesses are and about 2) the representation of the Nazi crimes based on the thesis of the incomprehensibility of the Nazi extermination and of the crimes defying description. This has mainly been a discussion in the field of philosophical and literary studies, although some 'prominent survivors' have participated as well. This discussion identifies the exterminated people as the 'real witnesses' because only they have seen death from the inside. Shoshana Felman and Dori Laub present the Holocaust as an "event without witness" (Felman and Laub 1992, 80) and that is the case in two different ways. First, the first-hand witnesses are dead, and second, language is incapable of describing events that should be witnessed. This position of testimony as testimony about the impossibility of the situation is also held by Giorgio Agamben (Agamben 1998). He draws upon the writings of the Auschwitz survivor Primo Levi and his statement about the dead as the real witnesses (Levi 1986). Most of the inmates of the camps were killed, therefore the dead are the real witnesses. The survivors are only pure exceptions from the rule. The opposite position is held by Jacques Derrida, who holds the survivors as the only witnesses (Derrida 2000). If a witness did not survive the event that was witnessed, there can simply be no testimony. Derrida says that the only one who can testify about one's death is someone who survived it. Thus it becomes obvious that Agamben and Derrida postulate two very different concepts of testimony: Agamben presents testimony of the impossible to bear witness, whereas Derrida presents the testimony of unexperienced experience.

As regards the question of the representation of the Holocaust and whether it is even possible for literature and the arts to represent the Holocaust, the two main positions may be illustrated by two famous survivors. Elie Wiesel said that there can be no novel about the Holocaust (Wiesel 1975)<sup>3</sup>. It is either not about Holocaust or it is not a novel. Literature and the Holocaust are incommensurable. On the contrary, Jorge Semprun has argued that the Holocaust can only be represented by the arts and that the thesis of it being beyond description is just an excuse for not having to talk about it (Semprun 1994)<sup>4</sup>.

# "A narrative turn"5 of testimony

Although testimonies have been important in legal investigation and historical research, such texts have generally occupied a difficult position in the interface between history and literature. On one hand, they have been seen as too subjective to be history and, on the other, as too focused on documentation to be valued as literature. In addition, discussions have revolved around the definition of witness and the possibility of representation. However, since the 1980s, the testimonies of the camp survivors have generated expansive new interest. Since the growing focus on memory began in the 1980s, the perspective of research on memory

<sup>3:</sup> Elie Wiesel, "For some Measure of Humility", in *Sh'ma* 5 (1975), 314. Reference in, Alvin H. Rosenfeld, "The Problematics of Holocaust Literature", in *Confronting the Holocaust: The Impact of Elie Wiesel*, ed. Alvin Rosenfeld et.al. (Bloomington and London: Indiana University Press), 4.

<sup>4:</sup> Jorge Semprun, *Schreiben oder Leben* (Frankfurt am Main: Suhrkamp, 1995), 199 f., 239, 309 f.

<sup>5:</sup> Term by James Phelan, Narrative Theory, 1966-2006: A Narrative (forthcoming), 3.

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has switched from *what* to *how*. The central question no longer concerns just which memories the survivor presents, but also how the memories are represented as a text. Lawrence L. Langer - who was one of the initiators of this change of perspective – calls this the second phase of the reaction to the Nazi extermination (Langer 2000). After the phase of the questioning of the representation, comes the phase of the analysis of representation. While the discussion about the possibility of representation and transmission of memories in many ways has calmed down, the focus on forms of memory and its representation has grown. These developments are connected, because the focus on the forms of the presented memories implies that the Nazi crimes can be described. If they are not viewed as describable, it would make no sense to analyze their forms of representation. Today, the focus of interest lies on the attempted solution to resolve the difficulty of representation, and the testimonies are valued as individual expressions and not reduced to being pure potential transmitters of facts. The testimonies are now understood as far more than sources of knowledge, i.e. they are valued as textual expressions, as testimonies of individual memories, of the witnessing process and of the resistance against death.

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The Nobel Prize in literature for 1965 was awarded to Mikhail Sholokhov (1905–1984), for the epic novel *Tuxuŭ Дон* about Cossack life and the birth of a new Soviet society (*And Quiet Flows the Don*, or *The Quiet Don*, in different translations). Sholokhov has been compared to Tolstoĭ and was at least a generation ago called 'the greatest of our writers' in the Soviet Union. In Russia alone, his books have been published in more than a thousand editions, selling in total more than 60 million copies. He was an elected member of the USSR Supreme Soviet, the USSR Academy



Professor Nils Lid Hjort Department of Mathematics, University of Oslo, Norway E-mail: nils@math.uio.no CAS Fellow 2005/2006

of Sciences, and the CPSU Central Committee.

But in the autumn of 1974 an article was published in Paris, Стремя 'Tuxoro Дона' (Загадки романа) ('The Rapids of Quiet Don: the Enigmas of the Novel'), by the author and critic D\*. He claimed that Tikhiĭ Don was not at

all Sholokhov's work, but that it rather was written by Fiodor Kriukov, a more obscure author who fought against bolshevism and died in 1920. The article was given credibility and prestige by none other than Aleksandr Solzhenitsyn (a Nobel prize winner five years after Sholokhov), who wrote a preface giving full support to D\*'s conclusion. Scandals followed, also touching the upper echelons of Soviet society, and Sholokhov's reputation was faltering abroad (see e.g. Doris Lessing's (1997) comments; "vibrations of dislike instantly flowed between us"). Are we in fact faced with one of the most flagrant cases of plagiarism in the history of literature?

## Approaching disputed authorship cases

The first reaction to accusations of plagiarism or to cases of disputed authorship is perhaps simply to listen to the points being made, checking the strength of argumentation by common sense or, if need be, with the careful scepticism of a court of law. In the present case, the claims made would perhaps be classified as unsubstantial. Various rumours were in circulation already from 1930, as detailed in Kjetsaa et al.'s account. Solzhenitsyn's (1974) preface appears to rest on the opinion that (i) such a young and relatively uneducated person could not produce so much fine literature in such a short time-span; (ii) all his later work was produced at a much slower pace, and has a lower literary quality; (iii) Kriukov's background and publications (summarised in Solzhenitsyn's own Afterword to the 1974 publication) fit the storyteller's perspectives better. To this



Mikhail Sholokhov (1905–1984), Nobel Laureate 1975.



Aleksandr Solzhenitsyn (1918–), Nobel Laureate 1980.

was also added the unfortunate fact that Sholokhov's personal author's archives could not be found. Further elaborations, partly also through attempts at linguistic and stylistic analyses, can be seen in  $D^*$  (1974).

If the case still warrants further discussion, after initial scrutiny, one may enter the intriguing but difficult terrain of sorting out an author's or artist's 'personal style', whether in stylistic expression, or via smaller idiosyncrasies, or perhaps a bit more grandly in their themes and how these are developed. In a famous essay, Sir Isaiah Berlin (1953) made a bold attempt at sorting Russian authors into 'hedgehogs' and 'foxes', after the old Greek saying that Erasmus Rotterdamus records as 'multa novit vulpes, verum echinus unum magnum': "the fox knows many tricks, but the hedgehog masters one big thing". Thus Dostoyevskii and Ibsen were hedgehogs while Pushkin and Tolstoĭ were foxes - the latter trying however very hard to become a hedgehog, according to Berlin. In Hjort (2006), I follow such a literary classification challenge by arguing, in three languages, that Carl Barks is a fox while Don Rosa is a hedgehog. See in this connection also Gould (2003), who uses the hedgehog vs. fox dichotomy to address the misconceived gap between sciences and the humanities (in the best spirit of the Centre of Advanced Study).

But even experts on literature, art and music are prone to making occasional mistakes, as demonstrated often enough, and it is clear that independent arguments based on quantitative comparisons are of interest. If not taken as 'direct proof', then such comparisons may at least offer independent objective evidence and sometimes additional insights. In such a spirit, an inter-Nordic research team was formed in 1975, captained by Geir Kjetsaa, a professor of Russian literature at the Department of Literature, Regional Studies and European Languages at the University of Oslo, with the aim of disentangling the Don mystery. In addition to various linguistic analyses and several doses of detective work, quantitative data were gathered and organised, for example, relating to word lengths, frequencies of certain words and phrases, sentence lengths, grammatical characteristics, etc. These data were extracted from three corpora: (i) III, or Sh, from published work guaranteed to be by Sholokhov; (ii) Kp , or Kr,

that which with equal trustworthiness came from the hand of the alternative hypothesis Kriukov; and (iii) TД, or TD, the Nobel winning apple of discord. Each of the corpora has about 50 000 words. My contribution here is to squeeze clearer author discrimination and some deeper statistical insights out of some of Kjetsaa et al.'s data.

## Sentence length distribution

Here I will focus on the statistical distribution of the number of words used in sentences, as a possible discriminant between writing styles. Table 1, where the first five columns have been compiled via other tables in Kjetsaa et al. (1984), summarises these data, giving the number of sentences in each corpus with lengths between 1 and 5 words, between 6 and 10 words, etc. The sentence length distributions are also portrayed in Figure 1, along with fitted curves described below. The statistical challenge is to explore whether there are any sufficiently noteworthy differences between the three empirical distributions, and, if so, whether it is the upper or lower distribution of Figure 1 that most resembles the one in the middle.

<b>Table 1:</b> Tikhiĭ Don: number of sentences $N_x$ in the three corpora Sh, Kr, TD of the given
lengths, along with predicted numbers $pred_x$ under the four-parameter model (1), and Pearson
residuals res <sub>x</sub> , for length groups $x = 1, 2, 3,, 13$ . The average sentence lengths are 12.30,
13.12, 12.67 for the three corpora, and the variance to mean dispersion ratios are 6.31, 6.32,
6.57.

		observed:			predicted:			residuals:		
from	to	Sh	Kr	TD	Sh	Kr	TD	Sh	Kr	TD
1	5	799	714	684	803.4	717.6	690.1	-0.15	-0.13	-0.23
6	10	1408	1046	1212	1397.0	1038.9	1188.5	0.30	0.22	0.68
11	15	875	787	826	884.8	793.3	854.4	-0.33	-0.22	-0.97
16	20	492	528	480	461.3	504.5	418.7	1.43	1.04	3.00
21	25	285	317	244	275.9	305.2	248.1	0.55	0.67	-0.26
26	30	144	165	121	161.5	174.8	151.1	-1.38	-0.74	-2.45
31	35	78	78	75	91.3	96.1	89.7	-1.40	-1.85	-1.55
36	40	37	44	48	50.3	51.3	52.1	-1.88	-1.02	-0.56
41	45	32	28	31	27.2	26.8	29.8	0.92	0.24	0.23
46	50	13	11	16	14.5	13.7	16.8	-0.39	-0.73	-0.19
51	55	8	8	12	7.6	6.9	9.4	0.14	0.41	0.85
56	60	8	5	3	4.0	3.5	5.2	2.03	0.83	-0.96
61	65	4	5	8	2.1	1.7	2.9	1.36	2.51	3.04
		4183	3736	3760						

A very simple model for sentence lengths is that of the Poisson, but one sees quickly that the variance is larger than the mean (in fact, by a factor of around six, see Table 1). Another possibility is that of a mixed Poisson, where the parameter is not constant but varies in the world of sentences. If  $\Upsilon$  given  $\lambda$  is Poisson with this parameter, but  $\lambda$  has a Gamma (a, b) distribution, then the marginal takes the form

$$f^*(y, a, b) = \frac{b^a}{\Gamma(a)} \frac{1}{y!} \frac{\Gamma(a+y)}{(b+1)^{a+y}} \text{ for } y = 0, 1, 2, \dots,$$

which is the negative binomial. Its mean is  $\mu = a/b$  and its variance a/b +  $a/b^2 = \mu(1 + 1/b)$ , indicating the level of over-dispersion. Fitting this two-parameter model to the data was also found to be too simplistic; clearly the muses had inspired the novelists to transform their passions

into patterns more variegated than those dictated by a mere negative binomial, their artistic outpourings also appeared to display the presence of two types of sentences, the rather long ones and the rather short ones, spurring in turn the present author on to the following mixture of one Poisson, that is to say, a degenerate negative binomial, and another negative binomial, with a modification stemming from the fact that sentences containing zero words do not really count among Nobel literature laureates (with the notable exception of a 1958 story by Heinrich Böll):

$$f(y, p, \xi, a, b) = p \frac{\exp(-\xi) \xi^{y} / y!}{1 - \exp(-\xi)} + (1 - p) \frac{f^{*}(y, a, b)}{1 - f^{*}(0, a, b)}$$
(1)

for y = 1, 2, 3, ... It is this four-parameter family that has been fitted to the data in Figure 1. The model fit is judged adequate, see Table 1, which in addition to the observed number  $\mathcal{N}_x$  shows the expected or predicted number pred<sub>x</sub> of sentences of the various lengths, for length groups x = 1, ..., 13. Also included are Pearson residuals  $(\mathcal{N}_x - \text{pred}_x)/\text{pred}_x^{1/2}$ . These residuals should essentially be on the standard normal scale provided the parametric model used to produce the predicted numbers is correct. Here there are no clear clashes with this hypothesis, particularly in view of the large sample sizes involved, with respectively 4183, 3736, 3760 sentences in the three corpora. The pred<sub>x</sub> numbers in the table stem from minimum chi squared fitting for each of the three corpora, i.e. finding parameter estimates to minimise  $\sum_x {\{\mathcal{N}_x - \text{pred}_x(\theta)\}^2/\text{pred}_x(\theta)}$  with respect to the four parameters, where  $\text{pred}_x(\theta) = np_x(\theta)$  in terms of the sample size for the corpus and the inferred probability  $p_x(\theta)$  of writing a sentence with a length landing in group x.



**Figure1.** Sentence length distributions, from 1 word to 65 words, for Sholokhov (top), Kriukov (bottom), and for 'The Quiet Don' (middle). Also shown, as continuous curves, are the distributions (1), fitted via maximum likelihood. The parameter esimates for (p,  $\xi$ , a, b) are (0.18, 0.10, 2.09, 0.16) for Sh, (0.06, 9.84, 2.24, 0.18) for Kr, and (0.17, 9.45, 2.11, 0.16) for TD.

## Statistical discrimination and recognition

Kjetsaa's group quite sensibly put up Sholokhov's authorship as the null hypothesis, and D\*'s speculations as the alternative hypothesis, in several of their analyses. Here I shall formulate the problem in terms of selecting one of three models inside the framework of three data sets from the four-parameter family (1):

- $M_{\rm I}$ : Sholokhov is the rightful author, so that text corpora Sh and TD come from the same statistical distribution, while Kr represents another;
- M<sub>2</sub>: D\* and Solzhenitsyn were correct in denouncing Sholokhov, whose text corpus Sh is therefore not statistically compatible with Kr and TD, which are however coming from the same distribution; and M<sub>0</sub>: Sh, Kr, TD represent three statistically disparate corpora.

Selecting one of these models via statistical methodology will provide an answer to the question of who is most probably the author.

Various model selection methods may now be applied to assist in ranking models  $M_1$ ,  $M_2$ ,  $M_0$  by plausibility; see Claeskens and Hjort (2007) for a broad overview. Here I choose to concentrate on an approach that hinges on the precise evaluation of *a posteriori* probabilities of the three models, given all available data, having started with any given *a priori* probabilities. This makes it possible for different experts, with differing degrees of prior opinions as to who is the most likely author, to revise their model probabilities in a coherent manner. This is quite similar to the so-called Bayesian Information Criterion (BIC), but certain aspects of the present situation call for refinements that make the analysis reported on here more precise than the traditional BIC. These refined scores are called BIC\* below; models with higher scores are more probable than those with lower scores.

In general, let  $p(M_1)$ ,  $p(M_2)$ ,  $p(M_0)$  be any engaged prior probabilities for the three possibilities; we should perhaps take  $p(M_0)$  close to zero, for example. Solzhenitsyn would take  $p(M_1)$  rather low and  $p(M_2)$  rather high, while more neutral observers would perhaps start with these two being equal to  $\frac{1}{2}$  and  $\frac{1}{2}$ . Writing next  $\theta_1$ ,  $\theta_2$ ,  $\theta_3$  for the three parameter vectors  $(p, \xi, a, b)$ , for respectively Sh, Kr, TD, model  $M_1$  holds that  $\theta_1 = \theta_3$  while  $\theta_2$  is different; model  $M_2$  claims that  $\theta_2 = \theta_3$  while  $\theta_1$  is different; and finally model  $M_0$  is open for the possibility that the three parameter vectors must be declared different. The posterior model probabilities may be computed as

$$p(M_{j} | \text{data}) = \frac{p(M_{j}) \exp(\frac{1}{2}\text{BIC}_{j}^{*})}{p(M_{0}) \exp(\frac{1}{2}\text{BIC}_{0}^{*}) + p(M_{1}) \exp(\frac{1}{2}\text{BIC}_{1}^{*}) + p(M_{2}) \exp(\frac{1}{2}\text{BIC}_{2}^{*})}$$
(2)

for j = 0, 1, 2. Space does not allow explaining in detail here how the three BIC\* scores are computed, but they involve finding maximum likelihood estimates of parameters under the three models and their precision matrices, along with accurate approximations of various integrals of dimensions 8 and 12; see Claeskens and Hjort (2007, Section 5.4) for a more detailed exposition of the somewhat elaborate mathematics involved.

## Conclusions

Using (2) to compute posterior model probabilities yields numbers close to zero for  $M_2$  and  $M_0$  and very close to one for  $M_1$ . With equal prior probabilities, we actually find 0.998 for Sholokhov with the remaining 0.002 shared between Kriukov and the neutral model that the three corpora are disparate, and even Solzhenitsyn, starting with perhaps  $p(M_1) = 0.05$  and  $p(M_2) = 0.95$ , will be forced to revise his  $M_1$ -probability to 0.99 and down-scale his  $M_2$ -probability to 0.01. We may conclude that the sentence length data speak very strongly in Sholokhov's favour, and dismiss D\*'s allegations as speculations: the Stalin Prize in Literature 1941 went to the right person. These figures might sound surprisingly clear-cut, in view of the relative similarity of the distributions portrayed in Figure 1. The reason lies with the large sample sizes, which increases detection power.

Of course the probabilities that come from applying (2) depend on the precise nature of (1), and must be interpreted with some caution. There would be other parametric families that also would fit the data, like a five-parametric mixture of two negative binomials, and these would lead to similar but not fully identical posterior model probabilities.

There have been various statistical studies related to disputed authorship cases in the literature, and one would expect this branch to expand with the increasing ease with which large texts may be inspected and analysed stylometrically via computers. Cox and Brandwood (1959) applied discriminant analysis in an attempt to order Plato's dialogues chronologically, using stress patterns of the last five syllables in each sentence. Mosteller and Wallace (1964, 1984) examined the federalist papers, where 12 essays were published anonymously, and used stylometry to demonstrate that James Madison is the likely author. Thisted and Efron (1987) used empirical Bayes methods to assess whether a poem discovered in the 1980s could be attributed to Shakespeare. It should be pointed out that some statistical techniques might be quite successful at finding differences between authors' or artists' styles, via qualitative measurements and analyses thereof, even if such discriminatory abilities might not offer real insights per se as to the 'real processes' that produce 'real art'. Thus Lyu, Rockmore and Farid (2004) provide digital techniques for distinguishing Pieter Brueghel the elder from various impostors, without pretensions of quantifying what makes Brueghel the elder 'better' than the others. I believe methods of the type discussed in the present article may be used in other studies involving 'authors' fingerprints', and that some such studies could shed light also on the intrinsically artistic aspects of the works under study. It is my ambition to demonstrate statistically that Bach cannot be the composer of Bach Cantata #189, for example, since Meine Seele rühmt und preist, although beautiful, is 'too plain' in parameters pertaining to musical variation to be the real thing. For the Don case, analysis based on model (1) shows that Kriukov has a significantly smaller p value than Sholokhov has (while other parameters match reasonably well, see Figure 1). Although based to some extent on conjecture, this is an indication that the latter varied the form of his sentences more than the former.

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# Notes Towards a Reading of the Textual Unconscious

# To re-open the question: some theoretical considerations

The relationship between literature and psychoanalysis has never been an easy one. Given Freud's own acknowledged indebtedness to and ongoing engagement with literature, it was at the very outset a close relationship, too close for comfort, perhaps, as the fundamental affinity has also generated a certain power struggle, or even – some would argue – a colonizing urge, evidenced in the very concept of 'application', which is all-too-commonly used to place Psychoanalysis in the position of a metalanguage.

Within the wide spectrum of psychoanalytic approaches to literature,

ranging from the initial engagements of Freud and Jones to extremely sophisticated structural parables, none has been more discredited or derided than the approach through authorial subjectivity, which often produces highly speculative, pathology-oriented readings, and – most problematically – tends to reduce the literary text into a clinical case study.

#### Professor Daphna Erdinast-Vulcan

Department of English Language and Literature, University of Haifa, Israel E-mail: vulcand@research.haifa.ac.il CAS Fellow 2005/2006



Paradoxically, perhaps, the de-authoring and de-authorizing drive of poststructuralist theory (most notably signaled by Barthes' diagnosis of the "Death of the Author') has opened up new ways of looking at the relationship between psyche and text, and new modes of psychoanalytic engagement, where the question of authorial subjectivity is no longer a simple premise, but the constitutive question of the text.

Having articulated this elusive form of textual presence as 'heterobiography' elsewhere, let me begin with a brief summary of this concept (Erdinast-Vulcan 1995). When a fictional text is scanned for autobiographical traces, the distinction between the ontological status of the historical subject who has authored the work and that of the fictional characters 'within' the work is usually acknowledged. The former is perceived as related to the latter through echoes and reflections: fictional renderings of historical events; textual representations of 'real' psychological states of mind, relationships and dilemmas. The edges of the text, the borderlines separating the somatic from the semiotic corpus, the realhistorical from the fictional, are thus carefully preserved and accentuated.

The conception of *hetero*-rather than *auto*-biography is, first and foremost, a breach of these boundary lines. It offers a reading of "a text without edges", to use the Derridean phrase, probing the jurisdiction of frames and borderlines, where "the supposed end and beginning of a work, the unity of a corpus, the title, the margins, the signatures, the referential realm outside the frame" are no longer hermetically sealed

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off from each other (Derrida 1979, 83–4). "Heterobiography" calls for a different reading strategy: rather than a quasi-archaeological project which aims to disclose the "figure behind the veil", the hidden presence of the historical author in his fictional work, the strategy would focus on a peristaltic, wave-like movement of desire, anxiety, or other affects between the different textual strata, cutting across the borderlines between the textual and the historical subject. Rather than a one-to-one correspondence of "life" and "fiction", we would look for an isomorphic relationship – an echo or a ripple effect – which boils over the edges of both text and subject. It is in this echo-effect that we can perceive the workings of the textual unconscious.

## Approaching the textual unconscious

It should be noted at the outset that the proposed approach is based on the irreducible singularity of literary texts, and avoids pre-given psychoanalytic categories and labels, and does not involve a mechanical application of analytical/critical procedures. The best model for the proposed approach is Freud's brief "Note upon the 'Mystic Writing Pad" (1925). The 'Mystic Writing Pad' is a children's toy, still available in the market and still endlessly fascinating nearly a hundred years later, consisting of a thin sheet of clear plastic which covers a thick waxen board. The user can write on it with any pointed instrument, a stylus which presses through the sheet of plastic and makes a faint indentation in the wax below which appears as a dark trace through the plastic. When the plastic sheet is lifted away from the surface of the waxen tablet beneath, the dark traces disappear; the pad is clean again, like a blackboard just wiped off. The Mystic Writing Pad can thus receive an infinite number of markings, and still retain its receptive capacity. But unlike other erasable surfaces, the mystic writing pad retains the traces of previous markings as indentations on the waxen surface below the transparent plastic sheet. For Freud, this 'mystic' or magical quality of the toy is analogous to the workings of the perceptual system, which receives sense impressions from the outside world, but remains unmarked by those impressions which pass through it to a deeper layer where they are recorded as unconscious memory. Thus, "the appearance and disappearance of the writing" is similar to "the flickering-up and passing-away of consciousness in the process of perception" (Freud, p. 230).

This Freudian conceit has been probed and expanded by Derrida who turned it into a paradigm for his refusal to acknowledge the boundary lines between psyche and text (Derrida 1966; 1978). My own interest in the mystical writing pad is rather more literal, as I would try to articulate a psycho-textual equivalent of the manner in which the writing on the pad becomes visible as a dark trace at the point of contact between the two surfaces. Far from a neat formula or a procedure, this approach places a heavy demand upon the reader, who must attend to the singularity of both the text and the subject in question. Rather than apply or superimpose ready-made psychoanalytic concepts and rather than switch on an interpretative meta-language – this approach entails a close listening to the specificity, the dynamic interaction, and the multiplicity of voices in the text.
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"One can share the view that the unity-of-science ideology is seriously flawed, and still think that the question of method ought to be at the centre of the meta-discussion and self-reflection of literary scholars"

**ANNIKEN GREVE** 

"The scientific world view may be a success, but its power of explanation is still fundamentally limited"

ODD O. AALEN

"..although it is safe to assume that the (medical statistical) model is wrong, one still hopes that it approximates reality." MATTI LISKI

This book contains 33 articles related to a series of presentations held at luncheon seminars at the Centre for Advanced Study (CAS) at the Norwegian Academy of Science and Letters in Oslo in 2005/2006. The presentations were made by the fellows of three research groups: Narrative Theory and Analysis (Humanists), Environmental Economics: Policy Instruments, Technology Development and International Cooperation (Social scientists) and Statistical Analysis of Complex Event History Data (Natural scientists).

The CAS is an inviting and suitable arena for research dialogue across disciplinary boundaries and academic fields, and the seminars were instrumental in creating a feeling of both social and professional community between the groups. They also produced an interdisciplinary atmosphere for the clarification of scientific concepts and their potential for straddling disciplinary cultures and delimitations.



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Drammensveien 78 NO-0271 Oslo Norway Telephone: +47 22 12 25 00 Fax: F-mail<sup>.</sup> Internet: ISBN: ISSN:

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