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Darmstadt – City of Poets, Thinkers and Space Explorers

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"Symbiosis – Synergy of Humans & Technology"

Darmstadt, Germany
September 7 - 10, 2015

Organizing Committee
Prof. Dieter W. Fellner, Fraunhofer IGD / TU Darmstadt
Prof. Hans-Peter Seidel, Max-Planck-Institute for Informatics

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Keynote

Visual Scene Understanding

Bernt Schiele
Director at MPI Informatics Professor at Saarland University

Abstract
Inspired by the ability of humans to interpret and understand 3D scenes nearly effortlessly, the problem of 3D scene understanding has long been advocated as the "holy grail" of computer vision.

In the early days this problem was addressed in a bottom-up fashion without enabling satisfactory or reliable results for scenes of realistic complexity. In recent years there has been considerable progress on many sub-problems of the overall 3D scene understanding problem. As the performance for these sub-tasks starts to achieve remarkable performance levels we argue that the problem to automatically infer and understand 3D scenes should be addressed again and may impact many areas of our daily life.

Short Biography
Bernt Schiele is Max-Planck-Director at MPI Informatics and Professor at Saarland University, both Saarbrücken, since 2010. He studied computer science in Germany and France and obtained his PhD from INP Grenoble, France in 1997. Between 1997 and 2000 he was postdoctoral associate and Visiting Assistant Professor at the Massachusetts Institute of Technology, Cambridge, MA, USA. From 1999 until 2004 he was Assistant Professor at the Swiss Federal Institute of Technology in Zurich (ETH Zurich). Between 2004 and 2010 he was Full Professor at the computer science department of TU Darmstadt.

Keynote

Technology meets biomedicine: analysis of Alzheimer's disease at single cell resolution

Arthur Konnerth
Director of the Institute of Neuroscience, Technical University Munich, Germany

Abstract
The invention of two-photon microscopy initiated the development of a variety of methods that allow the recording of detailed, dynamic images of activity in individual nerve cells, dendrites and synapses, thereby transforming the study of development, plasticity and functional circuitry of the healthy but also that of the diseased brain.

An example of the usefulness of two-photon microscopy is analysis of the alterations of neuronal function in Alzheimer's disease (AD). An essential feature of this neurodegenerative disease is the accumulation of amyloid-beta in the brain. However, the impact of amyloid-beta-accumulation on neuronal dysfunction on the single cell level remained poorly understood. Here, by using in vivo two-photon calcium imaging in a mouse model of AD, we made observations that were in striking contrast to a popular hypothesis. While, in line with that hypothesis a silencing of neuronal activity was indeed observed in a small group of cortical neurons, a substantial fraction of neurons exhibited an unexpected increase in the frequency of spontaneous calcium transients. These "hyperactive" neurons were found exclusively near the plaques of amyloid beta-depositing mice (Busche et al., Science, 2008).

When analyzing the visual cortex, we found that a progressive deterioration of neuronal tuning for the orientation of visual stimuli occurred in parallel with an age-dependent increase of the amyloid-beta load (Grienberger et al., Nat. Comm, 2012). As in cortical neurons, there was a marked increase in the fractions of both silent and hyperactive neurons also in the plaque-bearing CA1 region of the hippocampus of old transgenic mice (Busche et al., PNAS, 2012). However, in the hippocampus of young mice, we observed a selective increase in hyperactive neurons already long before the formation of plaques, suggesting that soluble species of Abeta may underlie the impaired neuronal activity. In support of this model, we found that the acute treatment of transgenic mice with a gamma-secretase inhibitor reduced soluble Abeta levels and rescued the neuronal dysfunction. Together, our results identify neuronal hyperactivity (Busche and Konnerth, Bioessays, 2015) as a major cellular mechanism underlying circuit dysfunction in AD.

Short Biography
Arthur Konnerth (link is external) graduated as MD from the Ludwig-Maximilians University Munich in Germany. Currently he is the Friedrich-Schiedel-Chair of Neuroscience and Director of the Institute for Neuroscience at the Technical University Munich; member of the German National Academy of Sciences Leopoldina, the Academia Europaea and the Bavarian Academy of Sciences.

Honors and awards (selection)

- 1986 Michael-Prize for Epilepsy Research
- 1997 Wilhelm Feldberg Award
- 1999 Adolf-Fick Award for Physiology
- 2001 Gottfried Wilhelm Leibniz-Prize
- 2001 Max-Planck Prize
- 2004 Brooks Lecture, Harvard, USA
- 2012 Advanced Grant of the European Research Council
- 2013 Bauer Foundation Distinguished Guest Lecturer, Brandeis University, USA
- 2014 Theodor-Bücher-Medal of the Federation of European Biochemical Societies
- 2015 Brain Prize of the Grete Lundbeck Foundation

Current Research Interests

His current research is focused on the development and application of methods that allow a quantitative understanding of function and dysfunction of neurons and circuits in the intact brain. He and his team pioneered in vivo two-photon imaging of cortical circuits with single cell resolution. More recently, they developed the LOTOS (low power temporal oversampling) method of high-resolution two-photon calcium imaging and used it for the functional mapping of dendritic spines in vivo. These approaches are used in his lab for the exploration of behavior-determined synaptic signaling and dendritic signal integration in neurons of defined brain circuits. A major goal is a better understanding of the cellular and circuit mechanisms of learning and memory in the healthy brain, as well as the pathophysiology underlying the impairment of cognition and memory in Alzheimer's disease.

<center>**Keynote**</center>

The Human & Machine Species: Life and Evolution as Physics

Adrian Bejan
Professor at Duke University

Abstract
In this lecture I will address the theme of the AE Conference, to draw attention to the theoretical work in physics that serves as backbone for this theme. Humans and technology are not in symbiosis. They are one species, not two.

Humans, loaded with (and encapsulated in) add-ons of many kinds and ages (from writing, to airplanes), are evolving as one species, the "human & machine species." This evolution is visible and recorded in our life time. I will illustrate it with the evolution of commercial aircraft, the cooling of electronics and modern athletics, which is a special laboratory for witnessing the evolution of animal locomotion.

I show that these evolutionary forms of flow organization are in accord with, and can be predicted based on the law of physics that governs evolution in nature, bio and non-bio: the constructal law. Evolution, life and the human & machine species are physics.

Short Biography
Adrian Bejan received all his degrees from M.I.T.: B.S. (1971, Honors Course), M.S. (1972, Honors Course) and Ph.D. (1975). He was a Fellow in the Miller Institute for Basic Research in Science at the University of California, Berkeley (1976-1978). At Duke University, he is the J.A. Jones Distinguished Professor. His research is in applied physics, thermodynamics and the Constructal Law as the law of physics that governs organization and evolution in nature.

Professor Bejan is the author of 28 books and over 600 peer-refereed journal articles. His h index is 55 on the Web of Science. In 2001 he was ranked among the 100 most-cited authors in Engineering world wide. He received numerous international awards for thermal sciences. He was awarded 18 honorary doctorates from universities in 11 countries.

<div align="center">**Keynote**</div>

Nanoscopy with Focused Light

Stefan W. Hell
Prof at Max Planck Institute for Biophysical Chemistry, Göttingen, Germany

Abstract
Throughout the 20th century it has been widely accepted that, at the end of the day, a light microscope relying on conventional lenses (far-field optics) cannot discern details that are finer than about half the wavelength of light (> 200 nm). However, in the 1990s, it was discovered that overcoming the diffraction barrier is realistic and that fluorescent samples can be resolved virtually down to molecular dimensions.

Here we discuss the simple yet powerful principles that allow neutralizing the resolution-limiting role of far-field optical diffraction[1,2]. In a nutshell, features residing closer than the diffraction barrier are prepared in different molecular (quantum) states so that they are distinguishable for a brief detection period. As a result, the resolution-limiting role of diffraction is overcome, and the interior of transparent samples, such as living cells and tissues can now be imaged non-invasively at the nanoscale using focused light in 3D.

Besides discussing basic principles, we will show recent advancements. In particular, we demonstrate massive parallelization of RESOLFT and STED recording using simple patterns of light, by more than 100,000 fold[3]. Likewise, we demonstrate the relevance of emerging 'far-field optical nanoscopy' to various areas, especially to the life and the material sciences.

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- 2. Hell, S.W. Microscopy and its focal switch. Nature Methods 6, 24-32 (2009).
- 3. Chmyrov, A. et al. Nanoscopy with more than 100,000 'doughnuts'. Nature Methods (2013).

Short Biography
Stefan W. Hell (link is external) is Professor at the Max Planck Instititute for Biophysical Chemistry in Göttingen, Germany, and Nobel Laureate 2014 for Chemistry.

Born on December 23, 1962 in Arad, Romania. Study of physics and doctorate University of Heidelberg (1990), postdoc EMBL Heidelberg (1991-1993), Senior Researcher University of Turku, Finland (1993-1996) and Visiting Scientist University of Oxford, UK (1994), German Habilitation in physics (University of Heidelberg, 1996), head of an independent research group (1997-2002) at the Max Planck Institute for Biophysical Chemistry, Director and Scientific Member at the Max Planck Institute for Biophysical Chemistry (since 2002), Head of the "Optical Nanoscopy" division of the German Cancer Research Center (DKFZ) Heidelberg (since 2003), Adj. Professor of Physics University of Heidelberg (2003), Honorary Professor of Experimental Physics University of Göttingen (2004).

Keynote

"Anchoring Innovation": a classicist's approach to the human factor in innovation

Ineke Sluiter
Professor of Greek at Leiden University

Abstract
Innovation is not a modern phenomenon: in this lecture, we will present examples of "innovation" in several different domains of the ancient world, and analyze the way in which innovations are "anchored", that is, how they are embedded in and attached to what is older, traditional, known. We will also look into ancient attitudes towards innovation.

These are fundamental issues for classical studies and for the Humanities at large, but a methodologically interesting and usable understanding of how innovation is anchored, i.e. the human-factor conditions under which innovations are likely to be successful, is of considerable interest to contemporary society as well.

Short Biography
Ineke Sluiter (link is external) (Amsterdam 1959) PhD Classics 1990, VU University, Amsterdam (cum laude) is Professor of Greek at Leiden University. From 2000 to 2011 she was the Academic Director of the National Research School in Classical Studies, the Netherlands (OIKOS). In 2010 she won the Spinoza prize (most important academic prize in the Netherlands, 2.5 million euros). Currently she is the principal investigator of the new OIKOS research agenda 'Anchoring Innovation' (starting grant of 3 million euros).

Her main research themes are ancient ideas on language and rhetoric; societal discourse, esp. about norms and values (collaborative research program: Penn-Leiden Colloquia on Ancient Value); cognitive approach to the Humanities; and "anchoring innovation".

Key publications

- (with Rita Copeland) Medieval Grammar and Rhetoric. Language Arts and Literary Theory, AD 300-1475 (Oxford, OUP 2009).
- co-editor of six volumes on ancient values (ANDREIA: Studies in Manliness and Courage in Classical Antiquity, 2003; Free Speech in Classical Antiquity, 2004; City, Countryside, and the Spatial Organization of Value in Classical Antiquity, 2006; KAKOS. Badness and Anti-Value in Classical Antiquity, 2008; Valuing Others in Classical Antiquity, 2010; Aesthetic Value in Classical Antiquity, 2012).
- 'Deliberation, free speech, and the marketplace of ideas', in: T. van Haaften, H. Jansen, J. de Jong, W. Koetsenruijter (eds.), Bending Opinion. Essays on Persuasion in the Public Domain. (Rhetoric in Society). Leiden, 25-47.

Patenting and Exploitation of Results in Human Embryonic Stem Cell Research

Professor Dr. Dres.h.c. Joseph Straus

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1.

Whereas, under strict regulatory conditions in a number of EU Member States, e.g. Belgium, the Netherlands, Spain, Sweden and the United Kingdom, research in human embryos is allowed, in others, such as Austria, Germany or Italy, it is strictly forbidden.

2.

Under Regulations and Directives of the EU, again under strict conditions, also the commercial exploitation of the results of research in human embryonic stem cells, such as pluripotent human embryonic stem cell lines, is also allowed, however, the final decision is left to national legislators of the Member States. As a result. some allow commercialization, other do not.

3.

The EU Directive on the Legal Protection of Biotechnological Inventions (98/44/EC of July 1998), on the one hand allows the patenting of elements isolated from the human body or otherwise produced by means of a technical process, but, on the other hand excludes from patent protection the human body, at various stages of its formation and development, and *inter alia* uses of human embryos for industrial and commercial purposes, and in general inventions where their commercial exploitation would be contrary to *ordre public* or morality.

4.

On the basis of these provisions the Court of Justice of the EU, first, applied the broadest possible definition for what constitutes an human embryo for patenting purposes (decisive is the potentiality to develop in human being) and then held unpatentable all inventions related to human embryonic pluripotent stem cells generated from destroyed human embryos, no matter how legal under the applicable law the generation of those stem cell lines was, and also no matter that the actual working of the claimed invention does not require any further use of human embryos.

5.

As a result, the only "unethical" aspect in the context of the research in human embryonic stem cells and the commercial exploitation of the respective research results, valid EU-wide seems to be patenting. The obvious consequence of this is that the respective inventions can be freely used and in a number of EU Member States also commercialized. Quite apart from the doubtful ethics involved, this also raises the issue of compliance with international law (TRIPs Agreement) controlling the EU Directive, which allows the exclusion from patentability for ethical reasons only, if the commercial exploitation of such inventions is not allowed.

6.

Note: A patent does not constitute a license to use, but only to prohibit the use of the patented invention by third parties. Thus also the patentee can use the invention only in accordance with regulatory provisions. However, the latter depend on scientific findings related to safety, etc. and on public acceptance. Both can change, but an invention which became publicly available cannot be protected anymore.

7.

What is needed is a forward oriented interpretation of law, whose ethics will incentivize the necessary research and development and which will stand scrutiny should in not too distant future stem cell research lead to new drugs curing Parkinson diseases, multiple sclerosis and other not curable illnesses. In which case all ethical concerns of the past would

disappear immediately and nobody will take the responsibility for the past decisions. The European legislator and the European courts have to take responsibility also for tomorrow.

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Stem Cell Ethics: hES and iPS

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1.

Sourcing of human embryonic stem cells (hES) from human embryos has stirred ethical controversies due to the fact that the embryo is an entity in a process of ongoing development, which – if transferred to the uterus and the conditions are favourable – will develop into a fetus and be born as a child. Compared to hES cells, the sourcing of induced pluripotent (iPS) cells is ethically unproblematic since they are generated from adult body cells. Also iPS cells could however be made 'totipotent' under very special and technically sophisticated circumstances, but they are clearly not in a process of ongoing development similar to hES cells. Their developmental potential is therefore rather theoretical.

2.

It is difficult to define exactly in moral terms what the pre-implantation embryo in the blastocyst stage is. Some will say it is just an organized conglomerate of biologically very active cells and nothing more. They endorse a model of the embryo as essentially a 'thing'. Others will say that the embryo has a full set of genes, making it an early stage of human life, fully capable (other conditions given) to develop into a fetus and a child. They endorse a model of the embryo as essentially a 'person'. A third group of people take an intermediary position and say, the embryo is unique: a very early stage of human development. They argue, this gives reason to treat the embryo with at least some dignity, perhaps a growing level of dignity ('gradualism'), not as a person but not as just as an assembly of material either. They endorse a model of the embryo as an 'object of respect'.

3.

The first and the third model are compatible with a rule that allows sourcing of hES from donated spare embryos from IVF. More controversial are schemes where women can donate eggs for producing research embryos in exchange for money or a better deal in IVF ('egg sharing').

4.

Sourcing of hES cells is not the only ethically sensitive aspect of emerging stem cell therapies. Others include (1) the patenting of cell lines in the form of composition-of-the-matter patent claims that apply to the cells as such, (2) the limitation and acceptability of medical risks of stem cell therapies for the patient, (3) the exploitation of despair by commercial clinics who sell unproven stem cell therapies to patients as last chance, (4) the good development of donor-patient relationships, if for instance matched haematopoietic stem cells from a very young sibling of the patient are used as a raw material for developing clinical grade and personalized therapeutic stem cells.

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Legal Aspects of Research with Human Embryonic Stem Cells (HESC)

Professor Dr. Jochen Taupitz

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1. At the international level, many texts proclaim the right to life in general, e.g. the Universal Declaration of Human Rights of 1948 (Art. 3) or the International Covenant on Civil and Political Rights of 1966 (Art. 1). But it is very much disputed, whether the documents apply to embryos.

2. The Council of Europe's Convention for the Protection of Human Rights and Dignity of the Human Being with regard to the Application of Biology and Medicine of 1997 leaves each country the responsibility for legislating on the permissibility of embryo research, while stipulating two conditions:

- the prohibition of producing human embryos for research purposes and
- the adoption of rules designed to assure adequate protection for the embryo.

But: What is an "adequate protection for the embryo"?

3. The Charter of Fundamental Rights of the European Union expressly prohibits reproductive cloning, but does not comment explicitly on embryo research.

4. In a Resolution of 7 September 2000, the European Parliament stated its opposition to the creation of supernumerary embryos and to therapeutic cloning; but the resolution is not binding.

5. The European Group on Ethics in Science and New Technolo-gies to the European Commission (EGE) adopted Opinion No. 15 of 2000 on the ethical aspects of human stem cell research. It states that "it is up to each Member State to forbid or authorise embryo research". On the other hand, the Group considers "ethically unacceptable" the creation of embryos with donated gametes for the purpose of deriving stem cells. But the opinion is not binding.

6. France, Spain, Portugal, the Netherlands, Denmark, Norway, Finland, Estonia, Slovenia, Hungary, Czech Republic and Greece *allow* research with supernumerary embryos / the derivation of HESC from supernumerary embryos. Belgium, United Kingdom and Sweden even *allow the production of embryos for research purposes.* In Austria the importation of HESC and their utilization is not restricted.

7. Only in Poland, Lithuania and Slovakia research with HESC is *forbidden.*

8. In Germany, Italy and Ireland *research with (imported) HESC is allowed under very strict circumstances.*

9. Lessons from the differing legal positions?

- From a legal point of view, different legal positions are an expression of national sovereignty and therefore not a bad thing in itself.
- As such, different legal positions constitute no sufficient reason to change the own legislation. Especially they constitute no reason for a race to the bottom!
- Competition between jurisdictions is like an in-vivo-experiment: It can remove or confirm fears and hopes.
- According to their responsibility for their own society, legislators are well advised to observe the foreign experiences very carefully.
- And there must be no contradictions inherent in a legal system!

10. Research with induced pluripotent stem cells (iPSC) as such is not subject to specific regulations in Germany (only for example it is forbidden to use artificially altered germ cells including artificially created egg and sperm cells from iPSC).

11. The use of an embryo for a purpose not serving its preservation is forbidden in Germany according to the *Embryo Protection Act.* Consequently the derivation (production) of embryonic stem cells (HESC) is forbidden in Germany.

12. According to the *Stem Cell Act* the importation and utilization of HESC cells is prohibited if it is not approved by the competent agency. The approval depends on

- *the date of the derivation of the cells ("cut-off date"):*

the stem cells must have been derived and kept in culture before 1 January 2002 / 1 May 2007 in accordance with relevant national legislation there

- *the origin of the stem cells:* inter alia, the embryos from which the stem cells have been derived must have been produced by medically-assisted in vitro fertilization in order to induce pregnancy and were definitely no longer used for this purpose and there is no evidence that this was due to reasons inherent in the embryos themselves; no compensation or other benefit in money's worth has been granted or promised for the donation of embryos for the purpose of stem cell derivation
- *the intended utilization in Germany:* only for high-level research without alternative
- *an opinion of the Central Ethics Commission for Stem Cell Research.*

13. A the derivation (production) of embryonic stem cells (HESC) is forbidden in Germany, but the importation and utilization of HESC is allowed if it is permitted by the competent agency: double (moral) standards? No!

- There is a legal and moral difference between the original act and acts of exploitation.
- The German legislator has no responsibility for embryos abroad - at most a responsibility to prevent them from being consumed by Germans or for "German research".
- The legislator has to take into account freedom of science and his responsibility for ill people.
- Fatalism: The consumption of embryos in the past is irreversible.
- Solution of the Stem Cell Act: The stem cells must have been derived and kept in culture before 1.1.2002. The cut-off date later was shifted to 1.5.2007.
- The cut-off date (1.1.2002 / 1.5.2007) was fixed to an earlier date than the date when the act / its amendment came into force (1.7.2002 / 21.8.2008)

14. Criticism of the cut-off date:

- Already the German Embryo Protection Act in connection with the general rules of criminal law prohibits every "German" participation in the derivation of embryonic stem cells abroad, even if the derivation of the stem cells is legal at the respective place!
- => The cut-off date affects science very much, but does not benefit embryos abroad
- => Disproportional (unconstitutional) intervention into freedom of science!

15. The permission to import HESC further depends on (inter alia) the origin of the stem cells: The embryos from which the stem cells have been derived must have been produced by medically-assisted in vitro fertilization in order to induce pregnancy and were definitely no longer

used for this purpose and there is no evidence that this was due to reasons inherent in the embryos themselves.

- Reasons: Apparently it is an indictable offence
  - to perform a pre-implantation genetic diagnosis (PGD)
  - to use embryos that have been selected after a PGD,

  and German researchers should not profit from such an offence.
- Consequence: No research with stem cells that have a defined genetic defect - which would be very useful to generate scientific knowledge about this defect!
- Criticism: Embryos selected after a PGD definitively have no chance to be transferred to a woman! => Is their use for research purposes really a violation of human dignity (instrumentalisation)? Since 2011 PGD is allowed in Germany! Apparently it is no more an indictable offence to perform a PGD! Contradiction inherent in the German legal system!

16. HESC may be imported and used only for research that serves eminent research aims to generate scientific knowledge in basic research or to increase medical knowledge for the development of diagnostic, preventive or therapeutic methods to be applied to humans.

- Reasons: Embryos and HESC are a valuable (and ethically controversial) resource. Therefore they should be used only for high-ranking goals (=> restriction of the use of the fruits of the forbidden tree).
- Consequence: The application of stem cell therapies in daily clinical practice is forbidden ($\neq$ Research)! Although research should end in clinical practice for ill people!
- Criticism: To heal ill people is a high-ranking goal! => Contradiction inherent in the German legal system!

17. Overall critical assessment of the Stem Cell Act

- The Stem Cell Act has been a political compromise between those who wanted to prohibit research with HESC totally and those who wanted to leave the door open for the hope to find therapies for still incurable diseases.
- The act came under pressure as a result of scientific progress in the production of HESC; result in 2008: shifting of the cut-off date.
- It will come under extreme pressure if stem cell therapies will be available for daily clinical practice.
- But if the future will prove that stem cell therapies are a fallacy, we in Germany did not get our hands dirty!

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Of Men and Tools: Shaping Group Identities in European History and Beyond

Pieter Emmer

Emeritus, Dept of History, Leiden University, The Netherlands

Abstract

This paper is not written as a conventional conference contribution but rather as a set of theses to hopefully serve as a basis for discussion during the round table organised by the History & Archaeology Section of the Academia Europaea during its annual meeting in Darmstadt.

1. Introduction

Let me start with a personal note. In studying and teaching history, I have always been struck by the exceptional role of (Western) Europe as compared to that of other continents. Others have had the same idea and it is no wonder that during the past twenty years, a considerable number of publications have tried to pinpoint the decisive factors that made Europe into a miracle. In order to identify the factors that provided the exceptional economic growth underlying the remarkable development of the arts, sciences, industrialisation, democracy, etc., several scholars have pointed to China that seemed much better poised to take a leading position in the world economy: one official language, one administrative system, one market and similar differences in climate that create the need for trade and migration. In addition, in China there existed no equivalent of the many vicious, expensive and internal wars that plagued Europe for centuries and seemed extremely detrimental to economic growth.

The publication of Kenneth Pomeranz, The Great Divergence: China, Europe, and the Making of the Modern World Economy (Princeton, 2010) sparked a lively historical debate that has been very effectively summarized by Patrick O'Brien at http://www.history.ac.uk/reviews/review/1008.

Much of the discussion as to why after 1800 Europe took the lead in economic development and not China centres on two questions: i) why is it that Europe exploited its coal deposits much more effectively than China providing Europe with an energy advantage and ii) the role of the New World as a producer of food and as a recipient of Europe's excess population. In both cases, however, these New World stimuli for European growth could hardly have been of importance before the middle of the 19th century, when the Industrial Revolution was well under way in England and Belgium.

In order to explain the onset of modern economic growth in Europe, we need to revisit the early modern period and not only look for the early beginnings of economic growth, but question the obstacles to it, caused by the political disintegration. Compared to Chine, the numerous political, cultural and linguistic borders seemed to have turned Europe in a collection of self-centred states which used a disproportionate part of their resources to fight one another, and prevented new economic activities because of the difficulties to migrate and invest across borders.

In reality, however, the political compartments in early modern Europe were much more open to foreign migrants and investment capital than has been assumed. In fact, early modern Europe counted no less than seven international migration circuits aimed at providing labour where needed and the same applied to investments. Loans, shares and government bonds had an international market.

In order to highlight the porosity of borders in Europe, I have selected three groups, who derived their identity from the tools they used rather than from the country where they had been born or lived: soldiers, sailors and planters.

Before the French Revolution, soldiering was an international, not a national profession. His weapons made the soldier not his nationality. Well-known is a letter "The sale of the Hessians" in which the author - perhaps Benjamin Franklin - ridiculed the "sale" of Hessian regiments by their sovereign to Britain, where they were shipped to North America in an attempt at suppressing the American Revolution. Hessians also fought for the king of Sweden and

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Bavaria as well as in the army of Prince Eugene of Savoy. Armies of professional rather than national armies were advantageous to Europe. In spite of the many conflicts between the European states, a professional, non-national army restricted the damage. Usually, military actions were confined to the areas, where the battles took place, and outside these areas of combat normal life could continue including trade between the nations at war. Hiring professional soldiers did not affect the demography and the economy as young men did not have to interrupt their work or training in order to do compulsory military service. In sum, the threshold to start a war was high as the professional soldiers in Europe only fought when they were paid making protracted wars very expensive.

Not only the identity of soldiers was dependent on the tools they used, the same applied to sailors and ships, particularly in the merchant marine. Usually, coastal regions could not provide a sufficient number of sailors creating long-distance migration circuits within and outside the borders of the maritime nations. Again, the international recruitment of sailors had a less detrimental effect on the demography of the maritime nations as the mortality among sailors on trips to tropical destinations was extremely high. By hiring foreign sailors, the staffing of the merchant marine and the various national navies was far easier than the recruitment within the national borders would have allowed for.

Last, but not least planters in the New World also constitute a mobile group with an international character, which headed some of the most export-oriented and the most capital intensive enterprises of the early modern period. Planters could be the sons of wealthy families in Europe, who went to the colonial New World with capital. Planters were also recruited among the military, indentured servants or privateers. And last, but not least, because of the high mortality in the Tropics, plantation overseers sometimes managed to buy a plantation and to become planters.

2. Soldiers

A case in point was the Swiss mercenaries, who served in many European armies, starting in the 17th century and ending in the 19th century. Most of them came from the catholic cantons. Around 1700, about 50,000 Swiss served abroad, half of them in France, 11,000 in the Netherlands, 6,000 in Spain, 5,000 in Savoy-Piedmont, 5,000 in Austria and 2,000 in Poland. Over time, the every Swiss state organised a recruitment board that oversaw the recruitment of soldiers. It was by no means certain that these mercenaries returned home after the contract had expired as many settled in the country, where they had served, in a variety of professions.

2.1. Sailors

Here, I turn to the states of Holland and Zeeland in the Netherlands, where about 15 percent of the male population

had a maritime profession. That was not nearly enough to satisfy demand, especially when the two long-distance trading companies were founded, the East and West India Companies. The East India Company (Vereenigde Oost-Indische Compagnie or VOC). The yearly demand for labour of the VOC alone came to about 4,000. while over time the total employment of the Company came to 40,000! The records of the VOC show that the young men, who wanted to serve the Company, came from all over Europe, albeit that the German speaking countries dominated. In some parts of southern Germany spending time in the VOC was a kind of rite de passage for boys in their late teens and twenties. In the Dutch merchant marine in general the percentage of non-Dutch sailors sometimes amounted to 40%. The (mainly Dutch) officers on the ships sometimes complained about the inexperience of the recruits ("they still have grass between their teeth"), but the willingness to serve was more important than experience. The boys and men were trained on the job and their geographical origin, language or religion was of little importance. Their identity was derived from the tools they worked: the ships

2.2. Planters

At present, an entrepreneur is someone, who succeeds in combining the factors of production, labour, capital, and the environment, in order to obtain the maximum amount of profit. In Europe, the limitations on the use of capital and labour were numerous, but these limitations were absent in the New World. In the tropical and sub-tropical parts of North- and South-America and the Caribbean a group of entrepreneurs came into existence, wo were able to manage the most capital-intensive business ventures at the time: plantations. The labour consisted mainly of slaves, imported from Africa and steadily increasing in price. The capital came from Europe, either as the private property of the planter himself, but more often from a consortium of merchants, who also had economic interests in the shipping industry specialized in bringing goods and migrants to the plantations and ferrying and selling plantation produce in Europe. During the 18th century, the Dutch developed investment funds that provided mortgages to planters allowing them to increase the number of slaves as well as their arable land.

Nationality did not play a prominent role. The English colony of Barbados, where the English had started plantation agriculture, experienced a shortage of land forcing some of planters to move to Suriname on the South American mainland. Subsequently that colony was conquered by the Dutch and expanded and until the end of the slavery period a large number of planters and overseers were not Dutch, but came from all over Europe and North America. The Dutch planters moved to the French Caribbean and the French planters from Saint-Domingue - after the slave revolt - escaped to Cuba and the South of the US.

Again, the tools (i.e. the plantations) created the identity

(i.e. that of planter or plantation overseer). In addition to soldiers, sailors and planters there existed numerous other groups in Europe, who derived their identity from their profession rather than from the country they happen to be born in like the higher echelons of the catholic clergy, artists such as painters, sculptors and architects. In addition, the nobility, the officers in the army and navy, the ruling monarchical families in Europe, and both university professors and students always consisted of a mix of nationalities.

2.3. Conclusion

Compared to China, early modern Europe looked like a jigsaw puzzle of large and small countries, many with differing languages and administrative systems. Behind this façade of differences, however, and before the onset of the 19th century national movements, early modern Europe could be considered as an entity when it came to sections of the labour market, the colonial, religious and educational elites.

When looking at the causes for Europe's jump ahead during the 19th century, borders in Europe seemed to have played a beneficial if undervalued role. By having borders, Europe was divided into a set of manageable and competing entities while at the same time these borders were sufficiently porous as to allow the free circulation of knowledge, expertise, and the migration of professional groups, allowing the economies of Europe to grow without the restrictions imposed by borders.

The Dawn of Chemistry : The Finding of Early Universe Molecules as a Synergic Endeavour of Science and Technology

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We live in a chemically and dynamically evolving Cosmos. The interplay between these two domains has shaped the Universe in the way we observe it now.

Dynamics, driven by visible and invisible forces, has governed the transformation of minute density perturbations into structures of varying degree of complexity (from galaxies to individual stars within them). Chemistry has been instrumental for modifying a very simple mixture of nuclei and electrons into complex molecules and solid particles, the essential ingredients for the cooling and fragmentation of the interstellar gas. The first synthesis of the elements occurred in a very short time interval of about three minutes after the initial expansion of the universe, but it took about four hundred thousand years before conditions were suitable for matter and radiation to decouple, with the former recombining into neutral atoms.. The ever decreasing energy of the photons of the cosmic microwave background (CMB) radiation, selectively promoted the formation of the first molecular species, from which all our present complexity has originated. This review highlights the progress made, observationally and theoretically, in understanding the current inventory, the origin and evolution, and the role of molecules in the Early Universe environment of preformation of galaxies. We now know that molecules are in the present Universe everywhere, the organic inventory is very diverse, and molecules play an important role in many processes that drive the evolution of the interstellar medium. Eddington was a bit dismayed after the discovery of the first diatomic molecules, and lamented that "atoms are physics but molecules are chemistry." As a physicist, he regretted the loss of innocence from the time when simple physical formulas were sufficient while now have to give way to the complex dynamical analysis and thermodynamical solutions of a molecular universe. However, the multitude of rotational, vibrational, and electronic transitions of molecules provide unique opportunities to probe the Universe in much greater detail than ever before and we have just started to explore this.

With the Herschel Space Telescope still gathering data, the Atacama Large Millimeter Array (ALMA), and also the newly expanded Karl G. Jansky Very Large Array (JVLA) starting up, the Stratospheric Observatory For Infrared Astronomy (SOFIA) taking off, and the James Webb Space Telescope (JWST) mission on the horizon, the future for molecular astrophysics looks bright. Over the next decade we can expect to make great strides in addressing the three grand challenges of molecular astrophysics: (1)What is the organic inventory of space, in particular, in regions of star and planet formation and how does that relate to the prebiotic origin of life, (2) what is the role of molecules in the evolution of the universeand more specifically during the Early Universe stage (3) how can we use molecules to study the Universe? Specifically, the HIFI/Herschel data on simple hydrides can be mined for the initiating steps in gas-phase chemistry. ALMAwill provide an unprecedented wealth of molecular data that can be used to probe the physical conditions in regions of star formation. In addition, ALMA can be expected to address the interaction of gas and grains both in hot cores and hot corinos near protostars where ice mantle products evaporate and initiate a rich chemistry and in prestellar cores where accretion takes place and nonthermal evaporation mechanisms feedback to the gas-phase molecular inventory. SOFIA is specifically geared toward probing the evolution of PAHs in space and determining their role in the physics and chemistry of photodissociation regions near massive stars. This will be an essential step in understanding in a quantitative way the dominant heating of interstellar gas and the role of PAHs in the ionization balance. Both of these are key to understanding the interaction of massive stars with their environment and the global evolution of the interstellar medium of galaxies. The JWST construction has the spatial resolution to probe the chemical evolution of these species in protoplanetary disks on the 10 AU scale. In addition, with our insights on the role of PAHs in the ISM developed through SOFIA, such JWST observations give us great insight into the physical structure of,

in particular, the disk photosphere. SOFIA and JWST will also form a great tandem in addressing the organic inventory in the habitable zone of terrestrial planet formation around nearby young stars. SOFIA can probe the spatial distribution at the AU level of simple but keymolecules.

We will therefore report in this talk how the joint collaborative efforts of many scientists all over the world have unravelled our chemical history from the simple beginnings of the Primordial appearance of molecules, about 380,000 yrs after the estimated Big Bang Event, and will endeavour to Illustrate how rapidly the joint efforts of so many scientists of such diverse backgrounds have managed to unravel the variety of so many chemical networks which are presently at work in our Universe.

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Cancer, Computers, and Complexity: Decision Making for the Patient

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Abstract

In the recent health care related discussions, a trend may be noted to question some of today's fundamental assumptions about the doctor-patient relationship, about the feasibility of medical studies, and the role of computers as an aid or replacement of doctors. Diagnostics and therapy decision making become more complex, and no end is in sight. Amounts of health-related data are being collected individually, and through the healthcare systems. On the example of breast cancer care, technological advances and societal changes can be observed as they take place concurrently, and patterns and hypotheses emerge that will be the focus of this contribution. In particular, three key changes are to be considered: (1) the growing appreciation of the uniqueness of diseases and the impact of this notion on the future of evidence based medicine, (2) the acknowledgement of a "big data" problem in today's medical practice and science, and the role of computers, and (3) the societal demand for "P4 medicine" and its impact on the roles of doctors and patients.

Categories and Subject Descriptors (according to ACM CCS): J.3 [Computer Graphics]: Life and medical sciences—Medical Information Systems I.2.6 [Computer Graphics]: Learning—Concept Learning I.4.7 [Computer Graphics]: Feature measurement—Feature representation I.5.2 [Computer Graphics]: Design methodology—Pattern Analysis

1. Introduction

Medicine today faces several paradigmatic changes that are either already under ways or likely to occur over the next few years. Oncology is a medical discipline where the understanding of causes and effects and the choice of treatment options has recently grown into a highly complex picture, where in some parts, research has only begun to scratch the surface of today's mostly evidence- and guideline-based clinical practice of diagnosing and decision making. Reflecting the increase in knowledge and data against the technological advances and societal changes that concurrently take place, patterns and hypotheses emerge, out of which three will be the focus of attention.

The description hereafter will take as a practical example the detection, diagnosis, and treatment decision making in breast cancer, being a disease with a high societal impact and posing challenges to healthcare economics, besides being a field of very active global scientific research.

2. Three Theses on the Future of Medicine

2.1. Conquering Cancer, but Drowning in Complexity

For the purpose of this article, a system or entity that cannot be described in an algorithm or recipe shall be called complex. Being complex can be opposed to the notions of being simple, complicated, or chaotic [Sno00]; compare Fig. 1.
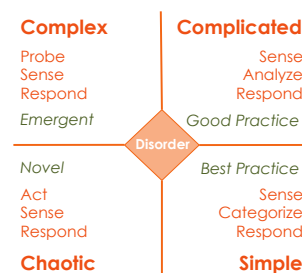
Figure 1: *Responding in systems from simple to chaotic. After: [Sno00]*

The complexity of cancer, the hallmarks leading to its

genesis [HW11], its diversity of genotypes and associated phenotypes, increasingly reveals itself through genetic profiling and various clinical and non-clinical imaging methods. In this light, no two cancers are the same. Consequently, they shouldn't be treated the same. A wide variety of treatment options has emerged, evolved, and diversified. This furthers a clinical decision making problem: doctors obtain extremely comprehensive information about the patient demographics, the disease and its comorbidities, therapeutic strategies and their impact and likelihood of outcomes. Summarising, there is too much information to consider, and too many options to choose from.

Our data acquisition tools already allow to measure more than can be clinically assessed, with efforts to automate the acquisition processes further. Researchers begin to face a "big data" problem, as many of the tasks needed for information extraction and sense-making can't be automated to a matching degree, leaving the tasks of information extraction and sense-making to the human observers. We create a historically unparalleled wealth of multi-scale, multi-level, and multi-disciplinary information that cannot realistically be described by conventional statistical analyses. Take as one example among several the existing collection of cancer genomic data that is being collected by the NCIs Cancer Genome Atlas project: 25,000 TB of data have been collected so far, and little of it has been tied to clinical information [Rub15].

One possible human reaction facing this complexity is to resort to simplifications and categorisations based on reduced information, or, in the worst case, on subjective opinions or best practices. In the case of breast imaging, for example, reporting of imaging findings follows a catalog of predefined terms. This not only reduces the continuum of potential findings to nominal categories, but also isn't open for non-standardised findings. Another example is decision making for chemotherapy. There is a limited number of potential drugs that can be combined into a limited number of therapy regimen. The choice of regimen is taken based on about four parameters derived from the huge and extremely feature-rich histopathology images, and these parameters are given in categories ("low – medium – high") rather than as a number. The choice of drugs is due to national and international guidelines which represent the minimal consensus that could be reached between competing scientists worldwide [GWC*13].

2.2. Empowering the patients

In parallel, societal and legislative changes influence (and are influenced by) the "big data" situation. Health data is personal, and hence it is a natural demand that it should be owned by the patient. Electronic Health Records stored by the patients themselves offer an opportunity to achieve this. With proper provisioning of secure access and exchange systems, safety concerns can be overcome [Cau15, AF97],

but questions concerning medical liability and responsibility, and psychological effects on the personal level remain unanswered. Further ethical questions arise when envisioning the medical histories of millions of humans to be jointly analysed for patterns, striving for precision medicine.

Conversely, in some clinical disciplines the integrity of the doctor is in question, when patients are granted by law the right to see all notes and documents created about them. A delicate balance will need to be met between the rights of health care professionals and patients. In addition, with the possibility of self-monitoring, the already existing demand of insurance companies may be extended that requires patients to monitor certain health-related parameters to obtain access to insurance coverage of specific conditions.

When, however, we acknowledge the deeply individual nature of disease, the future of evidence based medicine might be at stake. Patients ask for personalised treatment plans and drugs, and may become the driving force. However, the purely technical barriers to overcome to share the data across centres, cities, countries, and ultimately the world, are today unsolved or come at excessive integration costs – let alone the ethical issues mentioned before. Sharing, however, is a necessity in today's setup of phased clinical studies to collect sufficient numbers of cases showing the genetic mutation of interest [Rub15].

Precision medicine for the patient's benefit is promising [HKJea15] but costly, but who is going to cover these costs? Interestingly, simple health care cost estimates with only few assumptions already point out a potential for economic benefits with simultaneously improved outcomes. It is possible that pharmaceutical companies become the primary stakeholders in such developments since they are the prime beneficiaries of large-scale data pools to assess drug efficacy, striving to design the "right', the optimal and personalised drug. Then, the question remains how the empowered, participating patient will affect medicine's quality through his informational self-management. Will a popular medicine trend emerge, and how will that impact the profession of the doctor [Top12]?

2.3. Knowledge-based medicine

The confluence of heavily parallelised computer architectures and ingenious algorithmic developments in the field of machine learning has recently enabled a key technology advancement closely linked to "big data". So-called hypothesis-free statistical analysis uses a method shaped after learning patterns observed in the human brain – deep learning [HOT06, BLPL07]. This type of vastly complex artificial neural networks is capable to grasp and abstractly represent the most complex patterns without understanding them, if only fed with enough raw data. To move from representing to predicting, it is sufficient to provide the network with only a few well-annotated examples exhibiting

the desired outcomes. Thus, such learning machines can reach up to the performance of humans in many tasks, and even bypass them in some. The ultimate promise of knowledge-based medicine is precision medicine: The optimisation of diagnostic tools and therapeutic choices for individuals [KP12, Nat15, Hea15]. It is based on an objective and holistic data analysis, resulting in personalised, intuitive visualisations and comprehensive information use – something only automated computer analyses might be able to provide.

Together, data complexity, patient empowerment, and computing power close a loop: The hope to disentangle the patterns hidden in the data lies in collecting heaps of it, and analysing it with state of the art technology. To collect enough data will be possible by empowering the patient who may in return benefit from the analyses for his personal data: automated, reliable, on demand for the patient, and cutting health care costs for society.

3. Conclusions

We make the case for "P4 medicine": predictive, preventive, personalized and participatory. As some put it: "biology drives technology drives computation" [Hoo13]. As the biology of cancer begins to reveal itself through technologies invented over the past decades, data-driven computational tools have to be devised and understood to cope with the breadth and wealth of knowledge and information. On the legislative, ethical, economic, and psychological levels, we have pointed out pressure points that need to be addressed by the involved interest groups together with the respective legislative bodies and a cross-disciplinary board of scientists. Shaping the future of medicine is, seen in this light, a true societal task. The synergy of humans and technology manifests itself when we accept that our minds are not limitless, and that we need the power of technology to help us grasp and understand the wealth of information present in our data. This might enable us to use our human creativity to the better of the patients.

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Unleash the Beast! - Immunological Approaches for the Treatment of Cancer

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Abstract

With the aim of sparing patients the toxic side effects of classical chemotherapy, oncologists have set out to more selectively kill tumor cells and progress has been made in the past decades to prolong and improve the lives of cancer patients. Recently, researchers have discovered that cancer cells adopt strategies to evade the immune system of the human body, a subterfuge they share with certain parasites. Therapeutic agents aimed at interfering with check-point receptors of the immune system have led to novel clinical therapies with remarkable efficacy in a large variety of tumors. The biology and clinical effects of programmed death 1 (PD1) pathway inhibitors and related therapies will be presented.

1. Introduction

Despite remarkable success of targeted anti-tumor therapies, cancers continue to figure among the leading causes of morbidity and mortality worldwide with approximately 14 million new cases and 8.2 million cancer related deaths. [WHO15]. Progress has been made in understanding the molecular underpinning of the disease and recent evidence suggests that tumors adopt efficient strategies to evade the human immune system.

2. Breaking tolerance

Immune cells are constantly surveilling our bodies in order to eliminate foreign invaders and pathogens. Importantly, they also encounter all sorts of innocuous antigens that they know not to attack. Cancer cells have been long hypothesized to hijack this vital part of the immune system which separates friend from foe. Whilst the idea to combat cancer by spurring the immune system has been suggested decades ago, successful clinical interventions have only been demonstrated in the last couple of years. A novel drug class called check-point inhibitors has recently emerged which is aimed at releasing the immune 'brakes' and exposing cancer cells to the destructive power of the immune system. These novel agents are antibodies directed against proteins called PD-1, CTLA4 and, more recently, PDL-1. PD1 and CTLA4 are checkpoint proteins mostly expressed on T-cells and play a role in dampening the immune response. PD-L1, a ligand
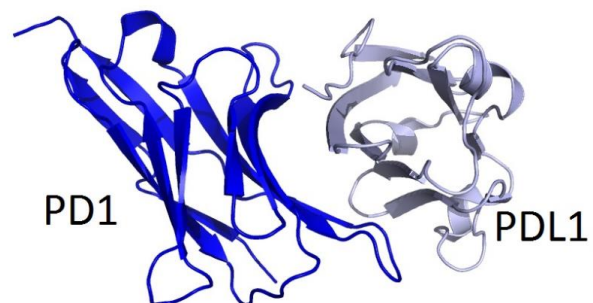
Figure 1: *Depiction of the immune-checkpoint proteins PD1 and PDL-1. The discovery of therapeutic antibodies interfering with this interaction has led to promising novel cancer treatments.*

of PD-1, is often found on cancer cells and serves tumors to induce tolerance and turn off the immune response. Together with many other proteins they constitute molecular elements of the inflammatory synapse. Antibodies raised against these targets have proven efficacious in animal models as well as in clinical trials. Three checkpoint inhibitors have so far reached the pharmaceutical market due to their effectiveness observed in skin and lung cancer patients [LCP15].

3. Therapeutic modalities

Today, the potential of breaking tolerance through checkpoint blockade is clearly recognized. However, not all patients seem to respond and side effects originating from exaggerated immune responses have been reported. The focus is now on combining these anti-checkpoint agents with supportive therapies in order to increase efficacy whilst keeping side effects manageable.

Apart from therapeutic antibodies, small molecules are particularly attractive as combination partners. Small molecules can conveniently be taken by mouth and their dose regimen can be adjusted or modified to intermittent dosing should adverse reactions prove unmanageable. Attempts to identify small molecules interacting directly with checkpoint proteins have so far not yielded clinical drugs, probably due to the demanding protein/protein interactions that would need to be disrupted in order to yield effective treatments. Instead, small molecule approaches have focused on identifying agents that modulate the activity of signaling molecules such as indole amine or TGF beta. These materials are secreted into the tumor micro-environment and dampen the T-cell response. Whilst such molecules might not have prominent anti-tumor efficacy in their own right, they have been demonstrated to be promising combination partners for checkpoint inhibitors in preclinical studies [ASS15].

Therapeutic antibodies and small molecules have proven important modalities in the booming field of cancer immunotherapy. Rather than engaging a patient's T-cell response by pharmacological means, the direct application of T-cells activated by genetic modifications has recently been the subject of several clinical studies. Autologous T-cells, transfected with genes encoding chimeric antigen receptors (CAR-Ts) have demonstrated remarkable clinical effects in particular in B-cell related hematological malignancies. Despite robust clinical objective response rates, this synthetic biology approach is still plagued by manufacturing and safety issues such as quality control and off tumor/on target toxicities. Overcoming such hurdles will pave the way to safe and efficient cellular therapies [JR11].

4. Conclusion

Whilst the idea of fighting cancer by activating the immune system is at least 100 years old [C93], immuno-oncology has come of age only in the last five years. Malignancies have long been interpreted as a genetic disease, but recent clinical data suggest that cancer can also be seen as a failure of the immune system to clear aberrant cells. Combinations of various therapeutic modalities hold promise to deliver effective anti-tumor therapies [MRF15].

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Publication Culture, Research Evaluation and the Recognition of Excellence

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Abstract

Authorship and Science are both in transition. Contemporary research funding models are based on post-WWII models of constant growth, which is unsustainable in a hyper-competitive research environment [AKT*14]. New forms of funding and performing academic research, as well as data sharing and integrity are rapidly evolving. Additionally, where research was once a solitary or small-team enterprise, particularly in Natural Sciences it is becoming increasingly common to see papers with tens, hundreds or even thousands of authors. In this climate, one wonders: what is "authorship" [W15]? How do you evaluate excellence? And how is a 5000-author paper born? This panel discussion will address these questions from the comparative perspective of biomedicine, particle physics, social sciences and humanities, and science and technology studies. We also present the Leiden Manifesto for research metrics [HWW*15] as an alternative to current models and open a call for discussion on how to improve on the current unsustainable models that are being used.

Categories and Subject Descriptors (according to ACM CCS): Documentation and Performance

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Elastic Computing – Towards a new Paradigm for Computer Systems

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Abstract

In this talk we present the fundamental research challenges we face today in designing, building and deploying elastic elements, i.e., Internet of Things (IoT) elements, cloud services, their dynamic infrastructures, and software. These elastic elements are very heterogeneous regarding design, lifecycle, operation, and evolution. Service units – abstracting elastic elements – are the core ingredients of our approach that are developed and provisioned in different locations. Such units and their infrastructure will collectively establish the building blocks for solving societal challenges in several domains. Such elastic elements will constitute the foundation for "problem-solving environments" for these societal challenges, e.g., platforms for smart cities, mobility, and healthcare.

Categories and Subject Descriptors (according to ACM CCS): C.2.4 : Distributed Systems

1. Introduction

Complex software systems such as Internet of Things (IoT) systems, cloud systems, cyber-physical systems, just to name a few, share some common characteristics: They often lack clearly stable spatial and temporal boundaries, are dynamic, and are composed of (autonomous) elements with different life-spans and evolution models. Furthermore, they are also very different w.r.t. the structure of the system, the composition techniques for building software, the execution and coordination among elements within them. Such complex software systems have been developed for addressing societal challenges such as in smart cities, health care, energy, and mobility. Using an analogy, individually, each of these systems can be seen like a special type of "material" and when composed they will create a "new type of material" (having novel properties of its own) that can potentially solve grand challenges that our society faces. Take smart cities as an example. A complex system of Internet of Things is deployed and provisioned to interface various infrastructures and environments; it can be considered as one type of "material". Cloud services are created and provisioned on demand to handle different types of sensing data and analytics; they are another type of material; intermediate networks and gateways between IoT and cloud services provide facilities for transferring data and pre-processing data; they are another type of material that bridge the two previous mentioned materials. Like different materials with dif-

ferent physical and chemical properties, all of these systems contribute to the successful construction of a new type of a smart city system. The smart city system in our example – a "composite material" – is very different from the mere aggregation of IoT and cloud computing systems. The key observation is that the "materials" we use to build a smart city solution are physically elastic. Their shape and size are changing under different demands and workloads, e.g., new sensors can join and leave, machines can be deployed or resized, and network topologies can be adjusted. Generally, within such systems, elements can already be elastic individually or collectively, and they operate differently under different contexts that guide their composability and coordination. However, at the level of the composite "material" – the smart city example in our case – we do not have sufficient knowledge and appropriate techniques that enable scientists and engineers to build such emerging new types of systems – the new composite "material" – in which there will be a large number of elastic computing elements, such as IoT elements (sensors, actuators, and integrating gateways), cloud services (e.g., data services, streaming analytics, and message-oriented middleware), and intermediate network nodes/routers, spanning across various locations, e.g., in global data centers, buildings, and network edges. For such new "composite materials," their elements, structures (topologies), and states are evolving. These elements can be composed and coordinated according to various al-

gorithms to solve complex problems in different application domains. Such new "composite materials" are essential and we need to develop them in order to support complex problem solving for the above-mentioned societal challenges. We call such new types of systems *elastic systems of everything (ELX)*. Inevitably, the property of elasticity is fundamental in building and operating such systems allowing the support of dynamic demands from consumers of ELX, such as changing performance and cost, as well as to deal with internal problems of ELX, such as system/service failures, governance assurances, and software maintenance and evolution. However, which are the fundamental principles that help researching groundbreaking techniques to develop and operate such ELX? Essentially, given an ELX, the way to develop and operate applications is fundamentally different from contemporary techniques in, e.g., IoT and cloud computing systems. On the one hand, we expect that both systems and applications are open, geographically distributed, and long living. We have open software ecosystems with multiple stakeholders providing and operating collaborating software at different places. Software will have multiple versions, add new components, remove old components, and reconfigure components, to name just a few possible actions, throughout its evolution. On the other hand, dynamic context will determine along which dimensions ELX and applications should be elastic. Take security and privacy issues as an example. Comprehensive security and privacy mechanisms are essential for widespread uptake and acceptance of such elastic systems and their applications as the ever-increasing number of devices collecting (possibly sensitive) data and interacting with the physical environment, combined with opaque data handling policies, contribute to a lack of trust. Hence, if security and privacy are important context properties, a holistic approach for creating ELX applications must intrinsically consider security and privacy issues as first-class design goals throughout the application lifecycle. While elasticity is an essential systems' characteristic, concrete elasticity instantiation will be constrained by situational contexts. Contexts are dynamic and complex due to various factors, such as distribution and dynamisms of the underlying infrastructure, geo-location, heterogeneity (e.g., of resources and capabilities), and interferences among different autonomous components. Thus, contexts have a huge impact on the development, operation, and maintenance of ELX.

Some New Developments on the Web

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Abstract

In this presentation I am addressing some aspects of WWW and ICT that are, sometimes by mistake and sometimes justified, perceived as dangers. I then mention four additional big dangers that are usually not even recognized as such.

1. Extended Abstract

I start by reporting on the well-founded claims of Tara Brabazon, Andrew Keen, Mark Bauerlein, Stefan Weber, Nicholas Carr [Bra07,Kee07,Bau08,Web09,Car10] and others that the Web and related ICTs (in particular smartphones and GPS) are dramatically reducing the cognitive capacity of users, i.e. of nearly all of us. Nobody doubts that the ability to calculate with numbers beyond the most rudimentary operations has disappeared due to universally available calculating functions. Similarly, it is clear that GPS and navigation devices as helpful as they may be are reducing our intuitive understanding of orientation. Copy and paste (from the Web or other sources) is often replacing writing a report or such as one did it 20 years ago as is known to every teacher or parent who cares. Reliable empirical evidence shows that even the ability to read "with understanding" is replaced by superficially browsing. More and more people are getting used to writing and reading short sentences, be it due to limitations of SMS, Twitter, to email exchanges, etc. All this reduces the ability or motivation to understand complex sentence structures. In addition, the attention span of the average person has reduced dramatically due to all the "interruption technology" (to quote Carr) such as mobile phones, emails, chats or blogs on the net, massive invasion of very short YouTube clips, etc. I have summarized the situation in a recent paper in Communications of the ACM entitled "Is the Internet turning us into dummies?" [Mau14]. Doomsday prophets are exactly claiming "yes" as answer to this question.

On the one hand, I will show that the situation as described above is fortunately less worrisome than it appears on first sight.

On the other hand, I will argue that although some real dangers like loss of privacy, lack of security of some electronic transactions and cyber-criminality are under discussion, a number of even more dramatic dangers do not receive the attention they should. I will mention four, and discuss how to at least partially react to them. One, the danger of dependence on networks. Two, the danger of certain types of cyberwar. Three, the more subtle effect that due to profiles of us we are more and more not deciding ourselves but are acting like puppets on a string: We will often not even be aware that other decisions are possible. And four that the many trillions of webpages do contain just about all knowledge of mankind yet finding what we are looking for is often like looking for the proverbial needle in the haystack.

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Can a Formal Theory of Informatics be based on "Theoretical Informatics"?

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Abstract

Traditional theoretical informatics reflects stand-alone, program-controlled computers, made to calculate proper output for a given input in a finite sequence of steps. In this setting, an informatics system calculates a partial function over finite symbol sequences.

With today's portable devices, control systems, service-oriented structures, the internet, etc., the predominant form of computing consists of interacting, non-terminating software components, and systems including technical devices or organizational units with local computing power.

Traditional theoretical informatics fails to cover many important aspects of such systems. Therefore, manifold modeling techniques, description logics, and language constructs arose during recent decades. This resulted in a heterogeneous world of loosely related theoretical notions, concepts, properties and results. A comprehensive, integrating theoretical framework with a formal basis, covering all those aspects, is still missing but urgently needed.

This talk suggests to develop such a theoretical framework. Its central concepts are formal models that cover e.g. interacting components, formal description of behavior not intended for implementation, a fresh look at basic assumptions on causality or the notion of time, deep-rooted invariants and other analysis techniques. This framework would make informatics a more self-contained science with a formal basis, at eye level with mathematics and the natural sciences (but with fundamentally different application areas and a richer interlocking with society). This approach stands in the European tradition of a more theory based set-up of informatics.

The Scottish Independence Referendum and After

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1. The Scottish Dilemma

The Scottish independence referendum on 18 September 2014 was a highly unusual event, an agreed popular vote on secession in an advanced industrial democracy. The result, with 45 per cent for independence and 55 per cent against, might seem to have settled the question decisively. Yet, paradoxically, it is the losing side that has emerged in better shape and more optimistic, while the winners have been plunged into difficulties. In order to understand what has happened, we need to examine the referendum in light of the evolution of the United Kingdom and the changing place of Scotland within it. Scotland should be seen as a case of the kind of spatial rescaling that is taking place more generally across Europe, as new forms of statehood and of sovereignty evolve. Scottish public opinion favours more selfgovernment but no longer recognizes the traditional nation-state model presented in the referendum question.

2. Constitutional Traditions in Scotland

Since the late nineteenth century union, there have been three main constitutional traditions in Scotland. The first is unionism, a distinctly British doctrine developed after the union of Scotland and England in 1707. [Kid08] Unionists are strongly committed to the maintenance of the United Kingdom and historically favoured a unitary parliament at Westminster, with no concession of political power to the nations of Ireland, Scotland or Wales. Yet unionists are not jacobins in the continental sense and have always recognized the reality of national diversity within the state. So they have no problem with the vocabulary of nation to describe Scotland, nor with the symbols of nationality or the existence of a distinct civil society. They accepted the perpetuation of distinct Scottish institutions, including the criminal and civil law and the education system, which never unified across the United Kingdom. It is precisely because they accept that Scotland is a nation, however, that they historically refused to countenance autonomy, arguing that the combination of nationality and self-government would inevitably lead to separation. [Kea09] During the twentieth century, the

Labour Party added another element to the unionist argument, that the unitary state was essential in order to secure social welfare.

The second tradition is that of Home Rule or, as it was called from the mid-twentieth century, devolution. This favours Scottish self-government within a reformed United Kingdom and was first formulated in the late nineteenth century following demands for Irish home rule. As adapted by the Liberal Party, it took the form of a federal reform, starting with Ireland and Scotland but eventually intended to lead to Home Rule All Round. The idea had significant support in the Labour Party and some support even within the Conservative Party. Although it has consistently been the preferred choice of a majority of Scottish electors (in surveys since the 1960s and when it has been presented at elections), the main parties subordinated it to their unionist preferences until the late twentieth century.

The third tradition is the independentist one, seeking a separate nation state. This was insignificant before the 1930s, when the first independence-seeking parties emerged and was not a serious option before the 1970s when the Scottish National Party (SNP) began to make electoral progress. Usually, independence has been placed within a broader framework, such as the Commonwealth or, in recent decades, the European Union, rather than being presented as radical separatism. As a result, the lines between advanced home rulers and moderate independentists has been blurred. Within the SNP there was a division between the 'fundamentalists' who wanted complete independence immediately, and the 'gradualists', who were happy to proceed first with devolution.

After a failed attempt in the 1970s, devolution finally came about in 1999, after Labour had returned to power with a large majority. It was the experience of being governed for eighteen years by a Conservative Party for which Scots had not voted that proved the decisive factor and the 1997 referendum providing for devolution was carried by a majority of three to one. Unionists accepted the verdict so that the unionist and home rule traditions appeared to converge. For

their part, the fundamentalists and gradualists in the SNP put aside their differences on the grounds that they could travel together in the next stage, towards independence. It was not long, however, before a new 'middle ground' emerged in the form of demands for further devolution, sometimes known as 'devolutionmax' or 'devo-max'. The Scottish Parliament established in 1999 has extensive and exclusive powers over wide areas of domestic policy but lacks substantial fiscal powers and powers over redistributive welfare payments and these are the core of further devolution demands.

3. The Nationalists in Government

The Scottish Parliament is elected according to the added-member system of proportional representation, which makes it difficult for any one party to gain a majority of seats. After the elections of 1999 and 2003, coalition governments of Labour and the Liberal Democrats were formed. In 2007, the SNP came ahead by one seat and formed a minority government. They had promised to hold an independence referendum but were unable to gain the necessary parliamentary support. The unionist parties (Conservative, Labour and Liberal Democrat),[1]) on the other hand, established their own commission (the Calman Commission) and pushed through a modest extension of fiscal powers for Scotland, as their response to the SNP threat.

In 2011, the SNP achieved the difficult feat of gaining an absolute majority and pressed ahead with their independence plans. It is important to note that this victory was not the result of an increase in Scottish identity among the population, or even in support for independence. It has long been the case that most Scots, whether nationalist or unionist, feel more Scottish than British but this number was actually falling both in 2007 and in 2011 (according to the Scottish Social Attitudes Survey)[2]. Support for independence had historically run at around 20 per cent but during the 1990s it had increased to around 30 per cent, in reaction to the domination of British politics by the Conservatives, who had steadily lost support in Scotland (and lost all their remaining seats there in 1997). In 2007 and again 2011 independence support was falling,[3] one reason apparently being that voters thought that the SNP were doing a good job making devolution work. The SNP victory was, rather, due to the perception

that they were a competent government, which was able to take decisions on its own, without looking to Westminster as Labour had seemed to do. The 2011 victory did, however, give the SNP a mandate to proceed with an independence referendum, although this is a matter reserved constitutionally to Westminster.

It was the confidence that there was no majority support for independence that prompted the unionist parties accept the SNP challenge and agree to a referendum as a means of settling the question. The 2012 Edinburgh Agreement provided that power be given to the Scottish Parliament (under section 30 of the Scotland Act) to hold a referendum but on conditions. The power was temporary, expiring after 2014. There would be only one question, on independence, and the question should be a clear one, which would specify the choice of independence or union, with no second option for enhanced devolution. This was significant because opinion polls indicated that such a 'devo-max' option was the one supported by the largest number of voters and the second preference of most others. The SNP had indicated that, while devo-max was not its policy, it would have allowed it on the ballot paper.

The table shows the distribution of preferences in 2012. The first option is equivalent to independence, although not using that term has raised support above the normal level for the times. The second option corresponds to most definitions of devo-max, while the third option is the status quo.

Constitutional Options 2012 Per Cent	
Scottish Parliament make all decisions	35
UK Government decide defence and foreign affairs, Scottish Parliament the rest	32
UK Government decide taxes, benefits and defence and foreign affairs	24
UK Government decide everything	6
Source: Scottish Social Attitudes Survey	

The ensuing referendum question was devised by the Scottish Government and put before the independent Electoral Commission, which made some minor changes and there was rapid agreement between the two sides on 'Should Scotland be an independent country? Yes/No.' This is certainly a clear question as far as the words go. The meaning, however, is less clear. Independence is a difficult concept in the modern world and the choice of 'country' rather than 'state' might be questioned (although the Electoral Commission tested it with the public, who seemed to have little difficulty).

4. The Battle Ground

The Edinburgh Agreement resolved the legal and constitutional issue from the outset, so that this hardly featured in

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[1] Unionist is a term historically used for the Conservative Party, and refers to its support for the union with Ireland and its merger with the old Liberal Unionists who split from Gladstone over Irish home rule. In Scotland, the term Unionist was used instead of Conservative until 1965. Its adoption by the Labour Party is recent and perhaps surprising in view of its historic connotations. The Liberal Democrats are usually now described as unionist although they themselves insist on their Gladstonian roots and call themselves federalists.

[2] http://www.natcen.ac.uk/ourresearch/research/scottish-socialattitudes/

[3] Scottish Social Attitudes Survey http://www.natcen.ac.uk/ourresearch/research/scottish-socialattitudes/

the debate, except in regard to Europe. Another remarkable feature of this referendum campaign was the lack of distance between the two sides in the vision of Scotland they presented. This in large part explains the fact that the independence question did not provoke a deep social division within Scotland but rather disagreements on how to get to the same place. This is, to an extent, true even on the constitutional issue itself.

The 'third way' option of devo-max had been ruled out by the unionists and was not the policy of the nationalists but, knowing that this is where public opinion clustered, both sides sought to get as close to this position as possible.

On the Yes side, the SNP and the Scottish Government presented a rather attenuated form of independence, which retained much of the infrastructure of the union. Critically, Scotland would retain the Pound Sterling in monetary union with the rest of the United Kingdom (rUK) although this would entail surrendering control of monetary policy and entering into a fiscal pact with rUK, similar to arrangements in the Euro zone.

For their part, the unionist parties abandoned their defence of the status quo and set up commissions to produce plans for further devolution. The most far-reaching were those of the Liberal Democrats, who have a long commitment to a federal United Kingdom and who proposed to devolve all income tax and various other taxes. The Conservatives also proposed devolution of income tax, while Labour was the least adventurous, agreeing only to devolve a quarter of income tax (in addition to the half that is already due to be devolved in 2016 under the Calman proposals). All of these proposals were short of devo-max as defined in the table above, but they did represent a move towards the centre.

Two crucial discursive elements featured throughout the campaign. The first was that of Scotland and which side incarnates it better. This is natural ground for the nationalists but there is a strong element of national distinctiveness in Scottish unionism, which has never denied that Scotland is a national reality with its own culture and traditions but argues that these can be preserved better in the union. Most unionists feel strongly Scottish, except for a small minority (well under 10 per cent of the voters) who feel only British. Faced with the SNP challenge, however, the unionists have lost their instinctive sense of Scottishness and tended to stress Britishness as somehow the superior identity, incarnating fundamental values such as democracy, fairness and solidarity, apparently reducing Scottishness to a mere cultural variation. This was particularly the case with the Labour Party, who insisted that values of fairness and solidarity were somehow essentially British. [4] The Conservatives, for their

part, had lost the ability to talk the language of Scottish patriotism which they possessed a generation ago and had, partly as a result, been reduced to a minority party widely seen as not quite Scottish. The Yes side, for its part, projected a modern, civic notion of Scottish identity shorn of ethnic particularism, embracing immigration and multiculturalism and sustained by groups such as *Africans for an Independent Scotland, Asian Scots for Independence or Scots Asians for Yes.*

The second field is union, natural territory for the unionists, but they have in recent years lost their understanding of what unionism means in the United Kingdom. Unionism historically succeeded in the United Kingdom by taking different forms in different parts of the kingdom, resting upon different social alliances. Any effort to unify and essentialize it is doomed to fail, as did the 'Britishness' campaigns of the New Labour Government (1997- 2010). First Minister and SNP leader Alex Salmond captured the old unionist spirit much better, and was able to make the historical and literary allusions to sustain it. He even famously declared that Scotland was currently part of six unions - political, monarchical, monetary, defence, European and social - and that the nationalists proposed to withdraw only from the political union, retaining the other five. The monarchical union is not problematic as it stems from an event in 1603 when the king of Scotland ascended to the throne of England (not the other way round). The British monarch is also head of state of some fifteen independent countries in the Commonwealth. The social union was not clearly defined, and might cover anything from the fact that families would still retain links across the border, to the idea of common social rights. The other ones are discussed below. All of this allowed the Yes side to shrug off accusations of separatism and bring reassurance to voters.

Because the issue of the right to self-determination had been resolved (at least on a temporary basis) by the Edinburgh Agreement, the campaign focused on the social, economic and security implications of independence and union.

5. Economy and Finance

The most important questions revolved around the economic consequences of independence. Scotland is neither a rich nor a poor part of the United Kingdom; its Gross Domestic Product per capita has in recent years been around 97 per cent of the average, lower than London and the South East but higher than other regions. The SNP has long argued that, with independence, it could join the 'arc of prosperity' of small, successful states in north-western Europe, which at one time included the Nordic countries and Ireland. After the economic crisis of 2008 and the crash in Ireland and Iceland, unionists lampooned this as the 'arc of insolvency', an equally misleading expression, since the other Nordic states came through the crisis rather well. In fact, the experiences of small northern European states have been rather different

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[4] The best exposition of this Labour view of Britishness and of welfare unionism is in Gordon Brown, My Scotland, Our Britain, London: Simon and Schuster, 2014.

from each other, with both positive and negative lessons for Scotland but this was not explored in great detail. [5] There were references in the Scottish Government's independence white paper [Sco13] to social investment and partnership but these were not well developed.

Unionists laid great stress on the risks of independence. They insisted that an independent Scotland would not have been able to bail out its banks in 2008 and that two of the largest banks, Royal Bank of Scotland and Bank of Scotland are both officially Scottish-based. In fact, both have most of their operations in England and, since the crash, are largely owned by the UK Government; in addition Bank of Scotland is part of the larger Lloyds conglomerate. The SNP remained vulnerable on the point, however, since it had supported the overexpansion of the banks since the 1990s and was not prepared to say that the banks should be allowed to fail. The arguments about the risks of independence reached a peak in the last week of the campaign, when the No side encouraged a stream of banks and businesses to issue dire warnings about relocating and disinvesting – some supermarket chains even warned that they would put up prices if Scotland voted Yes.

There was an extensive argument about public finances. For historic reasons, Scottish levels of public expenditure have been higher than the UK average at least since the 1960s. In the late 1970s, in anticipation of devolution (which did not happen at that time) a formula was introduced (the Barnett Formula) providing that most Scottish expenditure would take the form of a single block, which would vary according to increases or decreases in English expenditure on the same functions. [Kea10] So future changes in expenditure would be proportional to population but the historic base would remain. Over time, this should have produced convergence in expenditure levels but in practice Scottish expenditures remain significantly higher, leading to some grievance elsewhere in the UK. After devolution, Barnett continued in the form of a block grant to the Scottish Parliament, accounting for almost all its revenues.

Unionists argued that, without Barnett, Scotland could not pay for its own public services. Effectively, they said that Scotland got more than its share of spending and that, after a No vote, this would continue. This is not an argument that plays well in England or in Wales (which does badly out of Barnett) and this caused problems for the UK parties there. The Labour Party also argued that Barnett distributes revenue according to need, which is in fact not the case. [6] The Yes side responded that, taking North Sea oil revenues into

account, Scotland has generally paid its own way and that its public finances, while notionally in deficit since the crisis of 2008 [7], would not be as bad as those of the United Kingdom. Oil has featured in the independence debate since the 1990s. It is generally accepted that some 90 per cent of the oil reserves are in Scottish waters, a proportion that might even increase as new discoveries are exploited west of the Shetland islands. The weakness in this argument is that the Scottish Government also planned to set up an oil fund like that in Norway, to use the oil revenues to even out economic fluctuations, and to build long-term reserves. They could not simultaneously be used to cover current expenditure needs.

In principle, an independent Scotland could have three currency options: to adopt its own currency; to enter the Euro; and to share the Pound Sterling with rUK. The SNP (and hence the Scottish Government) adopted the last of these, although the Greens and the left of the independence movement did not. By the time of the Edinburgh Agreement, experience in the Euro zone had shown that monetary union is very difficult without a measure of fiscal union, at least in the form of controls over deficits and debt. Fiscal union in turn is difficult without political union. The Scottish Government accepted much of this reasoning but proposed a monetary union in which Scotland would share the currency, with a role in the management of monetary policy. The UK parties, which otherwise tended to avoid saying what they would do in the event of a Yes vote, made an exception here and declared that they would not countenance a monetary union under any circumstances. The SNP insisted that this was a bluff and that rUK would realise that it was in its own interest to have such a union. While SNP leaders refused to say what their 'Plan B' was in the event that rUK did refuse a monetary union, it was tacitly accepted that in that case they would use the Pound unilaterally. This might have been possible but it would have left Scotland with no influence at all over its monetary policy.

6. Welfare

Another central issue in the campaign was welfare. This is natural territory for the Labour Party, but has a broad appeal across Scotland, where most of the political parties (Labour, SNP, Liberal Democrats, Greens and the leftist Scottish Socialist Party) are in the social democratic fold. The UK Government has been undertaking a radical reform of welfare, which has become increasingly controversial. The SNP combines a commitment to social democracy with a pro-business stance in a way that has caused some tensions in the

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[5] It is analysed in Michael Keating and Malcolm Harvey, Small Nations in a Big World. What Scotland Can Learn, Edinburgh: Luath, 2014.

[6] Scottish Labour Party, Powers for a Purpose. Strengthening Accountability and Empowering People, Glasgow: Scottish Labour Party, 2013, p.37, 'An equitable system of grant distribution – to

Scotland, and indeed Wales and Northern Ireland – is a key aspect in the UK's social union.'

[7] There is not an actual deficit since Scotland must balance its budget. These are notional figures calculated by independent civil servants in the series Government Revenues and Expenditures in Scotland, which adds up all public expenditure and revenue in Scotland.

past. During the referendum campaign, however, it staked its ground on defending the post-war British welfare settlement, accusing Labour of not being able to stand up for Scotland or for the poor. Again, the Nordic states, combining economic prosperity with social cohesion, were the inspiration. For its part, the Labour Party insisted that welfare was inherently British, as the UK state was needed to equalize conditions and provide against asymmetrical shocks and that affective solidarity was at the level of the British nation. [8]

The focus on welfare allowed the Yes side to extend the independence coalition well beyond the core nationalist constituency to embrace most of the non-Labour left, sections of the Labour Party itself, part of the trade union movement and a large swathe of the voluntary sector. There was a contradiction in the SNP position, since it also favoured cuts to corporation tax (to attract inward investment) and air transport taxation and promised not to increase other taxes, putting its 'Nordic' credentials into question. Labour tried to exploit this contradiction but at the risk of raising questions about whether it would find the tax income to finance a social democratic welfare state if it were in power. Other elements of the Yes coalition were less inhibited, as its left-wing components rejected corporation tax cuts. This included the Green Party but also civil society groups like the Common Weal (the campaigning arm of the think tank The Jimmy Reid Foundation) and the Radical Independence Collective.

7. Defence and Security

Defence is a sensitive issue within the SNP, which has a significant pacifist and, especially, anti-nuclear tradition dating from the 1960s. Indeed, many activists had left the Labour Party and joined the SNP over precisely this issue. Before the referendum, the party had changed its historic opposition to NATO membership, and thus gained credibility for its independence project by providing assurances about security and reducing risk. This, however, provoked one of the few open divisions in the party in recent years and two of its parliamentarians left the party to sit as independents. Even more sensitive is the question of nuclear weapons. The UK's nuclear deterrent (Trident) is based entirely in Scotland and a decision is imminent on whether and how to renew it. SNP policy is that Scotland should be nuclear-free, meaning that the Trident system would have to be withdrawn. Since there is no obvious place elsewhere in the UK to put the base, this could have caused real problems. There were suggestions that Trident could be traded off against keeping the Pound but the sensitivity of the nuclear issue within the SNP made this difficult and the unionist parties seemed determined not to compromise on the currency.

The Scottish Government's white paper proposed that

Scotland would have military forces based on existing UK assets. There would be a naval base on the west coast, using the current Trident facilities. Scotland would meet its NATO commitments and look after home defence. Other analysts, however, proposed a more radical reformulation of defence policy, based on a limited set of strategic goals including protection of the oil fields (moving the naval base to the east coast), filling the gap in NATO surveillance left by the UK's decision to withdraw its Nimrod aircraft, and not sustaining an expeditionary capacity. These issues did not, in practice, feature prominently in the campaign.

8. Europe

One issue that did keep on coming back was whether, and how, Scotland could be a member of the European Union. After opposing UK membership of the (then) European Economic Community in the early 1970s, the SNP changed tack in the late 1980s and has since used Europe as an essential external support for an independent Scotland. By the time of the referendum, the SNP was the most strongly pro-European party in the United Kingdom. There were some early suggestions that an independent Scotland would automatically remain within the EU but by the time of Edinburgh Agreement the Scottish Government recognized that rUK would remain as the member state and Scotland would have to accede. Two mechanisms were suggested. Scotland could apply to join as a new member state using article 49 of the Treaty of European Union. Alternatively, given that the territory and people of Scotland are already in the Union, article 48 could be used to effect a treaty change recognising Scotland as the 29th member state.

The position of the No side was less clear. They did not explicitly say that Scotland would be excluded from the EU but came as close to this as possible. There were warnings that either procedure would require the assent of all existing member states and that some states might exercise a veto. It was usually implied that this would be Spain, fearing for the implications for Catalonia and the Basque Country. In fact the Spanish government was very worried indeed about the contagion of independence but never said that they would veto Scotland's membership of the EU. This would have been to admit that it was a precedent for Catalonia, something they were at pains to deny, pointing out the UK law allowed Scotland to vote for independence while Spanish law has no equivalent. At other times, unionists suggested that Scotland would have to leave the EU for a time and then might be readmitted. Finally, they argued that, even if Scotland were allowed in, it would have to join the Euro and the Schengen travel area and would lose the various UK opt-outs.

When challenged about the prospect of Scotland being excluded from the EU, unionists always retreated, but then shortly afterwards would return to the same point. There are good reasons for thinking that Scotland would be in the EU.

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[8] Again, this is articulated in Gordon Brown, My Scotland, Our Britain.

The first is a matter of democratic principle and European practice. An independent Scotland would be recognized by its former host state, the United Kingdom so there is no reason for any other European country withholding recognition (there is certainly no precedent for this). As an independent, recognized democracy compliant with the Copenhagen entry criteria and the *acquis communautaire*, Scotland could hardly be excluded just because it had exercised a democratic, legal and constitutional right. In a continent where nationality claims have proved so difficult to resolve, it would give a very bad signal to refuse the case of a nation that had addressed its national question in such an eminently peaceful and democratic way. The second reason for Scotland being allowed in is a matter of mutual convenience. Creating a gap in the single market and other European structures would be against the interests of rUK, other member states, business and citizens. It would be particularly absurd to spend time and effort disentangling Scotland from the EU, only to spend more time and effort getting back in again.

The Yes side had another argument to deploy, in the promise by the Conservative Party to have a referendum in 2017 on whether the UK should withdraw from the EU. Independence supporters argued that Scotland risked being dragged out of Europe against its will if, in such a referendum England voted to come out and Scotland to stay in. Opinion polls suggested that this was a real possibility. There is less visceral Euroscepticism in Scotland, the United Kingdom Independence Part (UKIP) is a minor presence and there is a shared commitment across Scottish civil society to the European project. Being pro-European does not carry the political penalty it does in England, something that the SNP has exploited to the full.

9. The Campaign

The campaign was conducted according to agreed rules, which recognized two official bodies, *Yes, Scotland* (including the SNP, the Greens and Scottish Socialists) for independence and *Better Together* (including the Conservative, Labour and Liberal Democrat parties) for the union. There were spending limits for each side and for the political parties and other campaign groups. It had been expected that spending would favour the No side, as they had support of business and wealthy backers but the fortuitous circumstance that an independence- supporting couple from Ayrshire won £161 million in the Euromillions lottery levelled the field. They provided some 80 per cent of the finance for *Yes Scotland*.

What was not anticipated at the beginning of the process was the high degree of public engagement that developed. This was less the work of the official campaigns and the parties than of groups within civil society. Indeed, the campaign operated at two distinct levels. There was the 'air war' by the official Yes and No campaigns, marked by a mass of statistical evidence and carried on through the printed and broadcast media. There were two debates between Alex Salmond and Alistair Darling (former Labour minister and leader of the No campaign). Darling was adjudged the winner of the first and Salmond of the second. At another level was the 'ground war' fought in communities and through social media, which largely escaped the control of the two official campaigns. This was marked by an extraordinary level of engagement – it was estimated that some ten per cent of the population had participated in public meetings. Here Yes supporters, including those outside the SNP, were omnipresent and the No campaign strangely absent. The result was a public debate about the future of the country going well beyond narrow constitutional questions and which reflected the lack of trust in conventional politics found right across Europe these days. The Yes side was much more present and visible in this ground war, while the No side concentrated on the official campaign.

Generally speaking, the business community favoured a No vote but organized business was less clear. The main employers' body, the Confederation of British Industry (Scotland) (CBI) registered as No supporters but this was met with a spate of resignations from public bodies (including the BBC and universities), which are not allowed to take political positions, as well as some independence-supporting business people. It then turned out that the CBI had not registered properly in any case, and the incident did it no credit. A smaller group, *Business for Scotland* supported Yes. Research on business attitudes indicated that, while business was generally against independence, those firms that depended on UK markets (as opposed to Scottish or global ones) were particularly concerned. [9] The trade unions were divided, leading most of them to adopt a position of neutrality. Some trade unionists supported *Labour for Yes*, a group of Labour Party dissidents in favour of independence. University academics were mostly neutral but there were organized groups on each side, *Academics for Yes* and *Academics Together*. Smaller groups were active in other professions. There was widespread support for Yes in the voluntary sector, although most groups did not take sides officially.

Much of the detailed argumentation came not from the two campaign groups but from the use their civil servants to prepare their positions. This raised some delicate constitutional issues, given the convention that civil servants are politically neutral and must serve successive governments of different persuasions. On the other hand, there is the convention that they must serve the agenda of ministers. Both governments took the view that it was right for their civil servants to follow their agenda, although there was more

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[9] David Bell and M. McGoldrick, Scottish Independence: Analysing Views from the Oil and Gas Sectors, http://www.futureukandscotland.ac.uk, 214. Brad Mackay., The Scottish Independence Debate: Evidence from Business, http://www.futureukandscotland.ac.uk

explicit political support for this in the case of the UK, as the issue of Scottish independence is hardly controversial at Westminster as it is in Scotland. The Scottish Government produced a 649-page white paper setting out the case for independence [10], while the UK Treasury issued a series of Scotland Analysis papers.[11]

The most notable feature of the campaign was the trend in opinion polls, with a twenty-point advantage for the No side at the beginning of the campaign disappearing by the last week, when the two sides appeared evenly balanced. [12] Clearly, the Yes side had won the campaigning if not the final vote. In the last weekend, there were even polls showing a small lead for Yes (albeit within the margin of error), which caused panic in the No side. Business at Westminster was suspended to allow MPs to decamp to Scotland and former Prime Minister Gordon Brown intervened to persuade the leaders of the three unionists parties to make a 'vow' that, if No won, then substantial additional powers would be delivered to Scotland in advance of the next UK General Election in May 2015. Precisely, the promised to produce agreement on a package by 30 November (St Andrew's Day), a firm programme by 25 January (Burns Night) and a bill before the UK General Election in May 2015. This represented a major shift since the unionist side, having refused a second question on additional powers (or devo-max) in the referendum, now seemed to changing the meaning of No to mean exactly this – after 20 per cent of the electors had already voted by post.

10. The Outcome

The final vote was 45 per cent in favour and 55 per cent against independence. This represents a clear victory for No but by a much narrower margin than originally anticipated. Indeed we might wonder whether the unionist parties would have accepted the Edinburgh Agreement of they had known that the polls would narrow so much.

Support for Yes and No was spread across all social categories and regions but with some significant differences. Pending the results of the referendum study, we must rely here largely on opinion polls during the campaign. The biggest difference is between those born in Scotland and those born elsewhere in the United Kingdom. Native-born Scots were about twice as likely as the latter to vote Yes (which still means that about a quarter of the English-born support independence). Those born outwith the UK (mostly Commonwealth and EU citizens) voted more like the native Scots. Men register about ten per cent more support for independence than women, a finding that has been consistent

for a long time. Lower income people and those living in deprived neighbourhoods are more likely to vote Yes than are the more affluent. Both of these findings are related to risk aversion, women being more risk-averse than men (for reasons we do not yet understand) and lower income people having less to lose. There is an age gradient, with people over 65 voting massively No, although the very youngest (between 16 and 18) do not seem to be strongly pro-Yes.

11. The Aftermath

The result was a clear victory for No, which appeared to settle the issue for a generation. Politically, however, it appeared more of a victory for the who looked in better form afterwards. Indeed the curious spectacle is that the losing side behaved like winners while the winners behaved like losers. Membership of the SNP increased more than three-fold within a few weeks, while the pro- independence Greens also massively expanded. The leader of the Scottish Labour Party, on the other hand, resigned, accusing the UK Labour party of treating the Scottish one like a branch office. Some No campaigners, unwilling to accept responsibility for losing their massive lead, suggested, as they had during the campaign, that they had been subjected to intimidation by Yes supporters. Academics for Yes had suggested that intimidation had even been practised within universities. The only evidence for this was an incident in which an SNP minister had complained about a professor who ran a neutral forum on the referendum also appearing on a No platform. The worse atrocity of the campaign was an egg thrown at Labour politician Jim Murphy. The effort to create a narrative about foul play in order to sustain unionist morale.

It was also a response to the fundamental change the referendum produced in Scottish politics. In the days before devolution, Scotland was run by an enlightened bureaucracy in the Scottish Office, under the aegis of the Secretary of State for Scotland, a Cabinet minister of the ruling party. Their role was to apply UK policy in Scotland, making whatever adjustments were necessary to sell it; and to lobby for Scotland within the UK Government. There was a democratic deficit in that parliamentarians at Westminster paid little attention to Scottish affairs and would vote through policies for Scotland, even when they might rebel on equivalent English matters. Scottish ministers were not in Scotland for most of the week, so that ministerial control was weak. Scotland did quite well in the distribution of public spending, for historic reasons and because of the role of the Secretary of State in the UK Cabinet, while regional policy diverted significant investments to Scotland. Until the 1970s, local government, increasingly dominated by the Labour Party, distributed patronage in the form of publicly- owned houses and jobs. This all ensured that Scotland was rather a depoliticised space, especially when Labour was in power. During the eighteen years of Conservative government between 1979 and 1997, a sense of political alienation grew as Scotland

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[10] Scottish Government, *Scotland's Future*.
[11] https://www.gov.uk/government/collections/scotland-analysis
[12] The trends can be followed in What Scotland Thinks, http://whatscotlandthinks.org/

was faced with radical policies for which it had not voted, and the Conservatives steadily lost support and in 1997 won no seats at all in Scotland. The Scottish Parliament did restore legitimacy for government in Scotland and reduced alienation, but was not noted for bold policy innovation and the UK parties remained dominant. The referendum campaign changed all this, repoliticizing the country to an extraordinary degree and shaking the old political and administrative classes. It is this that explains their reaction to the campaign, even it they won the vote. The constitution may not have changed but the political system did.

Since the 1980s, Labour has been the only party with a substantial presence and able to win victories in all parts of Great Britain. [13] It has thus played a key role in keeping the political system together. Now it faces a serious challenge from the SNP, on both the ideological flank, as another social democratic party, and on the territorial flank, as the party standing up for Scotland. Labour is particularly discomforted since it knows that over a third of its voters opted for Yes and it lost traditional working class industrial strongholds like Dundee, Glasgow and North Lanarkshire, all of which voted Yes. As the political centre ground has shifted in the direction of support for more Scottish self-government, the Labour Party still finds itself on the defensive, unable to take leadership of the issue.

The SNP, for its part, is positioning itself not just as a party for independence but as an actor in UK politics. Alex Salmond resigned as leader after the referendum and subsequently announced plans to return as a Westminster MP in the General Election of 2005. He also indicated that the SNP would be open to cooperation with other parties at Westminster, excluding only coalition with the Conservatives. This recalls the strategies of the Basque Nationalist Party and the Catalan Convergència i Unió in the past, of negotiating concessions in Madrid in return for parliamentary support, although in the case of the SNP it is only the Labour Party that would be available. In this respect, it has a precedent in the strategy of the Irish Party in the late nineteenth and early twentieth centuries, keeping alive home rule hopes in Ireland while assisting the British Liberal Party. At UK level, Labour might be open to deals with the SNP but it could pose problems for Labour in Scotland, which remains in fierce competition with the SNP for essentially the same share of the electorate.

12. The Smith Report

Following the referendum, the unionist parties sought to keep their promise for more powers, appointing a facilitator, Lord Smith, to broker an agreement in the agreed timetable.

This was widely criticized as an effort by the Westminster parties to agree a deal among themselves, with no time for public input or indeed a mature consideration of how their proposals might work. As the independence issue had been debated as such length while more devolution had been excluded from the Edinburgh Agreement, this was interpreted as a return of the 'old style' politics. The SNP proposal asked for more or less all powers over domestic policy, while declaring that it would accept whatever it was offered, even if fell short of its full demands. It did not, therefore, put forward a realistic set of proposals that might have allowed it to meet the unionists half way. The three unionist parties put forward the proposals they had broached in their own internal commissions, ruling out a more fundamental consideration of matters like the best allocation of taxation and welfare powers.

Smith reported on 28 November 2014. [14] Its main recommendation was that the Scottish Parliament should collect all income tax on salaries in Scotland, with discretion over the rates but not the base nor the threshold at which tax would be paid. Income taxes on dividends and saving would still accrue to the United Kingdom, as would tax on inheritance and capital gains; national insurance, also levied in incomes, would also be retained. Half of Value Added Tax in Scotland would be assigned to the Scottish Parliament, which would also be able to vary air passenger taxation. There would be some limited devolution of welfare benefits but the main benefits, which are being consolidated into a new Universal Credit, would be reserved for the centre. These proposals were welcomed by the business community but criticized by trade unions and the voluntary sector as not giving Scotland the power to promote social and economic equality or to look at taxes benefits and labour markets together. They are a long way from devo-max as that is normally understood.

13. EVEL and Barnett

The Scottish referendum debate had, meanwhile, sparked a reaction in England. English opinion had hitherto been rather tolerant in respect of Scotland, accepting devolution and, to some degree, even relaxed about the prospect of independence. The campaign saw a hardening of English opinion, not so much about Scottish self-government but about the role of Scotland within UK politics, focusing on two issues. The first is the West Lothian Question, or the fact that Scottish MPs at Westminster can vote on purely English matters while the equivalent matters in Scotland are the competence of the Scottish Parliament. The Conservative Party is sympathetic to the West Lothian complaint, since it has only one Scottish MP, and has proposed to address it though English Votes for English Laws (EVEL). This would mean that only English MPs would vote on laws that only affect England.

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[13] Great Britain consists of England, Scotland and Wales. The United Kingdom extends to Northern Ireland, which has its own party system.

[14] The Smith Commission, https://www.smith-commission.scot/

Some unionists have long opposed this on the grounds that it would create two classes of MP and rupture the unity of Parliament. Arguably, however, there are already two classes on MPs, since English MPs cannot vote on matters that have been devolved to the Scottish Parliament. Labour is vehemently opposed to any attempt to curtail the voting rights of Scottish MPs, which is not surprising because most of these are Labour. The same issue had tormented William Ewart Gladstone, when he had proposed home rule for Ireland in the nineteenth century and it was never resolved at that time. The Conservative-Liberal Democrat coalition had established a commission to look at these proposals under Sir William Mackay.[15] Its report recommended that English-only bills be considered by a parliamentary committee consisting of only English MPs (or English and Welsh ones where it was an England and Wales matter). The The final vote, however, would be taken in the whole House of Commons, which could reverse any changes made in the committee. A stronger proposal, from Conservative MP Andrew Tyrie, was that only the Third Reading be taken in the whole House, which in effect means that the House would have to accept any amendments made in the English committee or reject the whole bill. There is an argument about how much difference any of this would make, since it has been rare for a government enjoying a majority in the House of Commons not also to have a majority among English MPs.[16]

The issue has, however become important for English Conservatives, who think that too many concessions have been made to Scotland and insisted that this be a condition for implementing the Smith proposals. The Conservative Party response was to set up a Cabinet committee and promise that EVEL would be introduced in the next Parliament, but not to link it explicitly to the implementation of Smith. In effect, however, the link has been made.

The second issue is the distribution of funding among the nations and regions of the United Kingdom. As none of the three devolved territories so far has had tax-raising powers, all depend on transfers from Westminster. These are determined by the Barnett Formula, which was introduced in the 1970s in anticipation of the devolution that never happened and retained afterwards to set most spending for Scotland, Wales and Northern Ireland, then governed by the respective Offices. Barnett takes final vote, however, would be taken existing expenditures as the base and then distributes any increases or decreases according to population, based on the equivalent increases or decreases in England. Historically, Scotland had higher spending levels than England or Wales for a variety of reasons. There were traces of an earlier population-based formula (the Goschen For-

mula) while spending had not been cut to reflect Scotland's falling relative population. Because of Scotland's strategic political position, successive Secretaries of State had been able to bargain in Cabinet and with the Treasury for extra spending, without cuts elsewhere in the allocation. The application of Barnett should over time have eliminated this advantage, since the population-based element would have become larger in relation to the historic element. In practice, this did not happen fully,[17] so that Scotland's expenditure differential survived to the present. There are two ways of looking at this. One could say that Scotland gets more than its 'fair share' of expenditure. On the other hand, if one counts North Sea oil receipts, Scotland over the medium term covers its expenditures, so that Scotland is subsidizing the poorer parts of the United Kingdom. Politically there seems to be an unspoken understanding that, as long as North Sea oil revenues cover the differential spending for Scotland, things will be left alone.

Whatever its real effects, Barnett has become short-hand for the complaint that Scotland gets more than its fair share of funding. During the referendum campaign, unionist parties had created a trap for themselves in arguing, in Scotland, that Scots get more than their fair share and that this would continue while arguing elsewhere that funding is distributed according to need. The latter claim, articulated by Labour, is patently untrue since needs do not, and never have, featured in the Barnett calculations. Both causes were taken up by Conservative MPs already uneasy over Europe and the Barnett question was also pursued in Wales. At a time of public expenditure retrenchment, this has become a zero-sum game. The unionist parties, in their 'vow' and in the Smith report, indicated that Barnett will continue to govern that part of Scotland's expenditure not covered by devolved taxation but it is not at all clear what this means in practice or how Barnett will be recalculated. There are currently no proposals for a needs-based formula to replace it.

14. The European Context

One effect of the referendum campaign was to cement the image of Scotland as a pro-European country. Neither side questioned the desirability of membership of the European Union, only whether it could best be secured through independence or union. Following the referendum, the Scottish Government has emphasised the need to secure a stronger position for Scotland in European negotiations and in paradiplomacy in general. Like some other sub-state governments in Europe, the Scottish Government is able to participate in meetings of the Council of the European Union as part of the state delegation, by invitation of the UK Government on condition that it support a common bargaining

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[15] https://www.gov.uk/government/organisations/mckay-commission
[16] In the post-war period it has happened only in the short parliaments of 1964-66 and February-October 1974.

[17] It is not clear why this is so, but there appears to be a failure fully to adjust for population, together with some 'formula by-pass' as Secretaries of State were still able to make a special case.

position. The Scottish Government has called for 'direct' representation, but this is not possible for bodies other than member states; in practice it seems to mean guaranteed representation in the UK delegation. More difficult, perhaps, is securing a Scottish influence in European constitutional negotiations, at a time when the UK parties are committed to changing the UK relationship with Europe. [18] Whether it will be possible for the UK to re-negotiation its relationship is an open question but to the extent that it does, Scotland may not want to go along with this. Successive Scottish governments have had a positive view on migration, which goes against the UK parties' desire to restrict it. Yet the devolved governments have only been consulted on the 'review of competences' that has been seeking a UK position; they do not have a guaranteed say in the matter or a veto over changes.

The Conservative Party is committed to repealing the UK Human Rights Act, which incorporates the European Convention on Human Rights (ECHR, part of the Council of Europe) into UK law. This would create the anomalous position that the ECHR would be directly applicable in Scotland to devolved matters (since it is incorporated under the act setting up the Scottish Parliament) but not in reserved matters. If some Conservatives have their way and the UK repudiates the ECHR altogether, then matters would be even more difficult. Yet the Conservative proposals so far on the Human Rights Act have totally ignored the difficulties in Scotland (and Northern Ireland). [Con14]

The Conservative Party further propose that, after negotiations with other member states, they would have a referendum in 2017 about whether the UK should stay in or withdraw from the European Union. Surveys have shown that voters in Scotland are not strongly pro- European but they are less anti- European than those in England. This is not because they have made the connection between Europe and Scottish independence that the SNP make. SNP voters are not more pro- European than others; if anything it is Labour voters in Scotland who support Europe. [Kea09] There is not, however, the depth of anti-European feeling found in some other parts of the UK and no significant anti- European party. [19] Scottish civil society is strongly pro-European. There is therefore a realistic prospect that the UK could vote to come out of the EU but Scotland to stay in. The new First Minister Nicola Sturgeon has suggested that withdrawal from the EU should require the consent of all four nations in the United Kingdom; more realistically, such a scenario could re-open the question of Scottish independence to

another referendum. This time, presumably, European institutional representatives would be less hostile to the Scottish case but it would still set an important precedent for other European cases.

15. The Future of the State

The referendum may have buried the issue of Scottish independence for the time being but it has radically altered the internal politics of Scotland and the relationship of Scotland to the United Kingdom. Scotland has experienced its own form of protest against established parties and institutions – although paradoxically the SNP is itself a party of government and the Scottish Parliament an established institution. Society has been repoliticized and new social movements have emerged; whether these can be sustained during more normal political times, without the spur of a referendum, remains to be seen. The constitutional issue can be seen as one of failed secession but one that has left the prospect of independence looking like a credible and realistic one. Alternatively, it can be presented as an instance of state rescaling, in which old ideas of the nation-state are giving way to a new and complex order of multiple layers of authority and policy-making. [Kea13] It also represents an instance of a broader European phenomenon of repoliticization of the public space in the face of a dominant 'neo-liberal' ideology that has sought to put certain issues beyond public debate and contestation. This is not an issue that will go away any time soon.

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[18] The Conservatives are committed to a broad renegotiation while even Labour and the Liberal Democrats appear to accept changes in migration policies that could entail treaty change.

[19] In the 2014 European elections, the United Kingdom Independence Party (UKIP) won in the UK as a whole, with 27 per cent of the vote. In Scotland it came fourth, with 10 per cent, winning one seat.

Competing Identities and Turkey's Future

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Abstract

Turkey reflects many of the competing identities that shape today's world: former imperial glories vs independent state facing regional turmoil, democracy vs authoritarianism, radical differences within Islam, Kemalist secularism vs. religion in the public sphere, Turks vs Kurds and other ethnicities, modern city elites vs traditional countryside, global vs local economies, and so on. The shifting relationships among identities also affect another: Turkey as a possible future member of the European Union (with its own identity issues).

The Posthuman as a Cross-Disciplinary Challenge - Ethics and the Wildest Flights of Imagination

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Abstract

In discussions about the humans, post-humans and trans-humans of the future we encounter a number of future utopian and dystopian visions of the future projected either as goals to be pursued or warnings to be heeded. Many of these visions look (suspiciously?) like the worlds imaginatively created in classic and modern Science Fiction, but their ostensible purpose is not literary or to provide entertainment. Their ostensible purpose is to act as premises in ethical, political, legal and social arguments. How do we go about evaluating these visions from an ethical point of view? This paper will argue that there are two major contentious questions that impinge on the evaluation: 1) On what basis do we evaluate the welfare/eudaimonia of future, no longer quite human beings? 2) What account of social justice should we apply? It will further be argued that there is no neutral, theory free or objective answer to the first of these questions, since an answer necessarily requires a prior decision about a philosophical anthropology (or agentology). The only way to escape from this conclusion is to posit a completely radical break with the past, a break that also severs all evaluational connection. The Transhuman conception of 'the Singularity' is such a break, but it will be shown that introducing it creates and new, and potentially even more problematic problem in evaluation because the radical nature of the Singularity creates an absolute evaluational incommensurability (a true 'break' in time).

The Posthuman as a Cross-Disciplinary Challenge - Posthuman Aesthetics and Contemporary Ethics

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Abstract

Posthuman aesthetics is an emerging field of research where questions of aesthetics and ethics meet. Often discussions of the use of technologies take form as a meeting between philosophy and medicine, but this ignores how big a role aesthetics play in human existence and how it guides desires and choices ranging from personal, bodily changes to visions of life narratives. It is exactly here that humanities can ask new questions and answer them in a different way. For example by analysing the relationship between beauty and imperfection, which may seem paradoxical until placed in a context of developments of taste and of the idea of the interesting. Or, in an age where much focus is put on the visual, narrative time is often forgotten and even more so, how there can be no stories without something that is unexpected and imperfect? And when ideas of radically longer human lives, or even infinite lives, are conjured up by futurists, they should be countered by asking if one can imagine what life like that would be like? Or when thinking of a posthuman, one should ask how the rest of humanity will fare? Will it cease to exist or will all of humanity gradually become posthuman? Literary fictions and artistic visions have a significant presence in contemporary culture, and takes part in shaping the collective attitudes towards different futures. Novels such as Mary Shelley's Frankenstein, films Ridley Scott's Blade Runner, the artistic practices of Stelarc, or the contemporary ubiquitous fascination with superheroes in a variety of media, are just part of a material where trans- and posthuman visions and values are set in scene and trigger a discussion on what humans desire and fear.

Bioethics and Biolaw through Literature: a literary investigation into ethics, technology, and law

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Abstract

The literary field has successfully become the preferred locus amoenus where different fields of knowledge interact with each other. It is the privileged site where new and illuminating multidisciplinary studies are developed. The fictional world meets philosophy, history, anthropology, sociology or the visual arts, but also other entirely different disciplines, such as economics, legal studies, science, and medicine. Imagination casts new light on them, introducing original positions and presenting unexplored questions. In this broad spectrum of integrated studies, the connections between literature and the interdisciplinary fields of bioethics and biolaw have been placed under a new perspective.

The term bioethics involves a double function: it analyses the particular conditions connected to life and life experiments and it formulates specific norms regulating scientific behaviour. These scientific interventions have influenced our views on birth and death, on the construction of the body and its technical reproducibility, and have problematized the concept of the human persona. [Car11]

Bioethics examines the ethical and moral dimensions of biomedicine and biotechnology, the shorthand terms for identifying the modern processes that create, sustain, and control life. Biolaw takes their increasingly evident legal implications into account. Both bioethics and biolaw seek, ideally, to determine the legitimate possibilities of action in the biomedical sciences, by interweaving philosophical reflections, scientific investigations, and legal reasoning.

The dialectical interchange between literature, bioethics, and biolaw delves into the influence of biotechnological developments on human life, in order to predict their side effects and to evaluate their acceptability.

Bioethics and biolaw are two philosophical approaches that address social tensions and conflicts caused by emerging bioscientific and biomedical research and their application. Bioethics can be defined as "the research and practice, generally interdisciplinary in nature, which aims to clarify or resolve ethical questions raised by the advances and applications of biomedical and biological sciences. Biolaw, on the other hand, is a philosophical concept in law that can be defined as the taking of agreed upon principles and practices of bioethics into law with the sanctions that law engenders. [Car11]

The engagement of literature in the medical field and in its legal framework is oriented towards an elaboration of debated questions from a speculative and epistemological perspective. In parallel, a noteworthy part of the bioethics community has witnessed an explosion of interest in narrative and in story-telling. The "fictional dimension" of medical practice has begun to be conceived as an alternative way of structuring the experiences of patients, of forming values, and consequently, of making reasoned decisions on ethical issues. [Str05]

Through this multidisciplinary encounter, the impact on human life derived from the rise of biotechnology can be investigated in its manifold facets. Thus, the ethical and

legal implications on both present day communities and on generations to come can be deeply explored. At the heart of this conjunction lies the intention to rediscover and to bring to the fore the value of a "humanistic dimension" of technology itself, in order to invalidate the extremes of a future society dominated by technocracy, as well as by an anachronistic refusal of progress.

This idea goes hand in hand with the current opinion that science and law should frequently appeal to the arts, relying on their capacity to act as a mirror able to foresee the perils hidden in the very core of progress. In other words, the convergence of legal and scientific knowledge within the literary sphere aspires to the achievement of a harmonious mediation between disciplines very distant in their objectives, but equally fundamental for the preservation of our humanity.

Such literary analyses are not exclusively addressed to specialists in the fields of medicine, ethics, or law, but instead to the inquisitive, common (un-common) reader. In fact these topics question the basic features of our personhood, focusing on how technological progress impinges on both individual and social life. Literary works probe ethical and legal dilemmas, which inevitably force us to come to terms with scientific innovations; they also anticipate the new juridical problems stemming from unprecedented situations. It is therefore crucially important to establish judicial responses aiming at the protection of these new "artefacts of progress", by assuring them specific rights and liberties.

Such judicial responses rely on certain well formulated assumptions. First of all, the literary tendency to elaborate rather than to simplify and minimize the human problems they treat, leads to the unavoidable emergence of new troublesome aspects that the sterile analysis of traditional case-studies leaves out. [TW88] In addition, the vivid presentation of bioethical questions through literature, placed in the context of the lives and activities of specific characters, offers a fascinating escape from dry scientific discourse. It necessarily compels us to a serious re-thinking of the basic structure of our moral sensibility. The overlapping of literary production with bioethics mainly involves the depiction of existential events occurring in difficult medical situations that impose critical choices.

By the intrinsic ability to intertwine science with the fictional portrayal of bioethical dilemmas we gain the possibility of displaying situations from unique, unconventional, and unexplored perspectives, including conflicts of values. The opportunity to balance important values and obligations to the contingent experience affects our way of envisioning problems and directs us to a wider range of possible solutions.

Whatever study wishes to explore the current inventory of possibilities of "intrusion" on human life inevitably acknowledges the need to direct biomedicine towards clearly expressed legal regulations. Will such studies risk being confined to an everlasting status of indeterminacy and indefiniteness, with their rights unambiguously and profoundly undermined? One of the main questions at stake, which in all probability will become increasingly topical in the future, therefore pertains to man's possibility of being endowed with, or denied, the "status of person", and therefore one whose *integrity*, *autonomy,* and *dignity* should be legally safeguarded. This ambiguous situation is the primary consequence of the serious disagreement existing amongst physicians, bioethicists, lawyers, philosophers, and policy-makers about end-of-life decision-making. A set of basic questions are continually raised in debates looking for apparently unreachable solutions: who "owns" the body? Who can determine how and when life is *worth* living?; and who governs personal destiny? In what way is it possible to counterbalance individual rights and collective interests?

In fact, a re-evaluation of the contents, meanings, and applications inherent in the unprecedented advances in biotechnology is one of the pivotal difficulties that contemporary bio-juridical debates have to confront. The sophisticated entwining of technology with matters concerning life, death, and their legal regulation has thus led to the spread of new indefinite forms of life and to the subsequent crisis of their moral and legal personhood. The meanings of paramount notions, such as "individual autonomy" and "human dignity", need to be reframed, in order to avoid their reduction to mere empty labels. These are some of the imperative challenges that are increasingly affecting our society. Such essential thematic knots are very hard to loosen, because they involve our entire existence.

Starting from these theoretical assumptions, the research portrays the ways in which biotechnological possibilities have augmented our perception of the traditional scope of human progress. It draws our attention towards the ethical and legal consequences entailed by the side effects of technology, sensitizing the reader to the complexities of ethical choices and to the intricacies of legal quandaries that we all might possibly (and unfortunately) have to face. Indeed literature provides the most suitable cultural locus to put the pretensions of technology into question, for its deep-rooted interest in exploring the uniqueness and authenticity of the individual, while at the same time investigating the multiple aspects of human frailty.

The "literary investigation" presented in this study aims at exploring the ramifications of the nexus of ethics, technology, and law, focusing on a humanistic perspective. Challenging novels, from Shelley's milestone *Frankenstein*, (1818,1831) to H. G. Wells' *The Island of Doctor Moreau (1896)* and Stoker's *Dracula* (1897) up to the most recent thought-provoking works by Picoult, *My Sister's Keeper* (2003) prompt readers to stay *alert* and improve their ability to reflect, looking for the most *equitable* judgements and positions. And therein lies literature's vital and unique contribution to bioethics and biolaw. Scientists, bioethicists, doctors, lawyers, philosophers, and policy-makers play their unquestionable role in bioethical and bio-juridical debates, but should such basic themes, so fully related to the very essence of human existence, be left solely to them? Many fiction writers, stepping out of the probable and exploring the unthinkable, propose "what if?" questions, ask rather than give

solutions; they try to make sense of the rapid changes of biotechnology in a more unbiased way. Martha Nussbaum effectively sums up the matter in its essence, when she says that

certain literary texts […] are indispensable to a philosophical inquiry in the ethical sphere; not by any means sufficient, but sources of insight without which the inquiry cannot be complete. […] We need literature that talks of human lives and choices as if they matter to us all. [Nus90]

But let us consider in more detail the novels I have previously mentioned. The first three novels I mention anticipate clear bioethical problems that were to come to the forefront in our epoch, while Picoult's novel debates thorny questions that have brought for instance in Italy to the so-called "Englaro case".

Frankenstein poses typical bioethical problems because of the monster's very essence: it does not exist as an individual, as a human person because it is made out of parts of dead bodies (in some way an anticipation of the problem of cloning), but especially because his own maker/father does not recognise him. His lack of a family name prevents him from existing as a legal persona. The legal persona, also according to Kant who was the first one to connect the idea of person to a legal perspective, is the one who has rights and duties, while the monster in *Frankenstein* only has duties (he should not kill but in his turn he has no right to be protected because he does not exist as a persona). His being deprived of legal personhood is marked also by his being deprived of culture and education: he must steal it secretly by listening to the grandfather's teachings to his grandchildren in the hut in the mountains.

From this perspective, the novel anticipates also the debate on children's rights taken into consideration in the Charter for Children's rights signed by the United Nations in 1989, ratified in Italy in 1991.

In *The Island of Doctor Moreau* what is mainly at stake is an ever-changing concept of "persona" that is extended by the new cloning experiments and by the recourse to organ transplantation. Wells's novel actually speaks of vivisection, but the connection with genetic experiments is very strong. Such experiments, being extreme, undermine human beings' uniqueness by suggesting the possibility of a serialization of beings. A new law is necessary to keep these new beings within society, or a new concept of society is required so as to include them. The perspective from which I analysed the novel is the persona/human being dichotomy: these terms in fact do not necessarily converge.

Are the results of Moreau's experiments real personae? Considering the fact that personhood may even extend beyond humanity, we may certainly assert that all the beings on the island are "persons" with rights and therefore need protecting. The most obvious example of this

assertion are the cries of the puma. If we centre our analysis on the group of new beings that live in the forest in a sort of community, we may say that they represent the closest we can get in the novel to the concept of legal persona. They have attained a deep sense of what constitutes a man and what constitutes an animal and they ground this knowledge on a strong behavioural distinction. Such behaviour is strictly codified by a list of rules that are constantly being repeated to them by one the group whose function is exactly that of saying the rules out aloud (the so-called Sayer-of-the-law). The constant repetition of the law marks their process of evolution: the more ingrained the rules become, the more akin to human beings they become. Such process of "personification" moves through a long list of prohibitions towards an enforced sense of guilt and of total adhesion and obedience of the rules: the penalty hinted at in case of the violation of any rule insists on the physical pain that would stem from the violation itself.

His is the House of Pain.
His is the Hand that makes
His is the Hand that wounds
His is the Hand that heals. (p. 59)

The new biological experiments must go hand in hand with new legal rules that should keep the new beings under the restraint imposed by Doctor Moreau. Law is invested with a particularly authoritarian hue: it is an imposition and not the reflex of a shared way of life, thus originating a violent reaction by the "excluded".

The Master of the House of Pain will come again. Woe be to him who breaks the Law!
….all of them swaying in unison and chanting:
Not to go on all-Fours; that is the Law. Are we not Men?
Not to suck up Drink; that is the Law. Are we not Men?
Not to eat Flesh or Fish; that is the Law. Are we not Men?
Not to claw Bark of Trees; that is the Law. Are we not Men?
Not to chase other Men; that is the Law. Are we not Men? (p. 59)

The novel *Dracula* is another example of how literature anticipates bioethical questions typical of our years, for ex. the problem of euthanasia and the problematisation of the concept of persona. The evolution of Dracula's identity in the course of the novel moves from that of the wanderer, given his condition of undead, rooted in a place outside history and time (the castle, the snowy wilderness) to that of new capitalistic man, well rooted in civilized society thanks to his acquisition of a mansion.

Dracula tries to become part of western civilization by his possessions and by acquiring a settled position. It is a symbolic sense of geography and possession that epitomizes Dracula's attempt at existing as a legal persona. This entails also the inclusion of a new type of legal identity within the western racial corpus. The boundaries of persona are challenged in the novel: can Dracula be

considered a legal person? To this topic another biojuridical element can be added: in the novel the character of Mina asks to be killed should she be transformed into an undead. This entails the question of euthanasia: can a person decide of his/her own death?

Jodi Picoult's *My Sister's Keeper* draws our attention towards the ethical and legal consequences entailed by the side effects of technology. One of Picoult's strong points lies in her interest in sensitizing the reader to the complexities of ethical choices and to the intricacies of legal quandaries that we all might possibly (and unfortunately) have to face. Indeed literature provides the most suitable cultural locus to put the pretensions of technology into question, for its deep-rooted interest in exploring the uniqueness and authenticity of the individual, while at the same time investigating the multiple aspects of human frailty.

In Picoult's novel, set in the United States, the parents use reproductive technology to conceive a child, Anna, to serve as a donor for their leukemia-stricken daughter Kate. Anna, who is specifically conceived with "*In Vitro* Fertilization" and screened by "Preimplantation Genetic Diagnosis", is thus designed as a matched donor for her sister Kate. For years Anna has submitted to increasingly invasive medical interventions to donate tissues to Kate, to the extent that her social life has suffered significantly. When she is asked, as a 13-year-old, to donate a kidney to her sister, she seeks help from a local lawyer to sue her parents in order to obtain medical emancipation.

The *Convention for the Protection of Human Rights and Dignity of the Human Being with Regard to the Application of Biology and Medicine: Convention on Human Rights and Biomedicine*, generally called "the Bioethics Convention" (Oviedo, 4 April 1997), affirms the primacy of the human being and the protection of his/her physical integrity against the interests of society and science. Paragraph 2, art.5 unambiguously declares that health intervention can take place only after the person has been informed of the entire process of the intervention and after the person has given his/her consent. Art.6, dealing with minors, asserts that medical intervention must only be for the benefit of the person involved. In the case of Anna, her consent had never been required. This is why, Anna's family being directly involved in the question, a guardian *ad litem* is appointed by the judge, who should objectively defend the interests of the minor.

After this Convention, on October 19th 2005, a *Universal Declaration of Bioethics and Human Rights* was signed in order to assess the fundamental principles for the protection of the individual against scientific experimentation, whose aim is to evaluate the ethical questions caused by life sciences and technology when applied to human beings. It also offers a guide for the decisions concerning individuals. The question of human dignity and the wellbeing of the individual against the selfish interests of society and science is at the core of this Convention. Human dignity is explicitly declared as one of the foundational ideas of the *Universal Declaration on Human Rights* of 1948.

The capacity of narrative fiction to offer valuable ethical and social contributions makes it an indispensable medium by which to *learn* about ethics and society. Literature brings moral perspective into our meditation on the relations between life, technology, and law. Here I mean "literature" in a wider sense to include also cinematic production: all artistic expressions are "literature", either in their literal or metaphoric meaning. All are communication and narration.

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How to Breathe Life into Cultural Heritage 3D Reconstruction

Selma Rizvić

Abstract

Virtual 3D reconstructions of destroyed or disappeared cultural heritage enable the users to travel back through time and visualize monuments whose fragments they can see in museums or archaeological sites. A powerful way to convey information through 3D geometry is to add interactive digital storytelling to the virtual models. In this paper we present our work in interactive virtual cultural heritage applications with storytelling and show how the users appreciate this presentation form considering it as breathing life into 3D geometry. We describe the Taslihan project which consists of a documentary, interactive digital story and serious game about this valuable cultural monument from Sarajevo, Bosnia and Herzegovina, with only one wall remained as memento to its existence.

Categories and Subject Descriptors (according to ACM CCS): I.3.7 [Computer Graphics]: Three-Dimensional Graphics and Realism—Virtual reality H.5 [Computer Graphics]: Information Interfaces and Presentation—Artificial, augmented, and virtual realities D.2.6 [Computer Graphics]: Programming Environments—Interactive environments

1. Introduction

Cultural heritage enables us to understand the past. Digital technologies offer very efficient tools to display the original appearance of objects which presently exist only as remains at archaeological sites. Today we can virtually walk through magnificent monuments of ancient civilizations. However, even the highest quality geometry will not evoke in the user the feeling of immersion in the past in such a way as it does in combination with digital storytelling.

Since 10 years Sarajevo Graphics Group has been creating interactive virtual presentations of cultural heritage objects combining virtual environments with digital stories. User studies have shown that these presentations make the users as immersed as they are really traveling to the past. We will present such an application to illustrate the way how to breathe life into 3D geometry.

2. Previous Work

Storytelling has recently become an important part of cultural heritage presentations. Museum exhibitions introduce digital content to enhance their artifacts and attract more visitors, enabling them to learn about the history and context of the exhibits. Virtual reconstructions of cultural heritage objects incorporate various forms of storytelling [HCP12], [Pes14].

Sarajevo Graphics group introduced digital storytelling for the first time in the virtual reconstruction of the Church of the Holy Trinity in Mostar [RBKS*09], where the priest recorded on the green screen was telling stories about the church, while being incorporated in its virtual model. Virtual reconstruction of Isa bey's endowment was also enhanced with digital stories in various implementation forms [RSZ*14], such as interactive animation and interactive audio storytelling in 3D virtual environment.

Apart from these enhanced virtual reconstructions, we introduced digital storytelling also in our virtual museums [RS11], [Šl12], [RSHK12]. In Taslihan application, which we present in this paper, we continue our quest for the interactive digital storytelling method most appreciated by the users.

3. Tašlihan application

The Tašlihan (Figure 1a) was the largest accommodation facility in Sarajevo during the Ottoman period. It was built between 1540 and 1543 as an endowment of Gazi Husref Bey, governor of the Bosnian province within the Ottoman Empire. Rooms for guests were positioned at the first floor around the square yard, with stables for horses beneath them and shops for trade on the exterior side of the building. Aside of Tašlihan was built a huge covered bazaar called Bezistan, with 52 shops. Presently there is only one wall remained of

Tašlihan (Figure 1b), within the hotel Europe garden. The Bezistan is still functional as a trade center.

3.1. Concept

In order to bring this monument back to the collective memory, we created an interactive virtual presentation implemented in the Museum of Sarajevo and online [Riz15]. Taking in account the initial feedback from the users, we designed the presentation in three versions: documentary story, interactive digital story and serious game. This way we can compare the reactions of the users and explore the advantages and drawbacks of each presentation form. First we created the high quality 3D virtual model of Taslihan, in collaboration with experts historians and archaeologists who performed the excavations of the site. The geometry was created in Maya and exported to Unity 3D, where the basic navigation interface was added. The storytelling was designed in such a way that the story about Taslihan consists of the main story and sub-stories describing in detail selected topics mentioned in the main story. Based on the historic facts, a professional novelist wrote scenarios for the stories. Facing the lack of video footage, we engaged a graphics designer to create drawings of the main characters from the story. Digital stories were edited as sequences of old photos, camera recordings, graphics illustrations and Taslihan model computer animation renders.

3.2. Implementation

After finalizing the digital stories and interactive virtual model of Taslihan, we implemented the three versions of the virtual presentation. Documentary story was a sequence of selected digital stories, ready for playback directly from youtube. Interactive digital story and serious game are implemented in Unity 3D. The interactive digital story starts with the main story representing a summary of the information about the monument, its history and related events and characters. It consists of 7 thematic clusters. After each thematic cluster the user can activate the link to the sub-story, which describes in more detail a topic mentioned in the main story. One of sub-stories is linked to the interactive virtual model of the object (Figure 1c). The serious game has a similar concept to the interactive digital story, except for displaying the interactive virtual model. In this version, the model can be viewed only if the user replies correctly on questions related with digital stories [SR15].

4. User evaluation

The public promotion of Taslihan virtual reconstruction project has kindled a lot of attention of Bosnian media and general audience. We received many comments how very useful people find this application, as they now discovered an object whose remains they pass by every day without knowing what a great cultural monument used to exist in

that place. Both Sarajevo citizens and visitors of our town claim they learned from our stories something they have not been able to learn any other way. They particularly appreciated introduction of a narrator character, Murad Bey Tardic, a friend and collaborator of Gazi Husref Bey, who added an emotional dimension to storytelling. This arguments in favor of our hypothesis that storytelling breaths life into virtual cultural heritage reconstructions. Regarding the formal user evaluation, for now we conducted only an initial user study, performed on 8 participants. The results confirmed that the viewers feel immersion in the past of Tašlihan after viewing our application. The selected group of users were requested to compare linear storytelling in the documentary story with interactive storytelling. The results show that they prefer interactive over linear storytelling.

5. Conclusions

Our experience shows that virtual cultural heritage reconstructions become more appreciated by the users if they contain digital storytelling. If storytelling if crafted by a skilled professional writer, the user immersion increases. Still, a lot of work remains on developing the best form of interactive digital storytelling presentation in order to obtain the maximum user satisfaction. There is a tradeoff between the amount of interaction and amount of conveyed information. We are still evaluating if the users prefer an interactive virtual environment with stories linked to some triggers or a storytelling structure with hyperlinked interactive virtual models. However, regardless of the presentation form, we can conclude that storytelling can breathe life into cultural heritage 3D reconstructions.

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(a) The original appearance   (b) remains   (c) virtual model

Figure 1: Tašlihan, Sarajevo, Bosnia and Herzegovina

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The Representation of Monstrosity in Contemporary Fiction

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Abstract

In The Tree (1979), British novelist John Fowles explains that human beings have always tried to come to terms with the world in two basic ways: using names logically in order to classify things and to impose a rational impose rational order over the natural chaos of the external world; or using language intuitively in order to express their own individual feelings about the world and about themselves. The first is the collective language of scientists, the second, the language advocated by Wordsworth and other Romantic poets for the individual artist. Fowles, who believes with Virginia Woolf that "there is a lethal enmity between words and nature" [Fow85], 91, and that classifying and naming a thing is distorting its "beingness", what D. H Lawrence called "the existingness in things" [Fow85], 91, contends that art is superior to science in that it has a capacity for synthesis and closeness to wild nature, that allows it to render "truths too complex for science to express" [Fow64], 151. Starting from this definition of art, the three panel members will seek to analyse the evolution of the literary representations of monstrosity running pari passu to the development of science from the modern period until the present. In the first presentation, Svend Erik Larsen will explore the important transformation in European thought when monsters lost their ontological status as particular liminal beings and became human projections of monstrosity on unknown or incomprehensible phenomena, with examples from Michel Tournier's Le Roi des Aulnes and Gilles et Jeanne. In the second presentation Susana Onega will analyse a particularly salient example of this move: the representation of women as the monstrous-feminine alongside the birth and development of feminism in the nineteen seventies and eighties, and in the third, Daniela Carpi will illustrate Carter's subversive representation of monstrosity through the analysis of her group of tales in The Bloody Chamber.

In a little book entitled The Tree (1979), British novelist John Fowles explained that human beings have always tried to come to terms with the world in two basic ways: using language logically in order to name and classify things and to impose rational order over the natural chaos of the external world; or using language intuitively in order to express their own individual feelings about the world and about themselves. The first is the collective language of scientists, the second, the language advocated by Wordsworth and other Romantic poets for the individual artist. In The Tree, Fowles describes his lifelong relationship to nature, mediated by the early influence of his father, whose perfectly trimmed and ordered apple-tree garden betrayed his neoclassical "hatred

of natural disorder" [Fow79], 19. For Fowles, this type of garden, whose best example would be Carl Linnaeus' little garden in Uppsala, reflects the same anthropomorphic attitude to nature of a great deal of science and "betrays our love of clearly defined boundaries, unique identities, of the individual thing released from the confusion of background" [Fow79], 26.

Fowles, who believes with Virginia Woolf that "there is a lethal enmity between words and nature" [Fow85], 91, contends that classifying and naming a thing is distorting its "beingness", what D. H Lawrence called "the existingness in things" [Fow85], 91, since: "[e]ven the simplest knowledge of the names and habits of flowers or trees [...] removes us a step from total reality towards anthropocentrism; that is, it acts mentally as an equivalent of the camera view-finder. Already it destroys or curtails certain possibilities of seeing, apprehending and experiencing" [Fow79], 26-27. In other

words, Fowles' basic objection against taxonomy and science as a way of knowing the world lies in the fallacy of "supposing that the scientific method corresponds to the nature of ordinary experience":

> Ordinary experience, from waking second to second, is in fact highly synthetic (in the sense of combinative or constructive), and made of a complexity of strands, past memories and present perceptions, times and places, private and public history, hopelessly beyond science's powers to analyse. It is quintessentially "wild" in the sense my father disliked so much: unphilosophical, irrational, uncontrollable, incalculable. In fact it corresponds very closely [...] to wild nature. [Fow79] 36-37

The superiority of art over science lies, then, in its capacity for synthesis and in its closeness to wild nature. This is why Fowles defines art as "a human shorthand of knowledge, [....] the expression of truths too complex for science to express" [Fow64], 151. Starting from this conception of the function of art, the panel members will analyse the evolution of the literary representations of monstrosity running pari passu to the development of science from the modern period until the present.

1. From monster to monstrosity

In the first presentation, Svend Erik Larsen will explore the important transformation in European thought when monsters lost their ontological status as particular liminal beings and became human projections of monstrosity on unknown or incomprehensible phenomena, drawing examples, among others, from two novels by Michel Tournier, Le Roi des Aulnes [Tou70] and Gilles et Jeanne [Tou83]. As the etymology of the term "monster", from Latin monstrare, "show" and monere, "warn" [Shi02], were originally conceived of as exceptional creatures existing on the margin of the natural order of things, and thus, serving as signs of divine warning. The move from ontology to function initiated in the Enlightenment that came to a climax along the nineteen sixties, seventies and eighties, transformed monsters into discursive constructions and projections on the unknown identified by the features that made up the monstrosity, now applied to what in a given culture is thought to deviate from a stereotypical idea of human normality: enemies, foreigners, disabled, people of other ethnicities, religions and cultures in order to sustain the accepted normative standards of a culture.

2. The representation of the monstrous feminine in contemporary British fiction

In the second presentation Susana Onega will analyse a particularly salient example of this move: the representation of women as the monstrous-feminine alongside the birth and development of feminism in the nineteen seventies and eighties. According to feminist thought [Cre89, Cre93, GG79, Kri82, GG79, Shi91], the objectification of woman

is the necessary counterpart of the patriarchal construction of male subjectivity. In order to avoid it, feminist writers have attempted to theorise alternative representations of sexual difference by postulating the possibility of sustaining a bisexuality, not as a denial of sexual difference, but as a lived recognition of plurality, of the simultaneous presence of masculinity and femininity within an individual subject, and by advocating the production of a specific form of "feminine writing" (écriture feminine) that would embody such bisexuality and operate in the interest of women [Shi91], 16. The best-known statement of this project is contained in Hélène Cixous' "The Laugh of the Medusa" [Cix75], where she defends the definition of the female body as a cultural and linguistic construction rather than as an anatomical object, the basic metaphor or primary signifier of the new feminine writing. The way out of patriarchal oppression lies, then, in an alternative, feminine practice of writing, a kind of writing capable of discursively creating subjectivities that would be plural and shifting (bisexual), and that would break up the set of hierarchical oppositions which, Cixous argues, have structured western thought and governed its political practice, such as "culture/nature;" "head/heart;" "form/matter;" "speaking/writing," derived from the basic opposition "man/woman."

3. The Monster is us: monsters, beasts and vampires in Angela Carter's The Bloody Chamber

In the third presentation, Daniela Carpi will set the work of Angela Carter within the long history of the critical examination of monster lore, miracles, marvels, portents, and the like, particularly from the perspective provided by the study of the Other, the complete alter, which has proven to be fundamental in the analysis of the history of mentality, spirituality, and ideology both in the past and in the present [Cla12], 13.

Every culture knows this curious phenomenon of monsters and of terrifying creatures that represent complete alterity and challenge every basic notion of self and identity within a cultural paradigm [Cla12], 13. The function of the monstrous is a semantic tool through time, charting the change in "demystification and desacralisation" in parallel with scientific development. The monster may carry an allegory of the violent relationship between man, nature and technological development (Frankenstein, the white whale, The Time Machine).

These allegories bring us to the central problem of this topic: the ethical examination of evil. Unde malum? The latest contemporary perspective can be called "teratology of the sublime": it is focused on the monstrous character of evil, connecting it to horror, abjection, nihil and to what exceeds language. Evil in this case is the un-representable, it is radical otherness. In its absoluteness it is the other side of the divine. As an example of this contemporary revision of the figure of the monster Carpi will analyse Angela Carter's The

Bloody Chamber [Car79], where the author reactivates fairy tale poetics centred on an agonistic struggle with tradition that highly enhances the multivalent currency of the fairy tale from a cultural and self-reflexive viewpoint. Monsters are common characters in fairy tales; so we may say that "The Bloody Chamber" presents many examples. Of these, Carpi will centre her analysis particularly on the Marquis in "The Bloody Chamber" itself, on the Beast in Carter's three revisions of "Beauty and the Beast", and on the figure of the vampire in "The Lady in the House of Love".

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The Monster is us: monsters, beasts and vampires in Angela Carter's *The Bloody Chamber*

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This paper will set the work of Angela Carter within the long history of the critical examination of monster lore, miracles, marvels, portents, and the like, particularly from the perspective provided by the study of the Other, the complete alter, which has proven to be fundamental in the analysis of the history of mentality, spirituality, and ideology both in the past and in the present.

Every culture knows this curious phenomenon of monsters and of terrifying creatures that represent complete alterity and challenge every basic notion of self and identity within a cultural paradigm. The function of the monstrous is a semantic tool through time, charting the change in "demystification and desacralisation" in parallel with scientific development. The monster may carry an allegory of the violent relationship between man, nature and technological development (Frankenstein, the white whale, The Time Machine).

These allegories bring us to the central problem of this topic: the ethical examination of evil. Unde malum? The latest contemporary perspective can be called "teratology of the sublime": it is focused on the monstrous character of evil, connecting it to horror, abjection, nihil and to what exceeds language. Evil in this case is the un-representable, it is radical otherness. In its absoluteness it is the other side of the divine. As an example of this contemporary revision of the figure of the monster, the paper will analyse Angela Carter's The Bloody Chamber, *where the author reactivates fairy tale poetics centred on an agonistic struggle with tradition that highly enhances the multivalent currency of the fairy tale from a cultural and self-reflexive viewpoint. Monsters are common characters in fairy tales; so we may say that "The Bloody Chamber" presents many examples. Of these, I will centre my analysis particularly on the Marquis in "The Bloody Chamber" itself, on the Beast in Carter's three revisions of "Beauty and the Beast", and on the figure of the vampire in "The Lady in the House of Love".*

Towards Future Internet Communications
– Role of Scalable Adaptive Mechanisms

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Abstract

Tablets and smartphones have become the favorite gateway to the Internet for a majority of users. Being equipped with plenty of sensors, these devices enable far more than traditional web browsing. One example is the popularity of context-aware mobile multimedia applications, where, e.g., the user's location is integral part of the interaction with the application and with the applications media streams. At the same time, people increasingly manage their social life through their mobile devices. Future challenges originate from the huge amount of networked devices and e.g., up-coming pervasive cloud-centric infrastructure. We have to tackle the arising dynamics by appropriate (i.e., adaptive) multimedia communication systems in terms of the FUTURE INTERNET. *Using the example of a mobile pervasive multiplayer game, the key issues of future challenges of adaptive multimedia communications are presented. In more detail, future context-aware publish/subscribe systems enable local interaction between mobile clients. Transitions between different local publish/subscribe mechanisms enable the system to adapt to changing surrounding conditions. To detect such changing conditions, locality-aware monitoring mechanisms are an integral part of the communication systems. Finally, the vision and steps towards an overall transition-enabled Future Internet is outlined.*

Categories and Subject Descriptors (according to ACM CCS): C.2.1 [Network Architecture and Design]: Network communications—Network topology, C.2.3 [Network Operations]: Network management—Network monitoring, C.2.5 [Local and Wide-Area Networks]: Internet (e.g., TCP/IP)—Access schemes

1. Introduction

Since the advent of the Internet, the number of worldwide interconnected devices has been subject to continuous growth encompassing nowadays more than 12.5 billion devices (cf. [Eva11]). In particular, the number of mobile devices has become the dominant factor in the expansion of today's Internet (cf. [KM07], [Mor09]). By 2019, 64% of consumer Internet traffic will originate from non-stationary devices such as smartphones and tablets [Cis15]. Not surprisingly the omnipresence of the Internet has become an integral part of our everyday life. Hand in hand with this development, the requirements on Internet applications go far beyond traditional web browsing and messaging services. Internet applications heavily support the integration of multimedia content like pictures and videos. Users do not only play the role of an information consumer, but also as an information producer, e.g., by sharing such content with other users as part of a social network. Furthermore, applications

have become heavily context-sensitive exploiting a multitude of information sources such as sensors on the mobile device or external services like location services.

As a consequence, the way how information is spread over the Internet has changed dramatically and poses new challenges for the communication system and its mechanisms. Besides the need for massive data rates from different content sources and the integration of billions of sensors, further issues like limited energy supply of mobile devices (e.g., [HLB*14]) and high Quality of Service, such as reducing unnecessary additional latency depending on the distance of a device's location to available content sources (e.g., [HSL*15]), have to be taken into account.

The underlying communication mechanisms comprise a wide range of network access technologies, communication protocols, and application-aware services in distributed systems. All the applications and scenarios based on these mechanisms as well as the mechanisms themselves are very

heterogeneous and subject to continuous change. At the same time, surrounding conditions also change more rapidly today. For example, a large number of smartphones can be turned on in parallel at the end of a public event in order to inform about available public transportation.

When facing these diverse requirements of communication mechanisms, it will be very hard — if not impossible — to tackle them by means of a one fits all solution. Instead, evolving communication systems towards the FUTURE INTERNET should — as proposed/discussed in this paper — become tailor-made (i.e., adaptive) and allow to address the differing goals, increasing diversity and high dynamics of the applications and users.

2. Adaptivity in the Future Internet

To date, new communication mechanisms are designed for specific surrounding conditions in most of the cases. Although these mechanisms can be parameterized to some extent, each of them is not applicable in a totally different setting. Hence, these mechanisms only exhibit limited adaptability. Attempts to create a new architecture that meets all the requirements of the Future Internet ("clean-slate approach") are supported with a very high effort. However, there is no evidence, yet, that the variety of mechanisms can be permanently replaced. Indeed, the principle of constant change has been claimed as the most important core principle of the Internet [Car96]. Future communication systems must therefore lay the foundations, to dynamically switch between different mechanisms that serve the same purpose but are designed for different surrounding conditions. In doing so, applications, services and protocols are able to dynamically adapt to different settings in an optimal manner.

Basically, TRANSITIONS can be defined as a switchover from the currently applied mechanism(s) to another or multiple other mechanisms that exhibit comparable functionality. By conducting a single transition, one mechanism within the communication system is replaced by another, comparable mechanism at runtime. A set of mechanisms with comparable functionality is denoted as MULTI-MECHANISM. Since communications systems usually follow a layered model, a certain functionality resides in a particular layer, so that each multi-mechanism corresponds to a specific layer. Multi-mechanism adaptation by conducting transitions between different mechanisms of several multi-mechanisms on different layers is explored in the DFG Collaborative Research Centre "Multi-Mechanism Adaptation for the Future Internet" (MAKI). In doing so, the high dynamics in communication systems are addressed concerning surrounding conditions and requirements, that result from the varying demands of an increasing number of applications, from the differing access technologies of mobile and fixed devices, from the properties of the heterogeneous end devices as well as from the mobility and density of the users and their request behaviour anywhere and anytime.

One example for multi-mechanism adaptation in the Future Internet is BYPASS.KOM [RSH*14], which constitutes an approach for transitions in publish/subscribe-based systems in the context of mobile augmented reality games. In Google's Ingress, as an example of such a game, real-world locations or buildings directly become part of the virtual game world. They represent portals in the game that players of two competing factions aim to conquer. It is also possible for a faction to conquer an entire region. At the end of the day, the faction occupying the most regions wins. In the game, the players interact with each other, e.g., in order to arrange for a rendezvous with fellow gamers at a specific location, and with their environment itself. Hence, seamless local communication between mobile end devices is mandatory. However, in case of unforeseen events, e.g., when a large number of players gathers 'spontaneously' at a specific location, the communication infrastructure soon becomes overloaded. Although most of the information is only important in the players' vicinity, the information is routed via both, the cellular and the service provider's infrastructure. This centralized communication via the service provider's infrastructure generates unnecessary, additional latency and is also more vulnerable since signal strength and transmission speed can vary while the players move from one place to another. The high dynamics in the game are a major challenge that needs to be addressed for this new generation of mobile applications to further evolve. The idea of BYPASS.KOM is to exploit the locality characteristics of mobile augmented reality games. In doing so, a transition might enable players to switch from a mobile network to a direct communication ad hoc via Bluetooth or Wi-Fi, which reduces resource utilization and infrastructure load. The efficiency of different transitions is being investigated using a publish/subscribe-based system as an example of event dissemination systems, since publish/subscribe permits an efficient sharing of information.

While BYPASS.KOM enables transitions between different local publish/subscribe mechanisms, so that the system is able to adapt to changing surrounding conditions, such changes in surrounding conditions have to be detected somehow in order to be able to react to them properly. For this purpose, transitions must be aware of the current state of the network, the devices, and (ideally) the environment. Therefore, locality-aware monitoring mechanisms are required as an integral part of transition-enabled communication systems. An example for such a monitoring approach is CRATER.KOM [RSR*15]. The main focus of CRATER.KOM are mobile networks in challenging environments, for example, overload situations at Waterloo station in London, where up to ten times more people use the station at peak hours. In order to address these dynamic changes, CRATER.KOM allows to conduct transitions from centralized to hybrid monitoring topologies according to the surrounding conditions, such as node density or movement speed. This is achieved by dividing the current set of mobile entities into leaves and sinks,

where cellular uploads are only available for the latter, and by applying a gradient-based advertising scheme to establish areas around sinks. In doing so, CRATER.KOM allows to improve the monitoring quality in terms of accuracy of the monitoring information and precision of the network state despite dynamic changes in surrounding conditions. Hence, CRATER.KOM represents a robust and reliable monitoring approach which is applicable to a wide range of changes in surrounding conditions and network-specific aspects by re-configuring the monitoring topology structure.

Further approaches regarding multi-mechanism adaptation in the Future Internet are TRANSIT [WRRH14] and FOSSA [FRLB15]. While TRANSIT supports transitions between different mechanisms in the context of live streaming, FOSSA represents a generic framework for the execution of transitions in adaptive distributed systems.

3. Conclusion and Future Work

In this paper, we pointed out that communication systems themselves need to become highly adaptive to varying requirements and surrounding conditions in order to cope with the arising dynamics and heterogeneity of Internet Applications of today and the future.

Beyond the examples detailed as part of the paper, the DFG Collaborative Research Centre "Multi-Mechanism Adaptation for the Future Internet" (MAKI) investigates adaptation and transition principles as a foundation for the Future Internet. In line with this research effort, several questions have to be answered in order to lay the foundations for the Future Internet: how to determine the level of (de)centralized decision making concerning transitions, how to capture and cope with the dependencies between different mechanisms, and how to exploit the information of a mechanism's current state in order to achieve a smooth transition to another state.

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