Reason, Faith and Practice
In Our Common Home

Festschrift for Dr. Sytse Strijbos

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Introduction

This book is devoted to Dr. Sytse Strijbos, in our appreciation of his unique, devoted, and selfless efforts and contributions to the betterment of the world we live in.

The present age, often understood as either late modernity or postmodernity, seems to have manifested a *developmental paradox*. The invention and use of science and technologies has brought material well-being never experienced in human history. Much of the modern world is characterized by economic growth and reflected in advanced housing, schools, healthcare systems, transportation and communication infrastructure, safe and secure workplaces, social insurances of various types, pharmaceuticals that save the lives of millions—all bringing human comfort and fueling a consumption economy. Normatively regarded, however, there seems to be a blurred image. The development of societal institutions, based on some form of democratic rationality, is important in its striving for human equality and participation as well as the elimination of coercions and oppressions. Yet, we witness constant news about social, religious, political, and economic polarizations, with terrorist attacks and local wars killing innocent civilians, with global warming effects and microplastics in the oceans, with so-called "alternative truths" and challenges democratic institutions, including at its very heart the elections. More people than ever are consuming antidepressant pharmaceuticals and committing suicide. This imbalance between material development and normative advancement can be understood as the *paradox of modernity* and was brought to the surface eloquently by Max Horkheimer and Theodor W. Adorno in their seminal "*Dialektik der Aufklärung*" (Eng. "Dialectic of Enlightenment"). They challenge the myth of enlightenment and its progress, based solely on human reason, as reflected in rational bureaucratic organizations, science, and technology.

Raised in Dutch society during the World War II recovery effort, Strijbos is part of this paradox of modernity. He has witnessed the economic and material developments of his country and Europe, and the normative challenges of their societies. Strijbos has been exposed to several influences: a version of the Christian faith that promotes love and compassion, the power of intellect in science and technology, and the importance of action in entrepreneurship and businesses. Unlike most engaged people, he does not assume a stand for *one* of these three poles. Drawing on the intellectual tradition of Abraham Kuyper and Herman Dooyeweerd, he seeks and formulates an integrative vision and approach that can be characterized in terms of three poles, where each pole interacts with the other two and in that manner aims toward human dignity and justice. His message is that only in that manner can we firstly understand the roots of modernity and its paradox and then redirect our societies. Strijbos characterizes this integrative approach as *disclosure,* understood as "a process in which norms take shape that do justice to human life and society in its diversity. Disclosure accordingly goes together with recognition of the distinctive character and intrinsic normativity of the various terrains of life." This concept is founded on the view that "human

actions and interventions must be a positive response to a normative order that is itself anchored in the world."[1]

Over nearly three decades, after changing his career from developing new technologies through advanced applied research at Philips laboratories into an academic career based at the Department of Philosophy at *Vrije Universiteit Amsterdam*, Strijbos' integrative visions and approach are manifested in his unique leadership. While occupied with his devotion to family life and university lecturing, he has managed to conceive of, initiate, establish, and govern several independent organizations (e.g., "the Centre for Technology and Social Systems" and "International Institute for Development and Ethics") that aim to advance this integrative vision. The uniqueness of these efforts is that without any granted external resources, he motivates people in various parts of the world (e.g., the Netherlands, the United Kingdom (UK), Sweden, and South Africa) to pursue intellectual and practical activities also aimed at advancing this integrative vision, where attempts are made to relate faith and conviction to thinking and intellect, and to actions and practices. These efforts have formulated tentative bridges of several kinds. One kind is in the academia among the various specialized disciplines, typically isolated from each other, and with philosophy and theology. The other kind of bridges are between the academic world of thinking and the world of practices and actions, be it firms, entrepreneurship, hospitals, or aid agencies.

In the course of three decades, Sytse Strijbos has provided organizational and intellectual leadership that has contributed uniquely to the development of young people and scholars, several of which are today full professors and a university rector. In this book, students and colleagues of Strijbos have taken time to author a text with a message that in one way or another relates to the integrative vision proposed by Strijbos. These contributions are diverse, which only reflects the multidisciplinary impact of Strijbos' work and efforts and one of its underlying messages: the root cause of modernity and its paradox can neither be understood in terms of one or a few aspects only, nor in terms of the assumptions held by modernity. Rather, an integrated view is needed where faith should be related to thinking and science, which must be related to actions and practices – any separated approach is deemed to produce a partial diagnosis and thus a faulty remedy. Therefore, the title of this Festschrift that celebrates Sytse Strijbos is "*Reason, Faith and Practice in Our Common Home*."

Thank you, Sytse!

Spring 2018,
Christine Boshuijzen-van Burken, The Netherlands
Darek M. Haftor, Sweden

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[1] Both from: Strijbos, S. (2003). Systems Thinking and the Disclosure of a technological Society: Some Philosophical reflections. *Systems Research and Behavioral Science*, 20, 119-131. (p.128)

Biography of Dr. Sytse Strijbos [1]

Dr. Sytse Strijbos was born in Rotterdam, Netherlands, on March 28, 1944. He is the seventh child in a family of eight children, where the eldest and youngest were girls. His father was a hardworking tailor, and his mother worked as a nurse before she married. When Strijbos was about one year old, he stayed temporarily with relatives outside Rotterdam to recover from the effects of the Dutch famine winter at the end of the World War II. Strijbos was raised in the Calvinist faith, and in his youth, was shaped by the postwar Dutch mentality that emphasized citizens' contribution to the reconstruction of society, and an attitude that disciplined work is central in life.

In September 1961, after finishing high school, the young Strijbos moved to Delft, where he started his studies in applied physics at Delft University of Technology. He defended his master's dissertation at the Department of Physical Transport Phenomena, in April 1967. During his years as a student, the young Strijbos was an active member of the student society *Civitas Studiosorum Reformatorum*, where he was the president of the board from 1964 to 1965. Still, each year, he meets former board members and colleague students. Those younger years shaped Strijbos' thinking and attitude. This shaping would later influence Strijbos to search for an *integrative approach*, where the Christian faith's tenets of human dignity and compassion are combined with the human intellectual capabilities to reason and the human intentional action that transforms and intervenes in our reality – the crucial step from thinking and believing to action and the consequences thereof.

Philips Years

After his graduation in 1967, Strijbos started his career as a researcher at Philips *Natuurkundig Laboratorium Eindhoven*. [2] About one year later, in December 1968, Strijbos married Harma Bosker, whom he met in the Reformed Church in Delft. They started their married life near Eindhoven, first in Heeze and later in Aalst-Waalre. The first three of their four children were born there. During his studies in Delft, Strijbos was strongly inspired by the philosophy classes of Professor Hendrik van Riessen. Shortly after his marriage, he decided to enroll as a student of philosophy at the *Vrije Universiteit Amsterdam*. He studied almost all evenings and on his days off, in addition to his fulltime job at Philips. About five years later, in the spring of 1975, he received his master's degree in philosophy.

At Philips Research Laboratories, Strijbos conducted applied research in the research group on "*ceramic materials*" led by Professor Stuijts. One of the topics he worked on was compaction of powders, that is, one of the stages in the fabrication process of advanced ceramic materials.[3] Initially, he planned to write a doctoral dissertation on this topic;

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[2] https://en.wikipedia.org/wiki/Philips_Natuurkundig_Laboratorium

[3] Some data can be found in manuals on ceramic technology: R.J. Brook (ed.) Concise Encyclopedia of Advanced Ceramic Materials, Pergamon Press, Oxford, 1991, page 113-117 and page 383-384. And also in: M.N. Rahaman, Ceramic Processing,Taylor & Francis, London/New York, 2007.

however, he abandon this plan without much hesitation when he was unexpectedly invited to apply for a job at the *Vrije Universiteit Amsterdam*. Strijbos left Philips Eindhoven after ten years and took up the position as assistant professor in the Department *Systematic Philosophy and Cultural Philosophy*, led by Professor Van Riessen. In the summer of 1977, the family moved to Maarssen, a small city near Utrecht.

Academic Years

During his career in the Faculty of Philosophy at *Vrije Universiteit Amsterdam*, Strijbos established and managed several teaching and research initiatives in cooperation with other faculties and universities, which would clearly manifest his search for the integration of thinking, believing, and action. An initial and important initiative was the cooperation with the *Faculty of Dentistry*, now known as *Academic Centre for Dentistry Amsterdam,* (ACTA), which is a joint venture of the *Faculty of Dentistry of the University of Amsterdam*, the *Vrije Universiteit Amsterdam*, and the *Faculty of Exact Sciences* for students of computer science and artificial intelligence. On behalf of the ACTA, Strijbos developed a special ethics education program in cooperation with colleagues from social dentistry and the clinical staff. Eventually, this program led to an important achievement, namely, the publication of "*Kiezen en Keuzen: Ethiek in de Tandheelkundige Praktijk*," the first book on dental ethics in the Dutch language.[4]

Almost at the beginning of his work at the *Vrije Universiteit Amsterdam*, Strijbos conceived a plan to conduct a doctoral research project on *Systems Thinking*, which was a quickly and strongly emerging field. An initial impetus for this research direction was from a conference held in 1979 at the *Vrije Universiteit Amsterdam* on "*Systems Thinking and Societal Problems,*" that was held on the occasion of the third anniversary of the *Faculty of Philosophy* [5]. In the initial years of his doctoral research, Strijbos attempted "*to build a bridge to the special sciences and seriously address the problems that arise there*," he writes in the preface of his doctoral dissertation. He was specifically faced with the challenge of delving into the fields of dentistry and medicine, which were unknown fields to him. Strijbos writes in the preface of his dissertation, "*In order to become familiar with the problems of health care I not only processed much professional literature in recent years, but I also had many discussions with dentists and doctors*." Supervised by Professor Sander Griffioen and cosupervised by Professor Egbert Schuurman, Strijbos received his doctoral degree in 1988 with a dissertation entitled *"Het technische wereldbeeld: een wijsgerig onderzoek van het systeemdenken"* (Eng. *"The technological worldview: a philosophical study of systems thinking"*).[6] Partly inspired by his contacts at the *Vrije Universiteit Amsterdam*, in particular

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[4] Kiezen en Keuzen: Ethiek in de tandheelkundige praktijk. Houten/Diegem, Bohn, Stafleu, Van Loghum, 1999. – In Dutch, the word "kiezen" translates both as "choosing" and as "molars"; thus, the title can be translated as "Choosing (or Molars) and Choices: Ethics in Dental Practice"

[5] From this congress resulted the volume "Systeemdenken en samenlevingsproblematiek," edited by S. Strijbos, VU Boekhandel, Amsterdam, 1981.

[6] S. Strijbos, "Het technische wereldbeeld: Een wijsgerig onderzoek van het systeemdenken". Amsterdam, Buijten & Schipperheijn. An English summary can be found here: http://hdl.handle.net/1871/15599

the physician and medical historian Professor Gerrit Arie Lindeboom [7], he devoted the last chapter of his dissertation to a comprehensive analysis of the "*technologization process*" (Dutch "*vertechniseringsproces*") of modern medicine. This is a further development of his earlier reflections on medicine and medical ethics, which he published earlier in 1985, in the book "*Nieuwe Medische Ethiek*" (Eng. *"New Medical Ethics"*) [8].

The retirement of Professor Van Riessen at the *Vrije Universiteit Amsterdam*, followed shortly by the departure of his younger colleague and pupil Dr. Egbert Schuurman, also meant a change for Strijbos. More specifically, Strijbos' initial plan to further develop the pioneering work of Van Riessen's philosophy of technology and culture together with Prof. Van Riessen had to be changed. Instead, Strijbos joined then the Department of *Social-Cultural Philosophy*, headed by Professor Griffioen. At about the same time, Strijbos sought international cooperation with colleagues with whom he could share his philosophical interest in systems thinking and the philosophy of technology. One of the first contacts was with Donald de Raadt, whom he traced through a publication in an academic journal in the field of systems thinking. This contact and subsequent dialogs led to their establishment of the *Centre for Philosophy, Technology and Social Systems* (CPTS), in 1995, an international, interdisciplinary academic cooperation in the fields of philosophy, technology, social sciences in a framework of systems thinking.

Centre for Philosophy Technology and Social Systems

In 1995, Strijbos was the principal organizer of the annual conference of the International Society for Systems Sciences (ISSS) at the *Vrije Universiteit Amsterdam*. Donald de Raadt was then the president of the ISSS. The dialogs with Donald de Raadt culminated in a long-term collaboration. Strijbos presented courses on systems thinking at Luleå University of Technology, Sweden, where Donald de Raadt resided. Andrew Basden, from Salford University, UK, who also had a keen interest in philosophy and the use of information and communication technologies, soon joined this cooperation. In this cooperation, Amsterdam, Luleå, and Salford expanded to include a dozen doctoral students, with annual working conferences held in Maarssen, Netherlands. Central to this cooperation was the three founders' shared interest in the philosophy of Herman Dooyeweerd. The CPTS initiative can be regarded as a second major achievement (the ACTA initiative was the first), and represents an integration of faith and theology with thinking, where philosophy interacts with several specialized disciplines and their actions.

At the ISSS conference in Budapest in 1996, Strijbos met Professor Dries de Wet and Dr. Annemarie Potas from the Potchefstroom University for Christian Higher Education, Vaal Triangle Campus, South Africa (now known as the North-West University). They shared similar interests and the view that science and faith should not be isolated. This relationship was formally established in 1997, through an interdisciplinary research project where Strijbos cooperated with his new South African colleagues. At that time, Strijbos formulated his ideas

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[7] See introductory Chapter 1 in the volume "De Medische Ethiek in de branding, Een keuze uit het werk van Gerrit Arie Lindeboom," edited by S. Strijbos, Buijten & Schipperheijn, Amsterdam, 1992.

[8] See Chapters 2, 3, and 7 in "Nieuwe Medische Ethiek," edited by S.Strijbos, Buijten & Schipperheijn, Amsterdam, 1985

and termed them "*disclosive systems thinking*," on which he wrote scholarly contributions[9] that attracted several scholars from the Centre of Science and Faith at North-West University to participate in the annual working conferences of the CPTS in Maarssen. This long-lasting cooperation with South African communities manifested another dimension of the integration pursued by Strijbos: an integration between the Southern and Northern hemispheres, with all their peculiarities.

From the Netherlands, there was a keen interest in the CPTS' unique cooperation and attempted integration from the *Institute for Culture Ethics,* especially from Dr. Jan van der Stoep. The intellectual cooperation between researchers within the CPTS resulted in a millstone publication of a book in 2016, edited by Sytse Strijbos and Andrew Basden, entitled *"In Search of an Integrative Vision for Technology."* For the first time, this volume presents, in a systematic and comprehensive manner, the unique research program of the CPTS. This program proses a conception of humans, society, and technology and its use in an alternative mode to the prevalent contemporary approaches and their straggle between the intentional-constructivist and the material-determinist approaches. After a decade of operations, the CPTS was transformed into the current "*International Institute for Developmental Ethics*" (IIDE).

International Institute for Developmental Ethics
Encouraged by his entrepreneurial brother Aad Strijbos, and with support from Aad's company CHR Investment B.V., based in Rotterdam, Strijbos started an initiative that led to the establishment of the IIDE in 2004. The IIDE is a scholarly institute with a practical mission, researching the extent, nature, and normative aspects of poverty, inequality, and injustice through local, regional, national, and international channels. In that sense, Strijbos succeeded in achieving a fuller integration of the concrete action, with faith and reason dominating the endeavors of the CPTS.

Although the IIDE is a fully independent organization without ties to any religious denomination, it takes Christian principles and values as its primary source for guidance and reference. As such, its views on Christian social responsibility lead the way to its vision, its mission, and its concrete services and products for the benefit of society. The IIDE's mission is to offer expert capabilities to enable people and organizations in the development environment to become more caring, creative, and free in the context of development, by operating on the basis of Christian values, such as service, love, justice, equality, freedom, human dignity, and solidarity.

The IIDE has two legally independent departments: one in South Africa and one in the Netherlands. The department in South Africa resulted from Strijbos' collaboration with Rev. Kiepie Jaftha, then chief director of community service at the University of the Free State (Bloemfontein), and his interactions with North-West University, based on an informal level and through personal contacts and incidental conferences on developmental issues. Prof. Annette Combrink, then rector at North-West University, served as one of the board members

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[9] Strijbos S. 2003 Systems Thinking and the Disclosure of a Technological Society: Some Philosophical Reflections in *Systems Research and Behavioral Science* 20: 119-131.

of the IIDE. Strijbos' leadership is manifested by the memoires of Prof. Lucius Botes, as follows:

> *"When I think of Sytse Strijbos when he first approached me while I was the Director of the Centre for Development Support at the University of the Free State, South Africa the following thoughts and impressions came to mind. I was immediately impressed with Sytse's knowledge of the South African faith-based development scene. At that stage, he already networked with some 80 plus people and organizations in South Africa. I was also struck by his focus that we should create some space where faith-based development practice should reflect on the ethics of the practice. He constantly reminded me how important it is to pursue an engaged scholarship that attempts at bridging the gap between scholarly and conceptual views and practical experience. This means mobilizing practitioners to have more theoretical reflections on their practice and encourage development scholars to reach out to practitioners."*

>   - Professor **Lucius Botes**, former "Director of the Centre for Development Support" and Dean Faculty of the Humanities, University of the Free State, South Africa.

Strijbos succeeded in engaging the "*Noaber Foundation"* as a donor and investor for the projects pursued in South Africa, such as helping small business owners in Qua Qua with their start-up investments. That work produced an academic book titled "*From Our Side*," 2008, edited by Steve De Gruchy, Nico Koopman, and Sytse Strijbos. In the book, several scholars from South Africa and the Netherlands present their vision of social and cultural development.

International Engagements

In his academic work, Strijbos has been invited to deliver lectures and full courses on various aspects of normativity, technology, and systems thinking in various countries for a number of years. On an invitation from Professor Donald de Raadt, one major engagement toward the end of 1990's was the development and annual delivery of a unique course on systems thinking to undergraduate students at Luleå University of Technology in Sweden. He has delivered multiple guest lectures in Asia, for example, in China at the invitation of the Chinese Academy of Social Sciences and at several universities in South Korea and Japan. He also has presented guest lectures in North America.

From 1997 to 2014, Strijbos visited South Africa two to three times per year, usually for two weeks. In that context, Strijbos was appointed as an associated professor in the newly established *Centre of Science and Faith* at North-West University, providing him with the context where science and faith could be addressed in an integrated manner. Together with the director of this centre, Professor Pieter Potgieter, Strijbos developed annual workshops for newly appointed academic staff at North-West University, that is, workshops addressing the relation between science and faith.

At the beginning of the 2000s, the government of South Africa introduced a new educational mode for institutions of higher education called the "The South African Qualifications Authority" (SAQA), which required all academic staff to have had exposure to the following:

- *Identifying and solving problems in which responses display that responsible decisions using creative and critical thinking have been made.*
- *Using science and technology effectively and critically, showing responsibility toward the environment and health of others.*
- *Demonstrating an understanding of the world as a set of related systems by recognizing that problem-solving contexts do not exist in isolation.*
- *Contributing to the full personal development of the learner and the social and economic development of society at large, by making it the underlying intention of any program of learning to make the individual aware of:*
  - *participating as responsible citizens in the life of local, national, and global communities;*
  - *being culturally and aesthetically sensitive across a range of social contexts.*

Prof. Daan van Wyk, dean of the Faculty of Natural Science of North-West University, appointed the then retired rector of the PU vir CHO, Prof. Carools Reinecke, to develop new material for the prescribed course in philosophy of science for third-year undergraduate students to comply with the new SAQA regulations. Moreover, all the students in the Faculties of Natural Science, Health Sciences, and Engineering had to pass that course. Prof. Reinecke recommended that Strijbos act as an advisor and collaborator in the development of the new course. Based on his wide experience in this field, Strijbos proposed an alternative focus to the course: Science, Technology, and Society (STS). In addition, he advised that at least four other collaborators from the Netherlands be appointed by the university to partake in the development of the new course – a proposal approved by the university. Strijbos acted as scientific coordinator and Prof. C. Reinecke as managerial coordinator of a team that included Dr. Ir. F.K. Boersma (*Vrije Universiteit Amsterdam*), Prof. Dr. M. de Vries (Technical University Eindhoven and Technical University, Delft), Dr. H. Jochemsen (Director of the Centre for Medical Ethics at the G.A. Lindeboom Institute, Ede), and Dr. J. van der Stoep (Director of the Institute for Cultural Ethics, Amersfoort). Under Strijbos' initiative North-West University was the first institution that formally complied with the new SAQA requirements.[10]

Strijbos' social awareness has been well known throughout his academic life, through his continuous focus on practice-oriented research and additional activities. Among others, he was a guest lecturer for several years at the *Foundation of Christian Philosophy*, where he taught courses at the University of Twente and Wageningen University, Netherlands. He has served as member of the Provinciale Staten in Utrecht (States-Provincial, which is the provincial parliament in the Netherlands), acted as an external advisor of a hospital ethics committee in the Utrecht region, and served many years as elder in the local church community.

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[10] The positive outcomes of the innovative approach to education are documented in Proceedings of the Annual Working Conference of the CPTS (Reinecke, C. (2008). Critical cross-field outcomes for all graduate education at the North West University of South Africa. In: *Proceedings of the 13/14th Annual Working Conference of CPTS*, Basden, A., Eriksson, D., Strijbos, S. (eds). CPTS: Maarssen, 66-81).

Strijbos has always been interested in the relation between technology, philosophy, and theology. His primary hobby is reading books that are intellectually challenging or about history. He enjoys reading to his grandchildren and loves hiking and multiday tours.

Strijbos' Message

Strijbos' book on the ethics of dentistry is a bold manifestation of his vision for the interaction between faith, intellect, and action. A starting point is that theoretical reflection should begin with a pretheoretical concern in the context of human affairs, which is fed into an intellectual reflection unconditionally founded on creedal convictions that require critical reflection. The results from such intellectual reasoning should be fed back into social intervention for the sake of humans flourishing. Strijbos is not against the use of technology and development of social affairs but is always critical about the way development and technology are conceived, used, and pursued in human affairs; he stresses the importance of an explication of a normative direction of development and the use of technology. His book on the ethics of dentistry contains a plea for a modern version of professional dentistry that applies to any profession. Its pages provide a guide, not a solution, for normative reflection on daily professional practices, where emphasis is placed on the practical situation and contact with the patient in the sociocultural context, where the latter conditions human actions in the clinical practice.

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Social Change in our Technology-Based World

Sytse Strijbos

Introduction

The following text was written as an introduction to the proceedings of the annual conference of the Centre for Philosophy, Technology, and Social systems, an international and interdisciplinary research cooperation cofounded by Strijbos. The chief motive for the inclusion of this text in this *Dr. Sytse Strijbos Festschrift* is to provide the reader with a short illustration of the kind of thinking that occupied Strijbos, and the research collaboration that he coestablished and governed.

Integrative framework

With slight exaggeration, one can say that change is the only constant factor in today's society, where everything is in flux – continuing change seems to be a basic condition for living in modern times. These extreme dynamics and fluidity of society (Bauman 2000) have been directly related to the complex of Science, Technology, and Economy since the Industrial Revolution of the 19th century in Europe. In past decades, the study of this complex has become a vast field of interdisciplinary research with many ramifications and approaches (see e.g., the *Encyclopedia of Science, Technology and Ethics*.)

To understand social change in a technology-based society first requires a conceptualization of the main terms "technology" and "society". One should realize, however, that both terms are container concepts or collective names and do not refer to a specific object. Furthermore, one must be aware that by distinguishing between such a thing as "technology" on the one hand and "society" on the other, one might already start from a false view of technology, namely, as something separate from society. Aiming for an integrative vision of technology and society, one should consider that technology is about people and thus a part of society, not unlike a meteorite that impinges from outside on our human lives and society. "We know that technology does not determine society: it *is* society. Society shapes technology according to the needs, values, and interests of people who use the technology." (Castells and Cardoso 2005: 3)

Figure 1 provides a schematic of an integrative vision, in which the lower part of the diagram represents "technology" and the upper part "society." In everyday language, technology usually refers to material artifacts, such as a cell phone, car, or laptop. Usually, we are unaware that each of these artifacts is, for its functioning, dependent on a comprehensive system, for example, to use a car, a system of roads, petrol stations, legal regulations, and numerous other amenities required. Characteristic of modern science-based technology is that a fundamental transition has taken place in the relation between technology and society, namely, from technology that consists of separate artifacts in the hands of individuals to technology as a total environment in which we live. This new relationship between technology and society concerns the "how" or foundation of the various human and social practices in which our daily life unfolds. These practices have become dependent on their

realization of organized "sociotechnical systems," such as transportation from the mobility system, medical support from the health care system, and schooling and training from the educational system. The transition from a traditional to modern society thus goes along with a fundamental and irreversible change of our living environment. Technology has become a new habitat for people, a technotope.
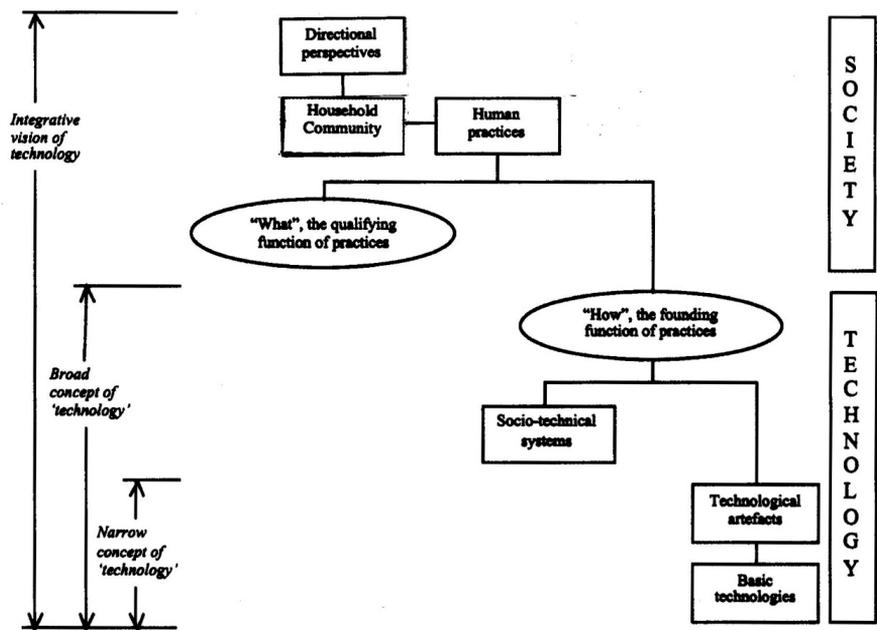
FIGURE 1   Schematic representation of technology as the founding of society

This fundamental transition to a modern technological world also has profound implications for the economic sphere of society and politics. Referring to Figure 1, one could observe that the sociotechnical systems that provide the foundation for societal life in its variety of practices also include the economic and political dimension, for example, the health care system. Since about the 1980s, the economy of health care has become a recurring matter of public debate. Notably, the traditional ethical relationship of medical practice between physician and patient has been dyadic. This situation has changed profoundly because this relationship is intertwined within a broader nexus in which several other parties are involved. This means, among other things for the physician, that their obligations to each patient must be balanced in a network of competing obligations and conflicting interests (see e.g. Haavi Morreim 1991).

Let us now turn our attention to "society" at large, the upper part of Figure 1. Through the centuries, the household has been the fundamental building block of human society - within

the household and family is where the exchange between the generations and their care for each other takes place. The fabric of society around the household has fundamentally changed since the rise of the Industrial Revolution. As long as the household as the fundamental unit of society persists, a broad range of human practices has gradually differentiated from the household, a process that began with the organization of labor and technical production in factories. The challenge for social change in a modernizing society can now be understood as the dual task of preserving the household as the ethical core of society and opening up the household and the potential of the various human practices for the benefit of society. This means that the shaping of the "how," the technical-organizational foundation of society, should enable concretization of the specific "what" of each domain of human life along with the sustenance of healthy households in society.

It is difficult to ignore that peoples' behavior patterns vary among regions and distinct cultural backgrounds. The role of culture and religion is therefore a hotly debated topic, in particular, the debate related to the economic development of a society. In recent years, the debate has been triggered by the study *Culture matters: How values shape human progress* (2000), edited by Harrison and Huntington, and some later publications. In the scheme of Figure 1, the role of culture and religion for the development of our technology-based societies is accounted for by "directional perspectives." Traditionally, the household and local community play key roles in the transfer of basic cultural values, formation directional perspectives on human life, and communication about the world from one generation to the next. In a differentiated society, human practices must play a complementary role in the transfer of specific values, or echoing MacIntyre (1981: 178), in developing and maintaining the so-called "internal good"' of these practices.

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Reflections on the CPTS Model of Interdisciplinarity

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1. Introduction

In this short paper, I adopt the role of 'critical friend' to the Centre for Philosophy Technology and Social Systems (CPTS)[11] research programme, and the contribution of Sytse Strijbos in particular: I believe the CPTS model of interdisciplinarity has some significant strengths, and also some potential weaknesses that the researchers taking it forward might wish to address. Most of my critique refers to Strijbos and Basden (2006a), as this offers the grounding for the rest of the CPTS research programme. However, my focus on this should not be taken as a sign that I regard other contributions as less significant.

Over the coming pages I will first of all highlight what I see as the strengths of the CPTS model, focusing in particular on the value of the systems approach embodied in it, and its potential applicability to technologies beyond information systems (the practical focus of most CPTS authors to date). I will then offer two critiques. The first points to a gap in the model: the omission of ecological systems as an aspect of analysis. The second critique raises some questions about the nature of the links between research at the levels of the artefact and directional perspectives. I suggest that, when there are significant disagreements on the ethics of a technology, to the extent that some researchers wish to prevent its development and others wish to press ahead, we have to ask whether and how interdisciplinary co-operation should proceed.

2. The Strengths of the CPTS Model

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[11] CPTS research program is now under the umbrella of the International Institute for Development and Ethics (IIDE)

In my view, the CPTS model of interdisciplinarity has several important strengths: it is explicit about its theoretical underpinnings; is inclusive of ethical debates; takes a useful systems approach to understanding the relationships between fields of inquiry; is potentially applicable to a broad range of technologies; and can enable the incorporation of many more disciplines than are currently included in the CPTS research programme. I discuss each of these strengths in turn below.

2.1 The Value of Explicit Theory

The first strength is that there is an explicit theoretical rationale for the focus on basic technologies, technological artefacts, socio-technical systems, human practices and directional perspectives as the principle concerns flowing into interdisciplinary engagements. As Strijbos and Basden (2006a) make clear, these categories are derived from the philosophy of Dooyeweerd (1955). Although I am not in complete accord with Dooyeweerdian thought, I nevertheless appreciate that there is a coherent set of ideas lying behind the CPTS model. This is important because it takes us a step beyond models that are simply born out of strategic alliances between researchers from two or more disciplines who happen to share common interests. While alliances like these can be useful for pursuing focused projects with particular purposes, it is difficult for them to give rise to more general models of interdisciplinarity unless there is a focus on providing some theory that explains why the model might have utility beyond the immediate local circumstances in which it was generated.

2.2 The Incorporation of Ethical Considerations

In addition to being explicit about theory, the CPTS model is inclusive of ethical considerations under the heading of 'directional perspectives'. This is important because there is a tendency in modern societies for ethical issues (about which ends to pursue and why) to be separated from technical ones (how to implement the ends that have already been pre-determined) (Habermas, 1984a,b). Even some supposedly participative approaches to information technology planning give people scope to debate means (ways to implement technologies) but not ends (the missions of their organisations that give rise to desires for technological solutions) (Willmott, 1995). By incorporating the research domain of 'directional perspectives' into the CPTS model of interdisciplinarity, and by making it clear that these can *frame* debates about technology (as well as being impacted by technological innovations themselves), it becomes much more difficult to marginalise ethical concerns than might be the case if the human dimensions in the model were restricted to socio-technical systems and human practices. Clearly, the strong inclusion of ethical considerations comes about because of the theoretical influence of Dooyeweerd (1955), but it makes the model equally useful from a critical theory standpoint (e.g., Habermas, 1984a,b) or a critical systems perspective (e.g., Ulrich, 1983; Jackson, 1991; Gregory, 1992; Oliga, 1996; Midgley, 2000; Córdoba and Midgley, 2003, 2006, 2008). For most writers on critical systems thinking, ethical reflection and dialogue are essential aspects of inquiry (interdisciplinary or otherwise).

2.3 The Systems Approach

The CPTS model also offers a strong *systemic* conceptualisation of the relationships between the various kinds of research that flow into interdisciplinary practice. Strijbos and Basden (2006a) focus on the *integration* of ideas across the levels of basic technologies, technological artefacts, socio-technical systems, human practices and directional perspectives. Here, they draw upon Boden's (1999) understanding of integration (one discipline learning from another), although there is actually a long tradition of integrative research going back to some of the earliest work in systems science (see, for example, Bogdanov, 1913-17; von Bertalanffy, 1956; Boulding, 1956; Miller, 1978; Troncale, 1985; Bailey, 2001; and Midgley, 2001). Many authors have tried to transcend the limitations imposed on inquiry by seemingly arbitrary disciplinary boundaries. While some of these (e.g., von Bertalanffy, 1956) have viewed integration as the generation of a new 'general system theory' to complement or even replace the old disciplinary ones (Boden, 1999, is critical of this), others take a different view. It is especially interesting to read Boulding (1956), who offers a 'skeleton of science' that is structured into similar levels as the CPTS model, and Boulding even recognises the relevance of spirituality – although there are actually more levels in Boulding's framework (and a tighter hierarchical relationship between them[12]) because his purpose is to provide a model for use across the disciplinary sciences, not just within the field of technology.

2.4 Applicability to a Broad Range of Technologies

Although the CPTS interdisciplinary research community has taken information systems as its first application domain, Strijbos and Basden (2006a) are explicit that their desire is to generate ideas that can be of use to research a wider set of technologies. I have therefore decided to test the wider applicability of the CPTS model through two simple 'thought experiments'. I have taken two technologies – workplace drug testing and genetically modified organisms (GMOs) of use in food production – to see whether the levels of analysis in the CPTS model are able to account for the various different issues that I am aware are being researched in these areas. I am not a specialist in either of these fields, yet I have taken an interest in some of the issues associated with them. Each is discussed in turn below, starting with workplace drug testing.

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[12] Boulding (1956) proposes a tight hierarchy, with simpler, smaller sub-systems being the 'building blocks' for the emergence of more complex, larger-scale systems. While there is a *general* movement from small to large in Strijbos and Basden's (2006a) list of basic technologies, technological artefacts, socio-technical systems, human practices and directional perspectives, I know these authors are aware that a strict hierarchical representation is problematic. The problems become particularly evident when you look at the relationship between socio-technical systems and human practices. A socio-technical system can be as small as a department within an organisation or as large as the global economy. Therefore, the relationship between socio-technical systems and human practices cannot be described simply as a class of systems (socio-technical ones) within a wider human environment: some socio-technical systems may *contain* human practices, and other human practices will be outside, and mutually influencing, those systems. The exact relationship between socio-technical systems and human practices therefore needs to be defined in a locally meaningful way within each interdisciplinary research project.

The basic technologies of workplace drug testing are chemical markers that indicate the presence of illicit drugs in urine samples. These chemical markers are the basis for the production of testing kits (artefacts). The kits are deployed within socio-technical systems: organisations wishing to test their employees in order to improve safety in the workplace (drug testing is generally introduced in relation to safety-critical occupations, although some employers use it more widely). Various human practices may be impacted, including personnel selection (drugs testing can become part of the recruitment process), counselling for people with drug and alcohol problems (many testing regimes are introduced alongside rehabilitation programmes) and drug-taking behaviour (people may stop taking drugs, moderate their use, or shift to drugs that are less easy to identify in a urine sample). Finally, at the level of directional perspectives, various ethical issues are relevant: e.g., those surrounding the tension between public safety and personal freedom. It seems to me that the CPTS model can capture all the main concerns of researchers looking at workplace drug testing, and it reveals substantial scope for interdisciplinary engagement.

Next we can look at GMOs. At the level of basic technologies, the functions of various genes have been identified, and new genetic combinations with desired properties have been developed. At the level of the artefact, crops are produced (e.g., genetically modified, disease resistant maize plants) using the results of the basic genetic research. These are then deployed within socio-technical farming systems, and these in turn interact with larger systems, including those associated with retail and international trade. Human practices of farming and eating are affected, as are political practices (e.g., there may be an increase in direct action protests). Finally, at the level of directional perspectives, the ethics of genetic modification are debated in research publications, the media and amongst ordinary citizens.

In the GMO example, I suggest that *most* (but not all) of the relevant research themes are accounted for by the CPTS model (I say 'most' because ecosystem research is not explicitly included, and I'll pick up on this later). Most importantly, the need to link together research at the various levels becomes quite apparent once we explore the connections between them. My own view is that the basic/artefact research on GMOs is still, by and large, overly disconnected from ethical research, despite the fact that many scientific authorities now recognise that the GMO issue (together with some other issues debated in the latter half of the 20th Century) has brought the whole credibility of ethically-disconnected science into question (e.g., ESRC Global Environmental Change Programme, 1999). For some GMO research that seeks to overcome this problem, see Cronin et al (2014).

Based on the two examples above, and the CPTS research on information systems presented elsewhere (Strijbos and Basden, 2006b), I believe it is reasonable to conclude that the CPTS model of interdisciplinarity may well be useful for research across a range of technologies (but with some caveats, to be explained shortly).

2.5 The incorporation of a Wide Range of Disciplines

A final strength of the CPTS model is that it has the potential to incorporate a wide range of disciplinary perspectives from the sciences and humanities. In relation to information

systems, the various chapters in Strijbos and Basden (2006b) demonstrate the inclusion of computer engineers, information systems practitioners, management scientists, systems thinkers and philosophers within the CPTS interdisciplinary network. However, this is a relatively limited range of disciplines in comparison with those that might need to be involved in interdisciplinary research on workplace drug testing (biochemists, manufacturing technologists, organisational analysts, economists, psychologists, psychiatrists, social workers, sociologists, policy analysts, systems thinkers and philosophers) or GMOs (biologists, agricultural scientists, economists, political scientists, sociologists, ecologists, systems thinkers, philosophers and theologians). The disciplines in brackets are just my own suggestions for inclusion – the potential scope is no doubt wider.

3. Critiques of the CPTS Model

Having highlighted what I see as the main strengths of the CPTS model of interdisciplinarity, it is now time to look at two potential weaknesses: the absence of an explicit focus on ecosystems, and what appears to be the assumption that scientific research into basic technologies and artefacts can sit harmoniously alongside philosophical research on directional perspectives, even when philosophers are advocating the abandonment of the technologies in question. I deal with each of these in turn below.

3.1 Ecosystems Research

The 'thought experiment' on GMOs that I briefly described above highlights a missing level in the CPTS model: the level of ecosystems. Of course, one could argue that ecosystems research needs to be conducted as part of the existing foci of the model: at the levels of the artefact (where ecological impacts of GMOs might be assessed), the socio-technical system (which people might claim includes ecological elements alongside the technical and social ones) and directional perspectives (where ecological arguments could be used to support either pro- or anti-GMO positions). However, it is *always* the case that the ecological, ethical, social and technical levels are relevant to one another – it is precisely the point of the CPTS model to demonstrate and formalise this. Therefore, to make the ecological implicit in the technical, ethical or social is to accept an aspect of the reductionist rationality that the CPTS model has been designed to challenge.

Worse than this, I suggest that the marginalisation of ecological concerns is systematically prevalent in Western political (and also many academic) discourses and practices (although thankfully less so than just one generation previously). There is therefore a danger that, left unaltered, the CPTS model will act to reinforce this marginalisation. I say that the marginalisation of ecological concerns is *systematically* prevalent in Western discourses and practices because I believe that marginalisation processes are far from random. Elsewhere, I have written about this at length (Midgley, 1994). Here I shall simply point out that the marginalisation of environmental issues has resulted from the dominance, over several hundred years, of anthropocentrism (seeing humankind as the centre of things, somehow disconnected from our environment) – and Western philosophy has not been exempt from

making anthropocentric assumptions. Even some systems thinkers (let alone philosophers) root the origins of rationality in either the individual human mind alone (following Kant, 1787) or linguistic communities (following Habermas, 1984a,b), thereby ignoring Bateson's (1972) insight that both mental and social phenomena interact with ecological systems (Midgley, 2002). From Bateson's (1972) perspective, rationality can be seen as a product of the wider systems we participate in – not a product of human beings or communities in isolation (also see Midgley, 2000).

If the proponents of the CPTS model want to take this point seriously, they will be faced with a dilemma: either remain faithful to their original translation of Dooyeweerdian philosophy into a framework for interdisciplinarity, thereby preserving the marginalisation of ecosystems research, or further develop the model to incorporate the ecosystems focus. Without conducting some new research, I am unsure whether or not this will necessitate revising some of the original Dooyeweerdian concepts, but in my view the whole issue is worth looking into. As I see it, exploring the ecological impacts of technologies (at local, regional and global levels) is a pressing priority, and we marginalise this at our peril.

3.2 Dealing with Conflicts over Normative Beliefs

My second critique of the CPTS model comes from asking the question, 'what if some researchers wish to prevent the development of a technology?' It seems to me that the CPTS model already pre-supposes the existence of a given technology (such as information systems), and the task of the interdisciplinary research community is to bring their various perspectives to bear on it, supporting each other in making everybody's work more systemic. This is certainly a laudable aim, but what when a technology is at a conceptual or early developmental stage and normative explorations at the level of directional perspectives lead to a conclusion that it is illegitimate? In such circumstances, will philosophers of technology (or others engaged in research on ethics) be expected to co-operate with those whose mission is to bring the 'illegitimate' technology to fruition?

A rejoinder to this question from an advocate of the CPTS model might be that this is *exactly* what needs to happen: without interdisciplinary engagement there will be no systemic thinking about the technology and therefore no chance to affect its development. My problem with this answer is that it is a little naïve with respect to the power relations that surround the production and deployment of technologies. Most technologies are produced by companies who make substantial investments in research and development. While they expect some ideas to fail, they also expect enough to succeed to yield a return for their shareholders. These companies therefore have significant vested interests, and the scientists working for them are rarely immune to commercial pressures: in many research and development divisions, the continued employment of scientists depends on the results they achieve. There is therefore an incentive for people working at the levels of basic technologies and artefacts to draw narrow boundaries around their research and exclude collaboration with people bringing them the very worst kind of 'bad news' – that their new idea might, from some points of view, be considered completely illegitimate.

Again there might be a rejoinder from an advocate of the CPTS model. Surely closing off to this bad news is not *really* in the self-interest of a company developing a new technology. Doesn't a belief in *enlightened* self-interest dictate that the company should be aware of potential problems with the technology so that they can address them in advance of a commercially damaging crisis? This is certainly the logic I have used myself when discussing the value of systems thinking with managers and policy makers. I believe that, if companies can be persuaded of the utility of a systems approach, then it is usually worthwhile for philosophers of technology (and others with an interest in ethics) to engage with those developing a seemingly 'illegitimate' product – *as long as this engagement is meaningful*. However I suspect that, in the majority of situations, the volatile mixture of commercial self-interest, the desire for secrecy so that the company can gain some competitive advantage over others in the same market, and fear and distrust of people with radically different perspectives will either prevent engagement altogether, or will limit this engagement to a tokenistic recognition of other points of view without there being any real prospect for changing the technology in question. In the case of engagement that is completely blocked, the philosophers of technology (and others with ethical concerns) will know where they stand: they will be better off working independently, or through alliances with other stakeholders, to make their case in various civil society fora. It is the tokenistic form of engagement that is more worrying: it is conceivable that the CPTS model might be used to demonstrate a coherent logic of engagement, thereby allowing ethicists to be 'captured' (or even duped) by those who have no real intention of reflecting meaningfully on their chosen path for action.

The issue is therefore whether use of the CPTS model of interdisciplinarity may, in situations where there is a strong normative conflict, result in a bias towards the values of the developers of a technology, with ethicists getting unwittingly tied up in pseudo-dialogues with their opponents. Anyone who is sceptical about my critique might ask themselves how often scientists with a nascent technology, employed by a company which has invested in its development, knowingly abandon that technology after hearing the arguments of philosophers. I would love to be proven wrong, but I suspect that this is a very rare occurrence indeed.

If the proponents of the CPTS model want to take this point seriously, I suggest it should result, not in the abandonment of the model (it has some significant strengths, and represents an ideal of good practice), but in further critical reflections on when and how it should be used. If we are dealing with less controversial technologies, such as information systems, this is not a major issue: the vast majority of people regard information systems as a 'good thing', and the need for interdisciplinarity arises because of problems in making the technologies work to their best advantage in social systems (without subordinating human desires to technological dictates or creating unwanted side-effects). The value of the CPTS model is therefore more or less self-evident in this scenario. However, if we are talking about a controversial technology in the early stages of development (such as GMOs before they went into commercial production), this is another matter entirely. If there is a chance of the CPTS model being co-opted to promote pseudo-dialogue rather than meaningful engagement, then social researchers might need to think seriously about how they explore situations characterised by value conflicts and power relationships prior to, alongside of, and/or instead

of engaging with technology development. For this purpose, some of the literature on critical systems thinking (e.g., Ulrich, 1983, 2001a,b) and systemic intervention (e.g., Midgley, 2000; Córdoba and Midgley, 2003, 2006, 2008; Pinzón and Midgley, 2011, 2013) may be useful, as writers in these areas have been working with questions of power and participation for over twenty years.

4. Conclusions

In this short paper, I have sought to reflect on the strengths and weaknesses of the CPTS model of interdisciplinarity so as to support its further development. In my view, there are some significant strengths to the model that make it *worth* developing: in particular, it is explicit about its theoretical underpinnings; is inclusive of ethical debates; proposes systemic relationships between fields of inquiry; is potentially applicable to a broad range of technologies; and can enable the incorporation of many more disciplines than are currently included in the CPTS research programme.

However, there are also some potential weaknesses that only come to the fore once we think of the model in relation to technologies other than those to which it has already been applied. My reflections on the GMO issue have raised a question about where ecosystems research might fit. I suggest that a new 'level' (ecological systems) is needed in the CPTS model, and further work would be useful to see whether this adaptation will necessitate any rethink of the philosophy underpinning the CPTS research programme. The controversial nature of the GMO issue also raises a question about how those developing a technology and those opposing its development could realistically be expected to collaborate on interdisciplinary research. As I see it, the worst case scenario is not a breakdown of dialogue (then people know where they stand), but co-option of the CPTS model by vested interests to enable a *pseudo*-dialogue that effectively neutralises the perspectives of those arguing that a technology is illegitimate. To avoid this kind of scenario, proponents of the CPTS model may be able to learn more about how to explore situations characterised by value conflicts from people in neighbouring research communities engaged in critical systems thinking and systemic intervention. These are my own interests, and I look forward to a continuing dialogue.

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A Dooyeweerdian Critique of Systems Thinking

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Abstract
Systems thinking has developed over the decades, into several streams, which seem to operate in parallel with little dialogue between them. Each stresses different theoretical issues or problems but, in addressing them, other deeper problems are revealed that are often ignored. This essay briefly reviews three of the streams with the theoretical issues they tackle, and some of the deeper problems. To address these deeper problems, and also to facilitate dialogue between the streams, Dooyeweerd's philosophy is employed to reintepret the theoretical issues in new ways, in which meaning is central. This initial proposal calls for further research.

1. Introduction

In its various forms, systems theory has been employed as a framework for understanding many issues, most related to the relationship between entities and environment. Systems thinking has developed over the decades, into several streams, each of which stresses different theoretical issues: holism, the system, its parts and its environment, and societal systems. As such, each stream throws up new problems, some of which are ignored, ("elephants in the room"). (The use of the word 'system' as in 'systematic' is not considered here.)

Sytse Strijbos (2010) sought to bring together systems thinking with Dooyeweerdian thinking, especially discussing how systems thinking may be interdisciplinary and bringing in a concern with normativity that most systems thought lacks. However, there has been no systematic consideration of how Dooyeweerdian thinking can dialogue with systems thinking in each of its forms.

This article explores the contribution that Dooyeweerd's (1955) ideas can make more generally to addressing such problems, including his law-oriented view of subject and object, his idea of irreducibly distinct aspects, and his presupposition that meaningfulness, rather than existence, is the foundation. First, issues that are important in several systems discourses are identified, along with problems. Then these are discussed in the light of Dooyeweerdian thought.

2. Systems Thinking in its Varied Forms

For convenience of discussion, systems thinking is separated into three streams, which stress different major issues, and each of which contains several discourses. The discourses overlap and some discuss issues from other streams. A number of critical questions or problems will be raised as the discussion proceeds.

2.1 Systems Thinking and Holism

Systems thinking is seen by many as an antidote to reductionism, as an holistic approach that tries to be sensitive of the wider world, and not just focus narrowly on entities. Reductions are of many kinds, but the kind that is problematic concerns how we see the world, and reductionism is an adherence (explicitly or tacitly) to a limited way of understanding the world, such as from physicalist, functionalist or managerialist perspectives. To Midgley (2000, 39) reductionism sees the world as "simple, objective, causal", but this does not adequately express all that systems thinking embraces, which can include the non-causal and subjective. Yet some reductionism does not assume causality, so Clouser's (2005) approach is preferred here, which defines reductionism in terms of elevating an aspect of reality, with the result that 'nothing but' that aspect is important in practice, and required for full explanations of all other phenomena.

Systems thinking opposes two tendencies of reductionism: (a) to assume that a whole can be fully explained in terms of its parts, and (b) that the whole may be understood without reference to its environment. Thus systems thinking stresses the *whole* rather than the collection of parts that comprise it: the whole is more than the sum of its parts. A system is more than the sum of its subsystems.

The idea of holism is attributed originally to Smuts (1927), who thought that seeing the universe in terms of 'wholes' rather than in terms of, for example, matter or spirit. It is wholes, rather than parts, which provide the better account. Smuts discussed the structure, dynamism and causality of wholes, and identified a provisional suite of 'gradings' of holism (material, body, animal, personality, groups, spirituality). However, Smuts and others tend to presuppose the possibility of wholes: what is it that makes wholeness and holism possible?

Systems thinking holism addresses not only the whole-and-its-parts but also the whole-within-environment (von Bertalanffy 1968; Ackoff 1963). Systems thinking takes account of how a system interacts with its *environment* while maintaining its own identity within that environment.

Two major applications of this idea are in the life sciences (organisms in biological, physical and psychical environment) and the organizational sciences (organizations in social, economic, legal and other environments). The question remains, however, on what basis we may differentiate types of wholes and types of environments. Bunge (1979), for example, excluded the possibility of psychical systems "for fear" that some might posit disembodied spirits as systems; fear does not seem valid as a basis for deciding which types there might be.

What differentiates system from environment, especially in the organizational field? In the practical context of wanting an holistic *systemic intervention*, Midgley (2000) discusses the idea of *boundary* between system and environment in some depth. It is the concerns of a stakeholder group that defines the boundary that is assumed by that group for a system. From

this arises an ethic (values, purpose in action and its associated rituals), which might conflict with other ethics. One group might be 'sacred' (dominant or central), with the other treated as 'profane' (disparaged, marginalized or ignored). Midgley, however, discusses only the *processes* surrounding the operation of boundaries and presupposes differences in concern and stakeholder group. He gives little attention to grounds on which it might be valid to differentiate these. He seems to allow for multiple boundaries (e.g. geographic, social, economic, legal, religious) but does not explicitly discuss this, yet to be able to handle these is vital for discussing human activity systems.

Checkland (1981) introduced what became known as *Soft Systems Thinking* (SST) as a way to address issues in *human activity systems* like organizations and businesses, and groups within them. This recognises that what is a 'system' depends on the way people see it, especially on their *Weltanschauung* (way of seeing the world). Checkland and his colleagues developed extensive practical tools for systems thinking in organizational contexts, including *Soft Systems Methodology*. For example, six main things need to be understood about any human activity system: CATWOE, its customer, actor, transformation, *Weltanschauung*, owner and environment.

Yet SST has been criticised by *critical systems* scholars on two accounts. Firstly, SST has no explicit place for normativity, except that which is completely at the mercy of the particpants' *Weltanschauungen*, and hence SST's holism is still constrained by the *Weltanschauungen* of those present. Secondly, SST has little place for societal structures, such as power or ideology, which 'make' people do what they do. Midgeley's (2000) systemic intervention does take structures into account, and even a system's effect on structures in the environment, but still has few firm grounds for normativity.

2.2 Systems Thinking: The System and Its Parts

Systems thinking must have an idea of what a system is. A number of basic propositions are widely agreed, though sometimes a little fuzzily, such as: a system is composed of *parts* that are *related* to each other inside a *boundary* that defines the system as a *whole*. Each part or sub-system may itself be seen as a system, and vice versa: any system may be seen as a sub-system of its environment; this places great emphasis on the *part-whole relationship*. System activity is seen in terms of systems receiving inputs and transforming them into outputs - but is this sufficient? Ackoff & Emery (1972) and many others hold that systems have *purpose;* what constitutes purpose?

Many kinds of entity have been considered systems: manufactured artefacts like bicycles, organizations, physical things like galaxies, living things, and even society itself (Ackoff 1974). This led some to ask how different types of system relate to each other, and Bunge (1979) differentiated five levels of systems (physical, chemical, biological, social, technical) and Boulding (1956), nine levels of systemness - static, simple-dynamic, cybernetic (control mechanisms), open or self-manufacturing, societal (plants), mobile and self-aware (animal), self-conscious (human individual), socially-self-conscious (human society), transcendental (ultimate, absolute, inescapable). But on what basis should we judge, or choose between, such suites of levels?

Hierarchy theory (Pattee, 1973) tries to identify principles of such levels, such as: the relationship between levels is asymmetric, entities at each level have properties that characterize that level, an entity may belong to several levels, levels of observation differ from levels of organization, each level imposes different kinds of constraint, and so on. But philosophy would ask what makes levels, and differences between levels, possible?

Systems are *dynamic* and yet exhibit a certain *stability*. Systems are complex and Ashby (1956) devised his *Law of Requisite Variety*, which states that for a system to be stable, then it needs an internal control system that has at least as many states as the system being controlled. This may be extended to say that a knowing-system (e.g. human or knowledge base) can only understand systems that are simpler than itself.

In living systems, Maturana and Varela (1980) employed the idea of *autopoiesis* as a way to account for how biotic organisms maintain distinctness from the environment while depending on it physically and continously interchanging material with it - as *open systems*. Midgley makes two criticisms of autopoiesis. One is that the plurality of kinds of phenomena are reduced to the biological. How can we understand the stability and integrity of a system without such reducton?

A partial answer may be given by Beer's (1984) *Viable Systems Model*, which was devised in organizational science. it identifies what subsystems a system (of organizational kind) needs to have in order to maintain viability. However, does this model reduce everything to the organizational aspect?

Midgley's second criticism is that Maturana's claim that autopoiesis is 'scientific' boils down to what happens to be meaningful to a consensual community. Given that the community in which the 'theory' of autopoiesis is discussed already accepts pluralism as a starting point, does it do any more than reinforce existing beliefs of that community?

We may also add the questions, What constitutes stability, viability or integrity of the system? Which of many environmental instabilities do we take into account, ranging from random atomic trajectories to the vicissitudes of fashion or markets? If stability is defined in terms of the persistence of the system over time, we must first define what it is meaningful to take into account in judging persistence.

A living system seems also to be a physical system. So some began asking how this could be. Driven by adherence to ideas of evolution, many asked how living systems could evolve or emerge from physical systems. *Emergence* is offered as an explanation: 'higher'-level properties (or 'patterns' or 'regularities') like life emerge from 'lower'-level properties meaningful to chemistry and physics. An emergent property is a property of a system that is not a property of any of its sub-systems (Hartmann 1952). (Midgley (2000) uses 'emergence' to refer to causal repercussions, e.g. deaths emerge from drink-driving, but that is not the meaning used here.) The idea of emergence has been around since Aristotle, but Goldstein (1999) gives a modern characterization of it as: features not previously observed, coherence over a period of time, 'wholeness', a product of dynamic evolutionary processes, perceivable ("ostensive"). However, for every account of emergence so far offered, is not meaning 'smuggled in' from a different level in order to recognise the properties that have emerged? For example, we say that life emerges from chemical subsystems, but on what valid basis do

we have the idea of life as something important, as opposed to mere ultra-complex-carbon-chemistry?

The questions remain as 'elephants in the room', which few recognise and fewer discuss. They presuppose pre-given meaning.

3.3 Systems Thinking and Social Structures

"It's the system, and I'm caught!" This meaning of 'system', as "an organized society or social situation regarded as hampering, stifling or stultifying" (Webster 1975, 2322) cannot be tackled with the concepts developed above. Neither can the idea of, for instance, economic system. 'System', here, refers to structures within which we live and which constrain, and perhaps enable, that living. Normativity, insofar as its implication of 'ought' constrains us, may be seen as system. (The term, 'systematic' would also seem connected with this.)

This was how Weber (1994) and Parsons (1971) used the term 'system'. System is that set of structures that constrain and guide our activity, and which operate by mechanical rules. These rules guide the activity of people within such systems. They are mechanical rules insofar as they are designed to be obeyed without question and this means, supposedly, that they remove responsibility from the individual and remove meaningfulness and normativity from their activity. In 'the system' - whether of an organization, the state or society - life becomes meaningless. Systemic life is contrasted with the lifeworld by Habermas (1987), which is replete with meaning and normativity.

Two questions arise: First, does this view hold true? Paradoxically, the 'mechanical' rules that are system embody a presumed normativity, an idea of what is right and wrong. Even if this were not so, Geertsema (1992) argues that the Weberian-Habermasian view does not hold true, pointing out that even those trapped in supposedly meaningless occupations can still find meaning and satisfaction even in the very midst of their work. The supposed mechanical following of rules only occurs because people tacitly agree do so. Geertsema's observation suggests that meaning and normativity may be inescapable.

Second, how may it be linked with the above ideas about system? Luhmann (1995) sought to link this with the above systems thinking, by developing a theory of *Social systems*. Social systems challenge the above systems thinking, and require new formulations thereof. If X and Y are two people, then, to X, Y is environment while, to Y, X is environment; if a system is always 'within' its environment, how can X be within Y within X? Does this suggest that the asymmetric idea of 'within' is inappropriate? As Luhmann pointed out not only are individuals within society but society is within individuals. Without resorting to such spatial metaphors, can we understand what kind of relationship this is?

Luhmann tries to account for this by saying that, within a highly complex environment, within the system boundary is a zone of a zone of reduced complexity, which is selected and processed by referring to *meaning*; it is also meaning that defines the distinctive identity of a system; this applies to both social and psychical systems, with different kinds of meaning. To Luhmann, social systems are systems of communication (of meanings). He suggests that the asymmetry of the part-whole relationship can be overcome by communication, which externalizes meaning from the individual by signification.

The idea of part-whole is inappropriate to explain the role that humans play in the operation of a social system. Traditional systems thinking might see the individual human being as part of a group, which is part of an organization, which is part of a subsystem like the economy, which is part of society. And yet the part-whole relationship is no longer adequate. Also, the relationship between the economic system or the education system with each other and with society differs from part-whole.

Luhmann and Parsons both discuss social systems within society, but while Luhmann considers society to be a nondescript environment, Parsons discusses how certain subsystems contribute to the functioning of society as a whole.

To Luhmann, human beings are not part of any system, nor even part of any conversation so that, curiously, not only is society the environment within which people operate, but people are the environment within which society operates, so that people can change society as well as society, people. This echoes, rather than solves, the fundamental problem above of social systems, of X within Y within X. Traditional systems thinking does not seem fully capable of addressing this.

Habermas (1987) discusses how system and lifeworld relate to each other. It is tempting to see society as a system: as a whole. Society-as-system has subsystems, e.g. the economy, and these may themselves be seen as systems that transform inputs into outputs.

Both society-as-system and its subsystems maintain themselves but the notion of autopoiesis is not sufficient, because it assumes a biologically-relevant environment. What is their environment? Perhaps the lifeworld. And yet, the relationship between society-as-system and lifeworld is not of the usual systemic kind, in that system rationalizes the lifeworld to become its subsystems, which is destructive of lifeworld.

There are other problems. Systematization of society leads to loss of meaning - and hence society-as-system lacks purpose. Habermas recognises that religion has previously accorded meaning, but with the supposed demise of religion, tries to find some other account. Habermas, however, ends up near a reductionism, of all human social activity to communication.

If we are to find insights about systems thinking from considering society as system then many of its cherished ideas must be modified, perhaps radically. But it is not yet clear how the two streams can be harmonized.

2.4 Overview

This shows the huge variety of thought in systems thinking. How may we understand it all? Many questions have been raised in discussing the streams of systems thinking, some of which are 'elephants in the room' - problems that have yet to be recognised and then addressed. Whereas systems theorists might try to resolve each problem piecemeal, it might be more interesting and beneficial if we can find a foundational approach which addresses most of them together.

On what fundamental basis is it valid to hold that the various characteristics of systemness are all important -- wholeness, part-whole relationships, purpose, environment, emergence, self-regulation, transformations? On what fundamental basis might it be proper to bring the two meanings of 'system' together, as their etymology would suggest should be possible?

Soft systems thinking seems to provide a partial answer to this question, in human subjectivity: it is human subjectivity that decides what is a system and where its boundaries are. However, this is not entirely satisfactory, in that it does not give any substantial meaning to systemness; it is merely one of those myriad of things that emerge from human subjectivity, and there is no answer to what differentiates systemness from, for example, beauty or preferences. And, as we have already seen, SST is not good at accounting for structures.

3. Dooyeweerdian Thought

If we ask that question, we find that most systems thinking discourses make the presupposition, rooted in Greek thought, that Being is the most fundamental state and that systems are primarily Beings. Dooyeweerd argued that this presupposition is fundamentally detrimental to philosophy and the various disciplines and that instead, it is better to conceive of Being as rooted in Meaning. "*Meaning*" wrote Dooyeweerd (1955,I,p.4), "is the *being* of all that has been *created* and the nature even of our selfhood."

3.1 Meaningfulness As Starting-Point

It is meaning, or as I shall call it here, *meaningfulness*, which makes systemness possible, and it is from an understanding of meaningfulness that we can understand and situate, and even integrate, most of the discourses of systems thinking.

Though meaningfulness refers to a Divine Origin of Meaning (Dooyeweerd 1955,I, 4), this meaningfulness is not 'imposed' directly by a Deity, but rather is a gift from the Creator to enable Creation to function with dignity.

Meaningfulness is something we and all things 'dwell within', rather than a property of things (Polanyi & Prosch 1975). "We have been fitted into this coherence of meaning with all our modal functions" (Dooyeweerd 1955,i, 4). A useful metaphor might be than of an ocean, in which fish swim and corals exist, but which also is the very thing that enables fish to swim and corals to exist. So meaningfulness is an 'ocean' within which all reality 'swims' and 'exists' or dwells, and which enables reality to 'swim' and exist. It is similar to Heidegger's insight that being is a dwelling within a world comprised of other beings, but here the dwelling is within meaningfulness rather than just among other beings that constitute the environment, and it is meaningfulness that enables both the system and its environment to exist and occur.

This meaningfulness is diverse, and Dooyeweerd delineated fifteen distinct ways of being meaningful, which he called aspects or spheres (quantitative, spatial, kinematic, physical, organic, psychic, analytic, formative, lingual, social, economic, aesthetic, juridical, ethical, pistic). As Basden (2008) explains in its Chapter III, all being, functioning, normativity, possibility, rationality, relationships, etc. can derive from meaningfulness and in diverse ways and of diverse kinds. Each provides norms that lead to overall good; for example the economic aspect directs us towards frugality, and the juridical aspect towards justice.

Each aspect is innately linked with others, by relationships of dependence (e.g. social functioning depends on lingual), and analogy, by which each aspect contains echoes of all the

others (e.g. the ideas of growth of an organization or economic growth are meaningful by analogy with the organic aspect but are not governed by its laws). Beware of analogy; it is subtle and may lead astray, as can be seen in the economic area.

3.2 Reinterpretation of Systems Concepts

This can help provide a new foundation for understanding systems. What follows are brief discussions of how each of the characteristics and problems of systems thinking may be reinterpreted (affirmed, critiqued and enriched) by Dooyeweerdian thinking, and how the main streams of systems thinking may be brought together.

1.System within Environment.
All systems exist and function within an environment, but this has two, not one, sides. Not only is there the fact-side of the system and all co-existing things with which it interacts, but there is also a law-side, which is the ocean of meaningfulness within which both system and its environment 'dwell' and enable them to be system and environment. From the perspective of meaning, there is no asymmetry between the beings of the system and the world.

2.Environment and its Diversity.
From the perspective of the law-side, environment is inherently of diverse kinds. We may identify a different environment with each aspect:

- a spatial and kinematic environment that surround the system;

- a physical environment, with which it exchanges physico-chemical materials;

- an organic environment for living things as an ecology of other living organisms;

- a sensory environment for animals, of seeing, hearing, feeling and motor responses;

- an analytic environment for human individuals of distinct concepts and ideas;

- a formative environment for humans, of artefacts and technologies, which individuals shape by formative power;

- a lingual environment, of messages, literature and bodies of recorded knowledge or information;

- a social environment, of relationships, roles and institutions;

- an economic environment, of resources and their production, management and consumption;

- an aesthetic environment, of enjoyment and harmony;

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- a juridical environment, of justice and injustice, and their expression in laws and social norms, and the means of maintaining them;

- an ethical environment, the attitudes of self-giving generosity or self-centred competitive defensiveness that pervades society;

- a pistic environment, of prevailing beliefs, presuppositions, aspirations, commitments and views of what is ultimately meaningful in life.

3.Wholes (Systems as such).

Dooyeweerd's theory of entities provides a sophisticated notion of a whole as a multi-aspectual thing. The being of the whole is its meaningfulness in each aspect. Thus a poem, *qua* poem, must have an aesthetic aspect, also a lingual aspect, and a physical aspect of medium, a formative aspect of structure, and is usually better if it is frugal rather than wasteful in word-use (economic norm). Thus any system-as-whole can be understood an a coherence of multiple spheres of meaningfulness, a different aspectual profile of coherence for each kind of system. That profile, Dooyeweerd called a *structure of individuality*, in that by it we could meaningfully describe each individual of a kind, and it also guides the individuals in their becoming and destiny.

Emergence, at least of the strong kind, may be understood as viewing the whole from the perspective of a later aspect, for example the organic rather than the physical. That is the 'smuggling in' of meaning.

4.Purpose of a System.

Purpose is to do with meaningfulness. Under Dooyeweerd, the purpose of a system is the aspect that most makes the system meaningful overall, as enabling what is good for the system; for example, biotic for living systems, economic for businesses. The multi- aspectual nature of systems suggests mutliple purposes, but there is one aspect, the *qualifying aspect*, which most clearly defines and guides the destiny of the type and which the functioning in all other aspects serves. There is also a *founding aspect*, which most clearly speaks about its coming-into-being. System purpose, then, is no longer a problematic notion.

5.System boundary.

It is this profile that offers a basis on which to delineate and understand system boundaries. Just as there may be many environments, and each system is multi-aspectual, it would be natural to expect multiple boundaries of a system. Checkland's (1981) fence-painting system is bounded spatially by the extent of the fence, but is bounded socially by the neighbourhood of those who will see and appreciate the fence, and bounded economically for example by the budget set for or by the painter. This can raise and answer the questions that Midgley's (2000) discussion of boundary omitted: how do we understand the concerns, and identify stakeholder groups, from which choices of system boundaries arise. This can then inform his discussion of the processesrelated to boundaries.

6.Weltanschauungen in Human Activity Systems.

Checkland's notion of *Weltanschauungen*, by which different people hold different views on what is the system, can be understood as a person's view that certain aspects are meaningful while others are less so. Indeed, Checkland explicitly defines the *Weltanschauung* as "that which makes the system meaningful". For example, the finance department of a company would adopt an economically-qualified *Weltanschauung* while the Directors of the company might adopt a pistically-qualified *Weltanschauung* (Mirijamdotter & Bergvall-Kåreborn 2006). In this way, Soft Systems Thinking retains its sensitivity to subjective assignment of value but need no longer be arbitrary. Moreover, since each aspect provides an inherent normativity, Soft Systems Thinking might obtain a normativity that it hitherto lacked (Basden & Wood-Harper 2006). *Disclosive Systems Thinking* (Strijbos 2000) is similar to SST but puts normativity central, recognises its diversity and tries to disclose it. Dooyeweerd's aspects may be employed in such disclosure (Goede et al. 2011).

7. Relationships between Wholes (Systems).
Wholes function as subject in the various aspects, in subject-subject and/or subject-object relationships. Whether it is a subject or object depends, not on the whole itself, but on how it functions in each aspect, and a system may be both subject and object in different aspects (Basden 2017). Thus, for example, when an animal climbs a rock for vantage (Gibson 1979) the animal functions in the psychical and physical aspects as subject, while the rock functions as subject in the physical aspect, by being rigid and offering friction, but as object in the psychical aspect, by affording climbability. On the other hand, two animals might mate or eat each other, both functioning as subjects in the organic aspect.

8. Part-whole Relationship.
Dooyeweerd differentiated the part-whole relationship from what he called enkaptic relationships. The relationship between a hermit crab and the shell it has found and made into its home, is one of *subject-object enkapsis*, not part-whole. The relationship between a town and its orchestra or university - and maybe between society and its various Weberian subsystems - is one of *territorial enkapsis*. The relationship between trees, insects, fungi etc. and the forest is one of *correlative enkapsis*, whereby the denizens generate the forest that enables them to exist. The relationship between society and human beings is one of correlative enkapsis, not part-whole. The *part-whole* relationship is that in which the part, *qua* part, has the same qualifying aspect as the whole but, independently of the whole, has an earlier qualifying aspect. Thus a lung is qualified by the biotic aspect only as part of the animal, but, when functioning on a bench, is qualified by the physical aspect of filtering and absorbtion.

9. Autopoiesis and Self-maintenance.
Autopoiesis is primarily an organic concept, referring to how organisms maintain their organic integrity in an environment with which they exchange physical materials. By analogy, it has been extended to, for example, how organizations maintain themselves as organizations, and society maintains itself. However, the mechanisms by which plants, organizations and society maintain themselves differ and must take into account the different qualifying aspects of each. Autopoiesis and self-maintenance are usually discussed and

studied by reference to their *processes*, but Dooyeweerd would suggest that we focus on their *meaningfulness*, because this is what defines most clearly what is to be maintained. For example, in a plant, the self-maintenance is deemed successful as long as it stays alive (organic aspect), while to a business, self-maintenance is deemed successful by reference to its economic aspect (usually encoded into company law as conditions for going into insolvency). This suggests that any general theory of self-maintenance is incomplete without explicit reference to the qualifying aspect of the system concerned, and probably other aspects of its structure of individuality.

10. Social Systems.

In social systems, each system is also part of the environment of other systems, which can be a problematic idea. Instead of trying to define system-environment relationships, Dooyeweerd would suggest thinking about how both systems are enabled in their very existence and functioning by the 'ocean of meaningfulness' within which both operate and which enables both to exist and function. Luhmann's conundrum that people are within society but society within people, is also resolved as follows: "society within people" refers to people functioning in the aspects that make "society" meaningful, especially the juridical, ethical and pistic, while "people within society" refers to correlative enkapsis in certain aspects as outlined above.

11. Society as System.

Society is not an entity in the sense discussed above, of being defined by a structure of individuality. Instead it, like a forest, is an *Umwelt*, which exists by virtue of *correlative enkapsis*, as a co-generative interplay between itself it its denizens. Though a forest functions primarily in the quantitative to psychic aspect, because those are the aspects in which its denizens function as subject, society functions in all aspects, because in all aspects human individuals function as subject and its functioning in each aspect is a subsystem thereof: its economy (economic aspect), education (lingual), judiciary (juridical), etc. In the ethical aspect, the 'subsystem' may be society's pervading attitude and in the pistic, its prevailing beliefs and presuppositions. Society may even be said to function in the physical and organic aspects if we take such issues as climate change and deforestation into account as societal phenomena. The supposed subsystems of society- as-system, such as the economic and educational systems, are not related by part-whole, but by territorial enkapsis. The self-maintenance of society is no longer by some subsystem of a viable system model, but by the functioning of its denizens in correlative enkapsis.

12. System and Loss of Meaning.

Habermas (1986; 1987) argued that system implies loss of meaning because it operates by mechanical rules. But this is unhelpful on two accounts: there is no necessary complete loss of meaning, and loss of meaning occurs by something other than rationalization. 1. This might be the case if all meaningfulness is only generated *ex nihilo* by attribution and signification of people, but if meaningfulness is an ocean within which all operate, then even the mechanical rules exhibit meaningfulness. At the least, as Geertsema (1992) points out, there is formative meaningfulness in the rules and there is probably some juridical

meaningfulness in that many rules 'make sense' in terms of justice, as well as economic meaningfulness in how resources are used, and aesthetic meaningfulness in that many rules are about maintaining harmonization. The problem of mechanicality of the rules is no longer to be seen as loss of meaning, but rather as an undue elevation of one aspect of meaningfulness, usually the formative aspect of achieving things or the economic aspect of efficiency. 2. Loss of meaning arises from other aspects being omitted or ignored. Since meaning always involves referring beyond (Dooyeweerd 1955,I, 4,110), nothing and no aspect can exhibit meaning in itself, when isolated from the others and from the central totality. When aspect or an entity is absolutized this occurs, and complete loss of meaning results.

13.System and Lifeworld.
Under Habermas, lifeworld forms an 'environment 'for mechanical system, but not in the usual systems sense. Under Dooyeweerd, lifeworld is the stock of background knowledge about everyday life. Everyday living is a functioning in all aspects without any one dominating. Lifeworld is thus inherently multi-aspectual, in which no single aspect has any prior claim to dominance. It is thereby replete with the rich meaningfulness and the normativity afforded by each and every aspect.

Humanly-generated rules express the normativity of one or few aspects. System, as set of rules, is thus seen as focused on a single aspect (or few). Rationalization of the lifeworld is an attempt to apply the analytic aspect to it, to pick it apart and maybe reconstitute it, and as such it falls away into nothingness, not because it is fragile, but because this is inherent to this kind of functioning, which Dooyeweerd calls the *Gegenstand* (Basden 2011). Differentiation of society Separating out distinct ways in which society might function and institutionalizing those ways, which does indeed involve the analytic aspect, is not necessarily a bad thing. Dooyeweerd discussed this at length, for example clearly differentiating society from the state, and this from the business, from the religious instution, from the family, etc. Each sphere of society is governed by a different aspect, and brings its own meaningfulness. Dooyeweerd argued that differentiation is inevitable if we are to disclose and open up the potential of the various aspects, for example opening up the lingual aspect with writing, drawing, printing, broadcasting and now ICT and the Internet. The problems that we experience with differentiated societal spheres lie not in differentiation as such but in the absolutization of various spheres (e.g. the economy) and the demand that other spheres serve it, and in the lack of attention to the inter-aspect coherence.

4. Conclusion

This essay has briefly reviewed three streams of systems thinking to reveal some of its deeper challenges. It has then outlined how it is possible to reinterpret many of the concepts of systems thinking from Dooyeweerd's perspective, in a way that retains the importance and thrust of each. No longer is 'system' taken for granted, but what systemness is has been exposed as rooted in meaningfulness. By moving them from their adherence to an existence presupposition, to a meaningfulness-oriented presupposition, each concept has been placed

on a new foundation, has been replanted in fresh soil. The soil is in many ways more fertile, and so many of the concepts have been enriched.

This opens up new avenues for research and discourse in systems thinking. The problems identified in Section 2 might be addressed if the Dooyeweerdian approach were to be developed, and the various streams of systems thinking have been painted into a single picture.

This paper is only a start. It is all too brief in both its overview of systems thinking and which concepts are meaningful therein, and its suggestions for a Dooyeweerdian reinterpretation are only sketchy. Both are in need of further development.

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The Quest of Metabolomics

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Abstract[13]

The term "metabolomics" was coined around 2000 to define a discipline that has since become an established science, the third of the genomics, proteomics and metabolomics triad. I formulated the following thesis to be explored in this essay: "*Though successive and more advanced biological and related sciences disclose life in more detail, the development of science* (also in metabolomics) *follows a never ending winding path (1) by being a human endeavour, (2) by dealing with the intricate fabric of life and (3) through the brokenness which is our common home.*"

As metabolomics is still a foreign science to some, I give an overview of its developmental path. In contrast to conventional science, metabolomics is distinguished by being an inductive science, is transdisciplinary and has a societal directedness. Some of its main aims thus include the discovery of biomarkers for disease, the commercialization of its findings and the contribution to precision medicine for the individual patient.

The argument of this thesis starts by reflecting on scientific development as the outcome of human endeavours; it is shown to proceed seldom in an uncomplicated and logical manner and often includes characteristically human events, underpinned by individual personalities and traditions. *"What is life*?" is a key question to biologists – I show that an ultimate answer eludes us due to the intrinsic complexity of Life. Although science has immeasurably illuminated our insights into life phenomena, the pathological techno-economic drive over time has created a cosmic reality of brokenness, which is our common home.

Scientists in the modern era have claimed that religion and science are two unrelated realms and accordingly have avoided any truthful view of an integrative meaning of life – of existence. Hope lies in a sense of a strong inner impulse (which is secular) to act against the brokenness of our common home and for us as Christians, a sense of calling (which is spiritual) driven by a conviction of Divine relatedness.

Keywords: metabolomics, human endeavours, fabric of life, brokenness, our common home

1.Introduction

"We are here to celebrate the completion of the first survey of the entire human genome. Without a doubt, this is the most important, most wondrous map ever produced by humankind" (Clinton, 2000). These were the opening words of President Bill Clinton on 26 June 2000 at the public announcement of the map of the human genome. It marked the outcome of fifteen years of concerted genomics research – sequencing, analysing and interpreting the human genome – through the International Human Genome Project. Expectations ran high on the academic and practical consequences of this momentous achievement. It was hailed as the first great technological triumph of the 21st century, taking humankind across a frontier and into a new era – a revolution in medical science whose implications far surpass even the discovery of antibiotics (Blair, 2000). Even so, profound insight at the ceremony was expressed by Craig Venter, co-founder and executive chairman of Synthetic Genomics, Inc., who conceded that the human spirit is at least as important as our physiology. "We're clearly much, much more than the sum total of our genes, just as our society is greater than the sum total of each of us" (Venter, 2000).

Most importantly, the complex relation between biological structure and function as illuminated through the map of the human genome, again revealed our limitations in dealing with life phenomena. Early estimates, following the mapping of the genome, showed that approximately 50% of distinct segments of the human genome are made up of stretches of DNA of no known function or significance (Brown, 1999). Virtually at the same time, limitations in genomics technologies set in motion the coming of further "omics" sciences, with genomics, proteomics and metabolomics forming the core triad. Contrary to the mono-disciplinary and reductionist character of science prevailing in the 20th century, the omics sciences are perceived as holistic. The mood in the scientific community, precipitated by the omics technologies, was that the dawn of ever more complete knowledge was at hand. Robert D. Hall, professor in plant metabolomics at Wageningen University and Research, succinctly expressed the initial view on metabolomics as a quest towards the "*holy grail … to gain a complete overview of the entire metabolic complement of an organism [plant]*" (Hall, 2006). Hall, however, implied that this voyage entails a winding path and progress will only be made through single steps or a small series of analyses which might at the onset seem inconceivable – "but, of course, future technological advances might prove us wrong." This early comment already underlined the central role of technology in the emerging field of metabolomics.

Promising as the holistic context is, I affirm that progress in science is an intrinsically contentious enterprise that will also prevail in the omics sciences. I base my view on experience as a scientist, on insights from the history of scientific development through the ages as well as on my personal belief and worldview. Against this background I formulated the following thesis to be explored in this easy: *Though successive and more advanced biological and related sciences disclose life in more detail, scientific development* (including metabolomics) *follows a never ending winding path (1) by being a human endeavour, (2) by dealing with the intricate fabric of life and (3) through the brokenness which is our common home*. The argument followed in this essay is to introduce metabolomics to the reader by exploring the early developmental path of metabolomics towards its present state, metaphorically expressed as the quest of metabolomics. Subsequently, the three characteristics that render scientific development as a winding path will be argued, illustrated

by examples from the historical development of biochemistry and by some trends already evident in metabolomics. Finally, the essay concludes with a brief eschatological perspective.

2. The Advent of Metabolomics

2.1 Background

The term "metabolome" was first used by Olivier, Winson, Kell and Baganz (1998) to describe the total set of metabolites synthesized by living organisms. Semantically, the term was fashioned by analogy with "genome" (the total DNA content of the genome of an organism) and "proteome" (the total protein content of an organism). In biochemical terminology, the metabolome refers to "the quantitative complement of all of the low molecular weight molecules [<1000 daltons (Da)] present in cells in a particular physiological or developmental state" (Olivier, Winson, Kell & Baganz (1998). Two further terms were coined to describe the scientific approach in investigations of the metabolome: *Metabonomics* was introduced by Jeremy Nicholson of Imperial College London (Nicholson, Lindon, & Holmes, 1999). Nicholson proposed "a new NMR-based[14] 'metabonomics' approach ... that is aimed at the augmentation and complementation of the information provided by means of the genetic and proteomic responses to xenobiotic exposure". Nicholson specifically defined metabonomics as "the quantitative measurement of the dynamic multiparametric metabolic response of living systems to pathophysiological stimuli or genetic modification". *Metabolomics* was introduced somewhat later by Oliver Fiehn of the Max Planck Institute of Molecular Plant Physiology, Potsdam (Fiehn, 2002). Fiehn highlighted the need for "a comprehensive analysis in which all the metabolites of a biological system are identified and quantified ... Since such an approach reveals the metabolome of the biological system under study, this approach should be called metabolomics". Initially, there was some confusion over the double terminology, but at present the two terms are used interchangeably, with the tendency in the literature towards the term metabolomics, which will be used here. The overriding initial view of this third omics science is that it represents the final level in a biological system, where the metabolites act as functional entities, unlike their structural nucleic acid and protein precursors. Metabolites thus express functional processes in biological systems but were soon realized also to reflect the influence of the surrounding environment on the biological system (Raamsdonk et al., 2001). Metabolomics consequently provides a new optic, a new power to visualize metabolite information within the context of the physiological, developmental, pathological and survival status of a biological system.

2.2 Characteristics of metabolomics

2.2.1 Metabolomics is foremost a *transdisciplinary science*
Very early in its developmental path, it was realized that metabolomics provides a fertile ground for creative thinking and for innovative technologies to uncover the vast potential

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[14] NMR: nuclear magnetic resonance spectroscopy

residing in the diverse biosphere. Several key characteristics, which differed from traditional biological sciences, were soon evident. First, metabolomics is foremost a transdisciplinary science (Madsena, Lundstedt, & Trygg, 2010) as illustrated in the conceptual model shown in Figure 1.
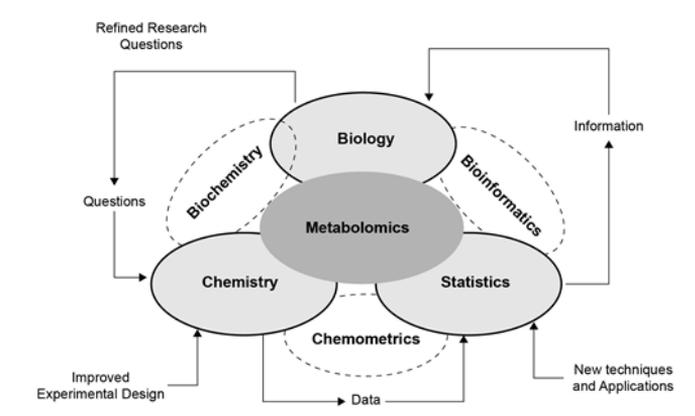

Figure 1. A conceptual model of the transdisciplinary nature of metabolomics. An initial research question is formulated by biologists. Inputs from scientists of different disciplines contribute toward refined questions, leading to the final question(s) formulated for the investigation. The subsequent process involve expert inputs from unrelated but coordinated disciplines, culminating in the final interpretation in which the biologists again take a leading role (Van Reenen, 2016).

Biology is the point of departure in metabolomics studies: new scholarly questions, not previously definable in the traditional sciences, now become feasible. The research material remained biological: organisms, organs, tissues, cells and biofluids. The modes of analyses, however chemical, required new technologies for measurement of high-throughput approaches to record a multitude of small molecules. It thus stimulated innovative analytical developments in the field of nuclear magnetic resonance (NMR) and hyphenated mass spectrometry (MS)[15]. The chemical data from these methods consist of numerical information on hundreds or even several thousand spectral values or chemical substances. Statistical methods required for analysis of such complex data likewise called for the development on new statistical, bioinformatics and data mining approaches, mostly of a multivariate nature. Interpretation of the functional meaning of the statistical information is beyond the ability of the statistics experts, but depends on biological scholars. Most importantly, the transdisciplinary approach is neutered if pursued by experts in isolation: continuous interaction and reflection among all the experts involved is an absolute requirement.

2.2.2 Metabolomics entails a *systems approach*

Metabolomics entails a systems approach, which yields far more insights than derived from studies at the cellular level. The strategy in the systems approach, as clearly developed

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[15] MS: mass spectrometry; Hyphenated: MS linked to sophisticated separation techniques like gas-chromatography (GC), liquid chromatography (LC) and capillary electrophoresis (CE), often in multi-dimensional modes, like time-of-flight (TOF) configurations, serial MS links (MSn, n>1) and two-dimensional separation modes (GC-GC).

through the views of Ramautar, Berger, Van der Greef and Hankemeier (2013), is to expand the scope of biological investigation from studying single metabolites or individual metabolic pathways to encompass as many metabolites or pathways as possible. Metabolomics thereby creates a functional read-out of the physiological status of the biological phenomenon being studied and is in principle ideally suited to provide comprehensive insights on the health status of an individual, exceeding that from clinical practice. Systems biology involves the consequences of innate or exogenous perturbations, being genetic, physiological or environmental and includes monitoring the responses of genes (in genomics), proteins (in proteomics), and metabolites (in metabolomics). Integrating the diverse data provides insight into the dynamics of the biological system involved and its response to individual perturbations (Ideker, Galitski, & Hood, 2001). The strength of metabolomics among the omics approaches is its contribution of a direct functional read-out of the physiological or perturbed status of the system of interest to elucidate an individual's health or disease status.

2.2.3 Metabolomics is an *inductive science*

The pre-genomic era of molecular biology was largely reductionist and relied extensively on a deductive, hypothesis-centered approach in the way its research was conducted (Maddox, 1992). Another attribute of the molecular biology of the last 50 years is that it was largely qualitative (Maddox, 1994). From this paradigm, it was not uncommon to denounce inductive methodology as ''merely a fishing expedition'', implying that science without a hypothesis is no science. Such an absolutist reductionist view was well-refuted by Kell and Oliver (2004), indicating that deductive reasoning progresses from Ideas to Data – the idea originates in the mind in the scholar, who designs and performs a well-defined experiment which either supports or rejects a predefined hypothesis. By contrast, the key point in inductive science is that it advances from Data to Ideas. Thus, data-driven programmes are not alternatives to hypothesis-led studies in knowledge discovery but are complementary and iterative partners, as illustrated in Figure 2, derived from one of our own studies.
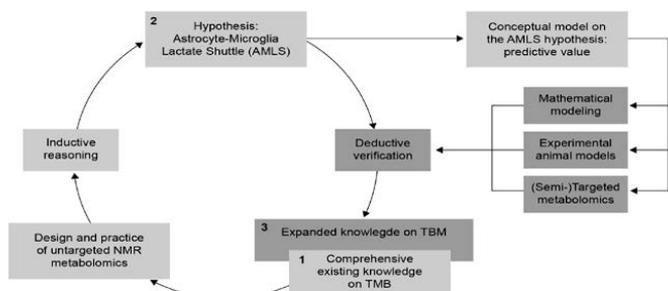
Figure 2. A modification of the iterative cycle of growth in knowledge, using the astrocyte–microglia lactate shuttle (AMLS) hypothesis for tuberculous meningitis (TBM) as an example. The existing knowledge [1] forms the basis of inductive reasoning on explorative metabolomics information that leads to the formulation of hypotheses [2], which in turn is followed by the use of deduction to verify these hypotheses and to further existing knowledge [3]. (Adapted from Mason, Reinecke, Solomons, & Van Furth, 2016)

2.2.4 Metabolomics is highly *technology* dependent

Metabolomics is highly technology dependent – indeed, metabolomics has been defined as a technology itself, "geared towards providing an essentially unbiased, comprehensive qualitative and quantitative overview of the metabolites present in an organism" (Hall, Vos, Verhoeven, & Bino, 2005). The capacity to interrogate biological systems has never been greater than now, superimposed by our technological ability to analyse a chemically diverse range of organic components in complex mixtures, as discussed above. In addition, the available bioinformatics and computer power and capacity for data analysis has created a whole new field of science. Roy Goodacre, professor in biological chemistry at the University of Manchester, pointed out: "Raw data is nothing but a poor relative of information and information is itself a giant leap away from knowledge" (Goodacre, 2005). Pivotal technological requirements for success are the combined ability to generate high quality data, mine the data and to perform reliable, comparative analyses, using and understanding highly sophisticated commercial software to disclose the chemical structures encapsulated in spectral data, required for pre-processing the machine output. This combined approach allows for the direct comparison of related data sets from comparative analyses, which finally permits visualizing strategies for readily understanding and interpreting the new information.

2.2.5 Metabolomics is *societal* directed

Metabolomics is typified as societal directed, as it opens many opportunities with a direct effect on society at large. Metabolomics is ideally seen as a full-scale discovery platform which supports and feeds into activities to advance our understanding of biological systems and to generate information with huge potential benefits for health and disease (Figure 3).
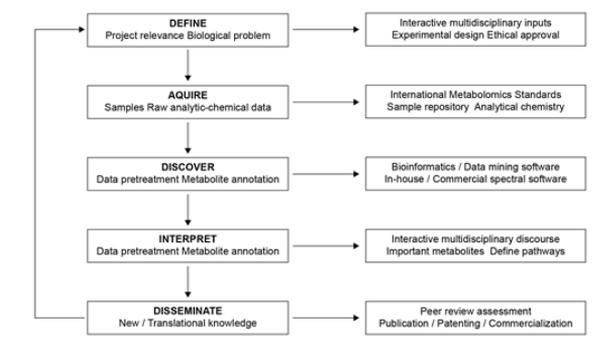
Figure 3. An overview of the logic underlying a pipeline at a metabolomics platform. The logic stretches from the design phase to performance, analysis and interpretation of results and culminates in dissemination and translation initiatives. Attendant aspects are shown to the right and the continuous process is indicated by the arrow on the left (see Brown et al., (2005), for a more technical overview).

Translational research is the term used for the process whereby information and new knowledge from research are used to develop novel ways to treat patients (Leunga, Musrapa, Diamandis, & Kulasingama, 2013); it is the route by which the knowledge contributed by metabolomics benefits society. Some outcomes of translational results are patents and

commercialization. Jan van der Greef, professor of analytical biosciences at Leiden University and internationally recognized as an innovative systems scientist, and Francis Collins both emphasize the translational imperative of omics-based knowledge: "The medical benefits of the current revolution in biology clearly cannot be achieved without vigorous and effective translation" (Collins, 2011), and "Metabolomics incorporates the most advanced approaches to molecular phenotype system readout and provides the ideal theranostic technology platform for the discovery of biomarker patterns for healthy and disease states" (Van der Greef, Hankemeier, & McBurney, 2006). Collins further avers that the triple frustrations of long timelines (some thirteen years for new drug development), extensive costs (the approximate cost of a successful drug development exceeds \$1 billion), and low success rates will severely hamper progress in metabolomics translational research. Despite these difficulties, the societal directedness of metabolomics remains a key characteristic of the field and distinguishes it from traditional biochemical research on metabolism.

2.3 In conclusion

Metabolomics has progressed towards an established science. It combines cutting-edge and highly sophisticated analytical instrumentation for metabolite detection and quantification, with computational and statistical approaches to extract, mine, and interpret metabolomics data. Internationally accepted initiatives have been developed for minimal reporting standards for metabolomics data (Fiehn et al., 2007), and strategies to enhance reproducibility and data standardization further are continuously refined (Allwood et al., 2009). User-friendly software, databases and computer languages and models that incorporate and interpret complex information have been developed and are crucial to handle the data acquired and to aid interpretation in a biological context. It seems that all bodes well for metabolomics and its application to human welfare.

3. Present Priorities in Metabolomics

3.1 Background

Notwithstanding the phenomenal successes in the quest of metabolomics, realism prevails. "Major advances and a totally new approach to analysis are essential before the holy grail of metabolomics is attainable. This will include developments in data preparation, storage, and curation coupled with a greater understanding and application of bioinformatics" (Ryan & Robards, 2006). Against this background, a brief snapshot of three current priorities in metabolomics research provides insight on the commitment within the scientific community on the quest of metabolomics. The three aspects are *biomarkers, translational research* and *precision medicine*.

3.2 Biomarkers

Biomarker discovery is a prime activity in metabolomics research (Mamas, Dunn, Neyses, & Goodacre, 2011; Mayr, 2008), given the important role of biomarkers in toxicology and in disease diagnosis, prognosis and risk prediction. Limited consistency, rigor and validation as

well as disparate use of terminology, are recognised as stumbling blocks in achieving scholarly requirements for candidate biomarker studies. To improve equity and standardization, the Metabolomics Society (Fiehn et al., 2007) as well as the US National Institutes of Health (NIH; Atkinson et al., 2001) proposed terms, definitions, procedures and conceptual models for biomarker development.

The NIH's Biomarkers Definitions Working Group's definition of a biomarker is now generally accepted – it is "a characteristic that is objectively measured and evaluated as an indicator of normal biological processes, pathogenic processes, or pharmacologic responses to a therapeutic intervention" (Atkinson et al., 2001). The views of Parida and Kaufman (2010), scientists in tuberculosis (TB) research, serve as a good example of a quest towards biomarker discovery, as expressed in the title of their paper. No new vaccine has been licensed for TB for more than three-quarters of a century, and no new TB drug has been licensed for half a century. Yet this ancient disease persists today, having reached pandemic proportions by causing the deaths of approximately 1.5–2 million individuals per year (WHO, 2014). This scenario in health care is particularly severe for South Africa, illustrated by a *WHO Global TB Report*, which listed approximately 312 380 new cases of TB in 2013 for South Africa alone, of which up to 10% manifested in the central nervous system – particularly severe as tuberculosis meningitis (TBM) in children. Parida and Kaufmann (2010) proposed that "the time is ripe to move from single markers for correlates of protection to a biosignature comprising a well-defined set of robust indicators in TB that can accelerate rapid screening and early selection of potential drug and vaccine candidates." We concur with this view, and recently proposed from our metabolomics study a global metabolite urinary profile reflecting a potential diagnostic biosignature for TBM, consisting of four host-microbial metabolites (Mason, Van Furth, Solomons, Wevers, Van Reenen, & Reinecke, 2016). The biosignature proved to have diagnostic value and provided prognostic insight into our TBM patients; it is the first to illustrate holistically the metabolic complexity of TBM-confirmed cases, and gave proof-of-concept that a biosignature of urinary metabolites can potentially be derived for the diagnosis and assessment of prognosis of TBM patients.

3.3 Translational research

Metabolomics greatly contributes to translational research as it provides for the quantitative analysis of thousands of different metabolites for the purpose of identifying unique metabolic profiles and metabolic fingerprints of specific perturbations, such as endogenous and infectious diseases or effects due to exposure to environmental xenobiotic substances. The outcomes of such work may provide basic or clinical knowledge, so that translational research strives towards meaningful use of such new insights, such as novel treatment regimens or drug design. These ideals cannot be attained in isolation. According to Szalma, "The wealth of data generated in experimental medicine studies and clinical trials can inform the quest for next generation drugs but only if all the data generated during those studies are appropriately collected, managed and shared" (Szalma, Koka, Khasanova, & Perakslis, 2010).

Integration of multidisciplinary data towards translational medicine is not easy. A system is required that allows clinicians, translational scientists, discovery biologists and commercializing entrepreneurs to interrogate potential and real data to enable proper design for clinical trials. Moreover, Szalma and co-workers emphasize that such systems should demonstrate the means to query both internal data – research, clinical and patient – and public data – novelty, legislation and costing –to enable the developmental phase, ensure alignment to legal requirements and eventually leading to full practical implementation.

3.4 Precision medicine

Precision medicine has emerged from personalized medicine. Personalized medicine couples established clinical–pathological indexes with state-of-the-art molecular profiling to create diagnostic, prognostic, and therapeutic strategies *precisely tailored to each patient's requirements* — hence the term "precision medicine" (Mirnezami, Nicholson, & Darzi, 2012).

Benefits from metabolomics to precision medicine come from the ability to expand metabolomics information to the systems-level by integration of the other omics approaches (Johnson, Ivanisevic, & Siuzdak, 2016). Jan van der Greef expects "that with the proper phenotyping/genotyping, metabolomics will play an important role in systems diagnosis, with an emphasis on following the changes over time of an individual and on a somewhat longer term on integrated interventions and personalized wellness" (Ramautar, Berger, van der Greef, & Hankemeier, 2013). Precision medicine is thus an approach that takes the individual variability into account in the prevention and treatment of disease.

Many perturbations in the human system due to diet, disease, medication and other interventions are multi-factorial and the study of small parts of the system is insufficient to understand the complete phenotypic changes induced by such perturbations. The systems biology context envisages that treatment in future will be tailored to the individual, instead of in the population-based way in which it is currently practised. In contrast to population-based contexts, people are individuals and each person's metabolism reacts differently to interventions.

Political leaders are inspired by the transition from the personalized to the precision view: "Tonight, I'm launching a new Precision Medicine Initiative to bring us closer to curing diseases like cancer and diabetes – and to give all of us access to the personalized information we need to keep ourselves and our families healthier" (Obama, 2015). Francis Collins, in his capacity as director of the National Institutes of Health in Bethesda, Maryland, believes that the time is right for this visionary initiative (Collins & Varmus, 2015). The proposed initiative (National Research Council, 2012) is designed to cover two main approaches: a near-term focus on cancer and a longer-term aim to generate knowledge applicable to the whole range of health and disease conditions. Collins regards both aspirations to be within reach because of advances in basic research, including molecular biology, the omics technologies and bioinformatics. He concludes: "With sufficient resources and a strong, sustained commitment of time, energy, and ingenuity from the scientific, medical, and patient communities, the full potential of precision medicine can ultimately be realized to give everyone the best chance at good health" (Collins & Varmus, 2015).

3.5 Conclusion

This brief snapshot of present priorities of metabolomics research provides the minimum basis to continue with my view that progress in science is an intrinsically contentious enterprise. My thesis is that "*though successive and more advanced biological sciences disclose life in more detail, it follows a winding path (1) by being a human endeavour, (2) by dealing with the intricate fabric of life and (3) through the brokenness which is our common home*. I will now argue this thesis by focusing on the three characteristics that render progress in science as a winding path.

4. The Winding Path of Scientific Development – A Human Endeavour

4.1 Human endeavours in normal science

Philosophers and the like of the post-modern era acknowledge science is a human endeavour, pursued within a paradigm with which they agree (Kuhn, 1971). Science does not present reality as such but provides the current interpretation of reality as influenced by theory and culture, reliant on empirical observation, and subject to change (Schwartz, Lederman, & Crawford, 2004). "Instead of being parts of a single, comprehensive 'unified science', the sciences are rather a confederation of enterprises, with methods and patterns of explanation to meet their own distinct problems" (Toulman, 1990).

Formally or informally, scientific knowledge in normal science (Kuhn, 1971) is ultimately established by consensus among self-appointed experts (Barnes, 1985), and "history suggests that the road to a firm research consensus is extraordinarily arduous" (Kuhn, 1971). According to Kuhn, the transition from the puzzle-solving profile of normal science to discovery is marked by human responses, typified as a crisis, which becomes progressively more generally recognized as such by the profession. "More and more attention is devoted to it by more and more of the field's most eminent men." Seldom is this winding path of progress and discovery more clearly illustrated than in the search for a model of the molecular structure of deoxyribonucleic acid (DNA), as it unfolded in the middle of the twentieth century, as illustrated below by three contributions – apparently more or less successful - along this winding pathway. In hindsight, James Watson remarked: "… science seldom proceeds in a straightforward logical manner imagined by outsiders. Instead, its steps forward (and sometimes backward) are often very human events in which personalities and cultural traditions play major roles" (Watson, 1968).

In his ground-breaking paper of 1944, O.T. Avery opened scientific minds to a new paradigm, by averring that DNA is the fundamental unit of hereditary (the transforming principle of Pneumococcus Type III) (Avery, MacLeod, & McCarty, 1944). Today, Avery's paper is seen to "share with the classics of science of previous centuries at least one quality now grown rare: from the first paragraph through to the end, one feels an original curiosity working" (Judson, 1996). The paradigm was set, but the critical question was: "If DNA is the carrier of hereditary specificity, *how*?" Three examples suffice to illustrate the arduous, winding road towards scientific discovery.

Erwin Chargaff, then in his late thirties, recognized the importance of Avery's paper and refocused his research on DNA. His frame of mind was that chemical differences in nucleic acids derived from taxonomically different species held the key to the hereditary information in DNA. As a meticulous bio-analytical chemist, he embarked on comparative analysis of the molar composition of the constituents of DNA from bovine spleen and thymus (Chargaff, Vischer, Doniger, Green, & Misani, 1949), from avian tubercle bacilli and from yeast (Vischer, Zamenhof, & Chargaff, 1949). He first observed that the purine (guanidine = G and adenine = A) and pyrimidine (thymine = T and cytosine = C) content of DNA of microbial origin differed much between species, as well as from the DNA of thymus and spleen. The relative amounts of the A, G, T and C bases indicated evidence of molecular diversity, and supported his view on the genetic basis for taxonomically different species. Second, his results also revealed a striking observation that the number of purines in DNA exactly equalled the number of pyrimidines (A + G = C + T). Chargaff, however, reported: "A comparison of the molar proportions reveals certain striking, but perhaps meaningless, regularities" (Vischer, Zamenhof, & Chargaff, 1949). This interpretation totally missed the point with regard to the critical question in the minds of scientists in the early 1950s. Today, every undergraduate biochemistry textbook includes Chargaff's rule (A + G = C + T) as a basic characteristic of the DNA structure.

Linus Pauling, then in his sixties, likewise decided to include DNA in his focus after seeing Avery's paper. Pauling was the leading chemist of his time, destined to receive the Nobel prize for his achievements on protein structure, but also described as "unquestionably the world's most astute chemist" (Watson, 1968). Pauling hastily proposed a model of DNA in 1953, published in the prestigious *Proceedings of the National Academy of Sciences of the USA* (Pauling & Corey, 1953). Watson, at the height of his and Francis Cricks' passion to propose a model for DNA, recalled that his stomach sank in apprehension on learning of Pauling's paper (Watson, 1968). However, on seeing the representation of Pauling's model, he at once felt that something was not right. "I could not pinpoint the mistake, however, until I looked at the illustrations for several minutes. Then I realized that the phosphate groups in Linus' model were not ionized, but that each group contained a bound hydrogen atom and so had no charge. Pauling's nucleic acid in a sense was not an acid at all" (Watson, 1968). Watson had no idea what led Pauling to this blunder, but if "a student had made a similar mistake, he would be thought unfit to benefit from CalTech's chemistry faculty" (Watson, 1968). In an interview years later on the failed proposal, Pauling answered that they were not actually working hard on the structure at the time. "We had really very little in the way of our own experimental data, a few rather poor X-ray photographs of DNA, not carefully prepared. I wasn't putting in much of my time on determining the structure. I thought I would get it worked out, you know, in a question of time." (Judson, 1996). In 1954 Pauling received the Nobel prize for chemistry, only one of three people to receive two Nobel prizes. The first, for chemistry, was for work on the nature of the chemical bond and its application to the elucidation of the structure of complex substances, like proteins. Pauling's model on peptide bonds in protein structure is presently covered in every undergraduate textbook in biochemistry. He received the Nobel Peace Prize in 1962 for his outspoken efforts for an international ban on atomic bomb tests.

James Watson, in his early twenties, and Francis Crick in his early thirties, both working in the Cavendish Laboratory at Cambridge University, successfully proposed a structure for DNA. Their own work included data from Maurice Wilkins and Rosalind Franklin, both from King's College of the University of London. Watson, Crick and Wilkins shared the Nobel prize in 1962 (Rosalind Franklin had died a few years before). The prize was awarded for the hypothetical double helix model of Watson and Crick that conformed in all aspects to the X-ray data of Franklin and its interpretation by Wilkins. Apart from the X-ray evidence and theoretical calculations, Chargaff's observation on the pyrimidine and purine content of DNA provided for an important breakthrough in developing the DNA model. The publication, which formed the basis for the Nobel prize to Watson and Crick, appeared in press a few months after Pauling's paper (Watson & Crick, 1953). The final version of the paper was typed up in the last weekend of March 1953. The laboratory's typist was not available so Watson's sister was approached to do the job. "There was no problem persuading her to spend a Saturday afternoon this way, for we told her that she was participating in perhaps the most famous event in biology since Darwin's book. Francis and I stood over her as she typed the nine-hundred-word article that began 'We wish to suggest a structure for the salt of deoxyribonucleic acid (DNA). This structure has novel features which are of considerable biological interest'." The manuscript included only one figure. The drawing "is purely diagrammatic. The two ribbons symbolize the two phosphate-sugar chains, and the horizontal rods the pairs of bases holding the chains together." The two strands of the double helix are stabilized by a purine (A and G), which is hydrogen-bonded (comparable to Pauling's model for the peptide bond of proteins) to a pyrimidine (T and C), which fully accounts for Chargaff's observations (A = T and G = C). All undergraduate textbooks in biology – and biochemistry – cover the fundamental structural and functional importance of the DNA double helix model of Watson and Crick.[16]

4.2 Human endeavours in metabolomics

Metabolomics as currently understood did not follow the developmental path of the traditional sciences – it was simply defined as metabonomics/metabolomics at the turn of the present century. Following a period of one-and-a-half decades from then, metabolomics is now moving from its early phase towards becoming an emerging discipline. It is too early in its history, and it would be presumptuous of me, to comment today on the endeavours of individual scientists and researchers in the field of metabolomics. A few of its characteristics that distinctly affect the efforts of those scientists that work on metabolomics can, however, be highlighted.

Intersubjectivity

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[16] In a television interview in 2013 - Glycolosis, cancer and metabolomics – James Watson made the remark: "If I were doing a PhD, I'd be doing it in Metabolomics"

Link: https://www.webofstories.com/play/james.watson/97;jsessionid=B39D5AEB3A055C7EE286775DA7B59BBA

Intersubjectivity is a term used in philosophy, psychology and sociology, to represent the psychological relations between people. It is also a core aspect in science used for the readily and accurately verification of analysis and interpretation of data between different scientists (which is described as "intersubjective"). The maturation of metabolomics since its inception is indicated by the number of publications in peer-reviewed journals; this has risen virtually exponentially from zero in 1998 to 100 by 2002, then climbed steadily every year to a cumulative total of over 400 reports in 2006 (Fiehn et al., 2007) to reach approximately 2600 per year today. This publishing profile may have been observed in normal science as well, following a unique breakthrough. What is greatly different in metabolomics, however, is the demand from within the metabolomics community that metabolomics data – the key products of human endeavours in the discipline – should be published to be available to fellow scientists in a way that permits its use and re-use – a new kind of intersubjectivity. "Because the biological milieu can change rapidly, and can be highly responsive to the environment, history and handling of the subject, details of the experiment are critical to interpretation of the data and to its reuse in meta-analyses of data from multiple experiments" (Fiehn et al., 2007).

Visibility

Changes in paradigms and revolutions in normal science have proved to be nearly invisible. "Both scientist and laymen take much of their image of creative scientific activity from an authoritative source that systematically disguises – partly for important functional reasons – the existence and significance of scientific revolutions" (Kuhn, 1971). The scenario within metabolomics is again greatly different. Findings and *original data* must be visible. Increasing amounts of data are presented in the more than a thousand metabolomics papers published each year. The latest common thread in all metabolomics journals of repute is that the mere description of investigations as a narrative text in manuscripts is not sufficient and do not justify publication without the data. "The underlying data needs to be published together with the findings in the literature to maximise the benefit from public and private expenditure and to take advantage of an enormous opportunity to improve scientific reproducibility in metabolomics and cognate disciplines" (Rocca-Serra et al., 2016). This view is reflected in the present policies of funding agencies. A new requirement of the National Institutes of Health of the United States (NIH) is that the results and accomplishments of the activities that it funds should be made available to the research community and to the public at large. The NIH furthermore requires data to be released within six months of their production.

Industry has followed suit. A private commercial enterprise, MassBank, has provided the first public repository of mass spectra applicable to metabolites (Data for small chemical compounds for life sciences [<3000 Da]; Horai et al., 2010). MassBank has developed as a distributed database and its products are available via the Internet. "The database contains 605 electron-ionization mass spectrometry (EI-MS), 137 fast atom bombardment MS and 9276 electrospray ionization (ESI)-MSn data of 2337 authentic compounds of metabolites, 11 545 EI-MS and 834 other-MS data of 10 286 volatile natural and synthetic compounds, and 3045 ESI-MS2 data of 679 synthetic drugs." This massive amount of spectral information to assist metabolite identification and annotation was contributed by sixteen international

research groups, and validated through experimental conditions as used in their own laboratories.

Transdisciplinarity

A key feature of transdisciplinarity is the practical unification of the meanings and insights that emerge from different disciplines. A Charter of Transdisciplinarity was adopted in 2007 by the participants at a congress of a society working on transdisciplinarity [CIRET (Le Centre International de Recherches et Études Transdisciplinaires)][17]. The charter does not claim any authority but gives a well-developed view on the scope of transdisciplinarity. It presupposes an open-minded rationality. In metabolomics, the transdisciplinary approach is resolutely open insofar as it goes beyond the exact sciences and disciplines traditionally associated with the numerical (through the use of statistics), physical (dependent on chemistry) and biological (invoking physiology) cosmic dimensions [developed in the Reformed Philosophy (Stoker, 1961)]. Each sphere is governed by different types of logic, but transverse in metabolomics. Any attempt to reduce reality to a single level governed by a single form of logic does not lie within the scope of transdisciplinarity. Transdisciplinarity thus complements the various disciplinary approaches and does not strive for mastery of several disciplines; instead it aims to open all disciplines to that which they share and to that which lies beyond them. It opens to us with new insights on nature and reality.

Transdisciplinarity has far-reaching implications for human endeavours. A hierarchal taxonomy of disciplinary modes of inquiry, including mono-disciplinary, multidisciplinary, cross-disciplinary, interdisciplinary and transdisciplinary practices, have been developed by Zachary Stein, academic director of the Center for Integral Wisdom at Meridian University, San Francisco, USA. According to Stein, individual researchers should "demonstrate disciplinary competence and know how concepts and methodologies from other disciplines relate to in their own, having mastered some concepts therein. They are able to constructively communicate with those from other disciplines in a problem-focused manner" (Stein, 2007). As a group, they should be able to demonstrate disciplinary competence and to collaborate constructively with those from other disciplines in a problem-focused manner.

To conclude: The contribution of normal science to knowledge and understanding of reality was, and still is, immeasurable; its outcomes are decisively the product of human endeavours, mostly following a path of puzzle-solving and incidentally of discovery and paradigm shifts (Kuhn, 1971). The development of the new omics sciences, and especially so metabolomics, will not diminish dependence on human endeavours. There are, however, no indications of metabolomics becoming a practice resembling traditional science, and of a smooth road that lies ahead. Transformation of the minds of its practitioners from all disciplines towards the characteristics and realities of metabolomics will be key to its progress.

5. The Winding Path of Scientific Development – the Intricate Fabric of Life

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[17] CIRET (Le Centre International de Recherches et Études Transdisciplinaires) http://nicol.club.fr/ciret/index.htm

5.1 *What Is Life?*

What Is Life?, written by Erwin Schrödinger, a physicist, was published in 1944 and intended for the lay reader (Schrödinger, 1944). In his book he addressed the key question: "How can the events in space and time which take place within the spatial boundary of a living organism be accounted for by physics and chemistry?" Schrödinger addresses the proposed existence of genes and the important role mutations play in evolution. According to his views, the carrier of hereditary information has to be both small in size and permanent in time. Although Schrödinger's notions have been superseded by scientific research, his book remains a classic, written with scholarly insight by a renowned physicist with modesty in entering the realm of biology.

The impact of *What Is Life?* cannot be underestimated. James Watson repeatedly said that *What Is Life?* had a decisive influence on him: "I became polarized towards finding out the secret of the gene" (Watson, 1966). Francis Crick, himself a physicist, was likewise strongly influenced by Schrödinger's book: "I had read Schrödinger's little book, too. … It suggested that biological problems could be *thought* about, in physical terms – and thus it gave the impression that exciting things in this field were not far off" (Olby, 1970).

The next 'exciting things' were in biology. "In the crudest terms, no other science, not nuclear physics, has ever expanded as biology did in North-America and Europe from the mid-fifties to the mid-sixties: new people, new and larger laboratories, more and ever-fuller meetings and journal and books" (Judson, 1996). I happened to be in the Netherlands during the full-swing of that period (1966–1968), doing a PhD in biochemistry at the Rijksuniversiteit Leiden (Reinecke, 1968). One of the central questions of that period dealt with the universality of the genetic code. I could show that ribonucleic acid (RNA) of plant origin could be translated with fidelity in a cell-free system of *Escherichia coli*, a bacterium (Reinecke, Van Reisen, Voorma, & Bosch, 1968).

The research mode of the time was astonishing – "a concentration of forces, a siege, a conquest. … it was a story of dispersal and movement, of uncertain directions, wrong decisions, multiple lines of work intersecting in fortunate encounters" (Judson, 1996). Conference rooms were packed, and I was able to experience presentations by biochemists who were Noble prize winners of the previous decade – Sir Hans Krebs, Severo Ochoa, Fritz Lipmann, Max Perutz, Fred Sanger – and of the upcoming generation – Marshall Nirenberg, Mario and Nancy Cappecci (a radiant young couple working on the participation of N-formyl-methionyl-tRNA[F] in the initiation of protein synthesis), Brian Clark and Kjeld Marker, and Sydney Brenner. Brenner was also a South African, doing a PhD in the UK. South Africans in those days went abroad for their final study, given the prevailing research culture at that stage in our country. Of the University of the Witwatersrand, always a leading research university in South Africa, Brenner observed: "It was a very underdeveloped country, scientifically – a provincial country. We didn't have PhD's; facilities for research were quite primitive. I mean, if you want to stain something you first *synthesized the dye*" (Judson, 1996). In Europe the science culture was vibrant and highly stimulating for the many young PhDs. The thrust was to unravel the genetic code, uncover the intricacies of the translation of the code to generate protein – shortly on the marvels of life phenomena as revealed by ever more reductionist approaches.

5.2 *Gesta Dei per naturam*

Then came the paper by Chargaff. It was the custom at the Editorial Board of the *Annual Review of Biochemistry* to invite a senior biochemist to submit the opening paper for that year's edition, reflecting on their research, on the essence of biochemistry or whatever they preferred. Chargaff accepted such an invitation and his paper appeared in the 1975 *Annual Review*, entitled *"A fever of reason – The early way"* (Chargaff, 1975). Chargaff was born in 1905 in Austria-Hungary, which is today Ukraine. He lived through World War I and experienced the fall of the Austrian empire first-hand, but left Europe before World War II. He eventually became professor of biochemistry at Columbia University in New York where he spent most of his academic life. His Jewish mother was arrested during World War II "and died, only God knows where and when, having been deported into nothingness from Vienna in 1943" (Chargaff, 1975). Chargaff's entire paper in the *Annual Review* is a self-reflection on his life, from which four extended, but essential, sections are quoted here. It started with his recollections of the historical events of that time:

> "When these pages appear it will be just about thirty years since the atomic bombs fell on Hiroshima and Nagasaki. I was then forty years old, poorly paid, and still an assistant professor at Columbia University; I had already published nearly ninety papers; I had a good laboratory and a few gifted young collaborators; and I was getting ready to begin the study of the nucleic acids. A yearly grant of $6000 from the Markle Foundation was the seal of my earthly success. … The double horror of two Japanese city names grew for me into another kind of double horror: an estranging awareness of what America was capable of, the country that five years before had given me its citizenship; a nauseating terror at the direction in which the natural sciences were going. Never far from an apocalyptic vision of the world, I saw the end of the essence of mankind; an end brought nearer, or even made possible, by the profession to which I belonged. In my view, all natural sciences were as one; and if one science could no longer plead innocence, none could."

Chargaff also gave a very personal account on the collaborative culture that existed amongst scientists, which still sounds very familiar to our times:

> "Looking back – and when you get old this is all you can do – I must say that I have not learned much from my teachers. In the strictest sense of the word I have had none. During almost my entire life I have myself been much more of a teacher than a pupil; and even this, in the complete moral and intellectual collapse of our time, may not amount to much. The sciences are extremely pedigree conscious; and the road to the top of Mount Olympus is paved with letters of recommendation, friendly whispers at meetings, telephone calls at night. From all this I have never been able to benefit. I am, to an unusual extent, my own product. … If there is such a thing as a great scientist – I have

met in my life perhaps one or two to whom I should have granted this attribute – this greatness can certainly not be transferred by what is commonly called teaching. What the disciples learn are mannerisms, tricks of the trade, ways to make a career, or perhaps, in the rarest cases, a critical view of the meaning of scientific evidence and its interpretation. A real teacher can teach through his example – this is what the ducklings get from their mothers – or, most infrequently, through the intensity and the originality of his view, or his vision, of nature."

Biochemistry is rare amongst the disciplines of the natural sciences: it resides neither in the physical nor the biological spheres, but occupies an interphase between these spheres. Like for many biochemists, Chargaff came to biology through chemistry.

"I came to biochemistry through chemistry; I came to chemistry, partly by the labyrinthine routes that have related, and partly through the youthfully romantic notion that the natural sciences had something to do with nature. What I liked about chemistry was its clarity surrounded by darkness; what attracted me, slowly and hesitatingly, to biology was its darkness surrounded by the brightness of the givenness of nature, the holiness of life."

It is, however, towards the end of his paper that he presents a link between the thrust to contribute to new knowledge through research, and what becomes lost as a consequence of these endeavours ("the givenness of nature, the holiness of life"). In his final analysis, Chargaff gives an important dimension to the question *"What is life",* which is explored in my thesis:

"It is clear that to meditate on the whole of nature, or even on the whole of living nature, is not a road that the natural sciences could long have travelled. This is the way of the poet, the philosopher, the seer. A division of labour had to take place. But the over fragmentation of the vision of nature – or actually its complete disappearance among the majority of scientists – has created a Humpty-Dumpty world that must become ever more unmanageable as more and tinier pieces are broken off, "for closer inspection," from the continuum of nature. The consequence of the excessive specialization, which often brings us news that nobody cares to hear, has been that in revisiting a field with which one has been very familiar, say, ten or twenty years ago, one feels like an intruder in one's own bathroom, with 24 grim experts sharing the tub. Profounder men than I have failed to diagnose, let alone cure, the disease that has infected us all. If I may be orphic for a moment, I should say that the ostensible goals have obliterated the real origins of our search. Without a firm center we flounder. The wonderful, inconceivably intricate tapestry is being taken apart strand by strand; each thread is being pulled out, torn up, and analyzed; and at the end even the memory of the design is lost and can no

longer be recalled. What has become of an enterprise that started by being an exploration of the *gesta Dei per naturam*?"

Chargaff died in 2002. Today, Google Scholar indicates 14 citations of his paper in the 1975 *Annual Review of Biochemistry*. During the centenary of the *Journal of Biological Chemistry* (1905–2005) the journal gave an appreciation of scientists of the past and published *Classics – Papers in a series reprinted to celebrate the centenary of the JBC in 2005*. Included in the series, under the heading "Chargaff's Rules: the Work of Erwin Chargaff", is an appreciation, followed by his publication "The separation and quantitative estimation of purines and pyrimidines in minute amounts – Vischer, E. and Chargaff, E. (1948) J. Biol. Chem. 176, 703–714" (Kresge, Simoni, & Hill, 2005).

5.3 *Ignoromes*

A recent personal opinion paper of Marlys Witte reflects on the application of omics technology in personalized medicine (Witte, 2011). Witte is director of the Medical Student Research Program and a faculty member in the College of Medicine, Department of Surgery of the University of Arizona. Her paper deals with two of the latest megatrends: (1) contrary to the "forward translation" to bring discoveries more rapidly from the laboratory into the clinic and to the general public, she notes that the Human Genome Project really began with the pressing of unanswered questions posed at the bedside by sick patients to their perplexed physicians; (2) the promise of "pharmacogenomics" to provide more personalized medicine based on specific drug regimens derived from the patient's genotype rests on an over-simplification of the "molecular model of life".

A key aspect is her emphasis on the ignorance towards the role of clinicians in the thrust of non-clinical scientists for personalized medicine and her frustration with the exploding omics-craze[18]. She laments the elusive quest for "personalized" treatments by introducing a new omics: "Ignoramics involves recognizing and dealing with what we know we don't know, don't know we don't know, and think we know but don't'' –the unanswered/unasked questions and unquestioned answers ("ignoromes")." She is especially critical to the rush to reduce biology and disease to molecules. Developments in personalized medicine need to be balanced by an equally energetic effort in the clinical context, for which she use the term "medical ignoramics". The familiar involvement of the clinician who must decide what to do when *lives* (my emphasis) hang in the balance and when it is unclear what best to do, is indispensable in dealing with omics-based personalized medicine.

5.4 *Zōē*

Our custom at North-West University is to prescribe biochemistry textbooks of the first rank to our undergraduate students, to whom I used to present their first experience of the subject through a semester course, simply called "Introductory Biochemistry". The main emphasis in

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[18] Omics nomenclature: Genomics, proteomics, metabolomics, transcriptomics, lipidomics, nutrigenomics, pharmacogenomics …… ignoramics.

the course was on the structure and function of nucleic acids and proteins. I was always a little uncomfortable at the first lecture, as it included a brief view on the scope of biochemistry. Most textbooks present this in the introductory chapter and cover the topic in a few sentences, such as:

"We must never lose sight that biochemistry is the chemistry of *life* that concerns us here. The complex chemical substances and reactions that we have introduced have their significance as parts of living matter and life processes. To see biochemistry from this perspective, we should begin by asking, *What is life?"*(Mathews, Van Holde, & Ahern, 2000).

I found remarkable perspectives on this question from published dialogues on religion, belief and life, exchanged between Umberto Eco, agnostic and professor in semiotics at the University of Bologna, and Carlo Maria Martini, theologian and cardinal in Milan (Eco & Martini, 1999). Reflecting on abortion and on the innermost essence of being, the ultimate point to which Eco arrived was the question *What is life?* When does embryonic life start? What is the essence of our existence? In his response to Eco, Martini linked the innermost essence of being – *of life* – primarily to the relation between God and man. He drew Eco's attention to three alternative words used for *life* in Greek. The Gospel of John reads: "*In him was Life ..."*(John 1:4a – Holy Bible, 1978). The capitalized *Life* is used by Bruner (Bruner, 2012) to designate *zōē,* the form used by the Apostle John for "life". Elsewhere, life is used in Matthew 10:28 to describe existence (*bios, βίος*) or in Luke 12:22 as the life-giving breath, or spirit (*psyche*,ψυχή). The ultimate truth of John 1:4a is that the human being, Jesus of Nazareth, came into being from his mother, Mary, begotten by God the Father's Holy Spirit. He was born as a true human being, but lived in union with God his Creator and Father for his whole life. "The result or sum of his life, believers in him are convinced, is *the* Life" (Bruner, 2012).

5.5. Conclusion

The four views explored above do not seem to constitute a coherent whole but were specifically selected to illustrate that the fabric of life is multifaceted. The physical and biological spheres of the cosmic reality are interrelated, but irreducible to each other, rendering sublime beauty to the multifaceted phenomenon called life. Traditional science and the omics technologies contributed immensely to knowledge and further understanding of life phenomena; to achieve its ends, it was, and remains, a winding path of incremental increases in knowledge, breakthroughs and even dead ends. Up to this point, the question *What is life?* remains an open one. It is simply a matter of statement to say that scientists of the modern era claimed that religion and science were two unrelated realms and accordingly avoided any truthful view of the integrative meaning of life – of existence. Looking back to the post-double helix era, some hope still resides in the reductionist, mechanistic insights it brought to molecular biology – insights that are indispensable in a discussion on the intricate fabric of life. The omics sciences will likewise provide insights into the human nature with far-reaching practical implications, permitting increased understanding of the multiple manifestations of the human condition. However, more is needed. The question on the essence of life, on meaning, necessitates complementary levels of reflection on existence. In

his monogram, *The Biology of Ultimate Concern*, Theodosius Dobzhansky affirms that "science and religion deal with different aspects of existence. If one dares to over schematize for the sake of clarity, one may say that these are the aspect of fact and the aspect of meaning" (Dobzhansky, 1967). Science may serve to deepen insights on life, but the most profound, meaningful and ultimate view, as implied by zōē, requires an integrative view and its teleological dimension.

6. The Winding Path of Scientific Development - Brokenness which is Our Common Home

6.1 Brokenness

Brokenness in the Biblical sense is the condition of being humbled before the Lord in complete dependence upon Him. In the Dutch/Afrikaans language, and within the Christian Reformed tradition, brokenness is referred to as "*gebrokenheid*". It is a term with historical meaning, but is likewise highly relevant to the present and future times (Hoogland, 2002; De Roos, 2014). In this tradition, brokenness does not only reflect an individual's spiritual condition, but encapsulates the essence of creation at large. The comprehensive extent of global brokenness is nowhere better illustrated than in the letter of the Apostle Paul to the Romans (Romans 8).

In Rome, all were accustomed to the *Ara Pacis Augustae,* a monument of several friezes, reflecting Caesar's vision of Roman civil religion and celebrating peace as his most significant achievement. An important frieze depicts Tellus, the original earth goddess. Tellus was typically depicted in recline and probably derived from the Greek tradition of a Mother Earth (Lawrence, 1965). In contrast to Tellus, Paul in Romans 8:19 reminds the Christians and gentiles in Rome of "creation" (κτίσις, female), the Divine work which applies only to God (the Creator: κτίστης, male), who alone can make what was "not there before" (Latin: *ex nihilo*) (Jewett, 2006). In view of the physical evil and misery prevalent in the world – which Paul knows the Christians experienced (Romans 8:20a) – the Apostle attributes the human consciousness of pain and misery to the rest of creation (Romans 8:22b). In contrast to a frieze depicting a joyous Tellus, Paul hears only agonized human suffering, which he extrapolates to a creation's groaning for redemption. By using the expression "the whole of creation", Paul depicts the entire range of animate and inanimate objects on Earth as suffering, a comprehensive state of brokenness. It cannot escape one's immediate feeling that the brokenness preached to the Roman Christians and gentiles found a remarkable resonance in the encyclical message of Pope Francis of 24 March 2015.

6.2 Our common home

Pope Francis's Encyclical *Laudato Si* – On Care for Our Common Home (Francis, 2015) is an appeal to alert humanity to understand the destruction that man is rendering to the environment and his fellow man. Advocates of climate change acclaimed the Pope's engagement with this environmental issue (Chan et al., 2016). In his commentary, "Finding the message of the Pope's Encyclical" (Hulme, 2015), Mike Hulme, professor of climate and culture in the Department of Geography at King's College, London, recognizes the powerful

critique of the Pope on environmental issues as being the world humans have made for themselves. Hulme also asserts: "It is a world driven by a pathological techno-economic paradigm and a 'deified market,' in which the poor are marginalized, solidarity is undermined, and greed triumphs over justice. … Pope Francis offers a holistic narrative of the human condition that embraces science, but is hardly driven by it. … It is rooted in a cosmic reality – with both material and spiritual dimensions – and recognizes the human capacity for ingenuity and propensity for greed." Hulme's analysis expresses the third argument of my thesis: "brokenness is our common home."

The Pope's message is all-inclusive: "I wrote to all the members of the Church with the aim of encouraging on-going missionary renewal. In this Encyclical, I would like to enter into dialogue with all people about our common home" (Francis, 2015, in §3). He displayed exceptional wisdom in his appeal for the Church to participate in a process of salvation of our common home. "On many concrete questions, the Church has no reason to offer a definitive opinion; she knows that honest debate must be encouraged among experts, while respecting divergent views. But we need only take a frank look at the facts to see that our common home is falling into serious disrepair" (Francis, 2015, in §61).

The wisdom of the Pope is not denominational centred, but it does add a preeminent spiritual view that our common home should be cared for and protected by all as if of a sacred reality (Chiotti, 2016). The spiritual view is holistic and refers to how we deal with interconnected themes, like peace, justice and human dignity, which "cannot be separated and treated individually without once again falling into reductionism" (Francis, 2015, in §92). The encyclical presents Gospel truths and provides a challenge for every believer, as well as non-believer. The Pope's view relates well to Dobzhansky's ultimate concern: "Since remote antiquity, religion has been a cultural universal in mankind, because its symbols, myths, and philosophies provided answers to the ineffable problems of human existence. And it is because religion provides, or seems to provide, these answers that it served as a social cement" (Dobzhansky, 1967).

6.3 Eschatological perspective

Pope Francis alluded to the immense technological advancements of recent centuries has not been accompanied by a development in human responsibility, and contemporary man has not been trained to use power well (Francis, 2015, in §105); it is essential also to show special care for indigenous communities, their culture and traditions in order that they maintain their identity and values (Francis, 2015, in §146). According to his view, indigenous communities are able to instil a greater sense of responsibility, a strong sense of community, a readiness to protect others, a spirit of creativity and a deep love for the land. They are also concerned about what they will eventually leave to their children and grandchildren. These values are deeply rooted in indigenous peoples (Francis, 2015, in §179), and should be cultivated in our care for our common home. Continuing, Pope Francis became more explicit: "… social love moves us to devise larger strategies to halt environmental degradation and to encourage a 'culture of care' which permeates all of society. When we feel that God is calling us to intervene with others in these social dynamics, we should realize that this too is part of our spirituality, which is an exercise of charity and, as such, matures and sanctifies us" (Francis,

2015, in §231). Indeed, hope lies in a sense of calling which entails a strong inner impulse towards a particular course of action (which is secular), especially when accompanied by conviction of divine influence (which is spiritual) – encouraging a 'culture of care' which permeates all of society.

A further interpretation of Pope Francis's encyclical sees the desert of values that permeates all of modern society, at the very root of the crisis (Tilche & Nociti, 2015). This existential view brings us back to the letter of Paul to the Roman Christians. The concepts of "revelation" (Romans 8:18) and the reference to "up till now" (Romans 8:22), presupposed the eschatological perspective in Romans 8:23-25. Paul first describes the present reality, including the prevailing experience of faith in the midst of suffering. He intends the "beleaguered believers in Rome to discern in the growing triumph of the Gospel the initial evidence of this glory" (Jewett, 2006). In Paul's formulation "together" (Romans 8:23) refers to the shared experience of believers and the creation as a whole, both yearning for the future restoration (Jewett, 2006), and expresses a sense of hope through the conviction of faith in God's immanent and transcendent presence.

7. The Quest of Metabolomics: a Synthesis

"We're clearly much, much more than the sum total of our genes, just as our society is greater than the sum total of each of us". This was the sobering notes of Craig Venter (Venter, 2000) at the announcement of President Bill Clinton on 26 June 2000 "to celebrate the completion of the first survey of the entire human genome – the most wondrous map ever produced by humankind" (Clinton, 2000). Venter's view resonates with my thesis that "*successive and more advanced biological and related sciences disclose life in more detail*". However, "*scientific development, including the quest of metabolomics, follows a never ending winding path by being a human endeavour*". Notwithstanding its winding and endless nature, along this path we experience inspiration, challenges and motivation: "The more we know, the more aware we are of what we know not. Indeed, the most important product of knowledge is ignorance. The questions we ask today are more profound and more interesting than those asked years ago ... our most important resource [is] ignorance" (Gross, 2004).

On this winding path we are "*dealing with the intricate fabric of life*". Successive and more advanced biological and related sciences disclose life phenomena in ever more detail. We see more clearly with every increase in our knowledge the immense complexity of life – we see more clearly with every increase in our knowledge what we are: "A little less than the angels and crowned with glory and honour" (Psalm 8:5), confessing of being now in the "*brokenness which is our common home*" - "for now we see only a reflection as in a mirror – now we know only in part; then we shall know fully" (I Corinthians 13:12).

Epilogue

In his career and in his reflections Sytse Strijbos always stresses the relation between faith and reason and our everyday reality within human practices. Working with Sytse on an interdisciplinary project on Technology Transfer and Intercultural and Development was Henk Jochemsen, the general director of Prisma, Utrecht, and Special Professor of Christian-Reformational Philosophy at Wageningen University and Research, and I. We embarked on a

theoretical project on how to contextualize metabolomics in a traditional cultural setting of indigenous people, having an HIV study in mind. We formulated two basic questions: First, we questioned the value-neutral character of modern science and technology; second, we asked ourselves if it is possible to introduce modern techno-scientific practices into cultures that are still (or at least partly) pre-modern, in a way in which those practices contribute to an improvement in the living conditions of the people involved (Jochemsen & Reinecke, 2011). Our final note on the outcome read: "Given the delicate balance between trust in modern medicine and/or in traditional healers, any attempt to involve the people in a research project as indicated in this paper will have to seriously consider the way in which the (intended) participants will be informed". For this purpose we proposed a cultural model, developed in the course of the study.

Our first project was purely theoretical, but we envisaged extending it to the real world of HIV and AIDS through a second project, using quantitative research in the humanities. Honey Nonyane recorded interviews with Tswana people, living in the north-west of South-Africa on the question of how contemporary technologies, like metabolomics, can be introduced into such communities in an ethically acceptable and effective way. She presented the outcomes as a research report for her BA Honns degree. Johan Zaaiman from the School of Social and Government Studies, North-West University (Potchefstroom campus), was the supervisor and joined us in the study.

The chosen research method involved the semi-structured, in-depth interview of individuals, including questions at the meaning level. The results indicated that the worldview, belief system and cultural customs of these people significantly influenced their interpretation of HIV and AIDS and their treatment. It led us to expand the earlier model to an empirically informed, dynamic representation (Figure 4) that envisages possible influences of the introduction of new technologies on the belief and behavioural system of the community.
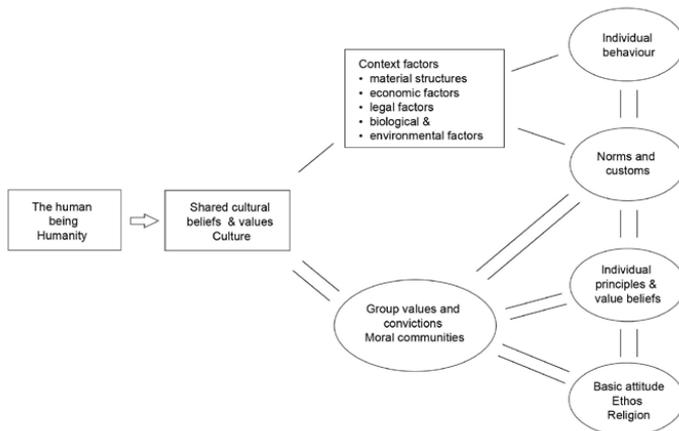

Figure 4. A model of external and internal influences on individual behaviour. (From: Jochemsen & Reinecke, 2011)

Our final findings were published under the title "Attitudes and perceptions regarding metabolomics research on HIV and AIDS: Towards a dynamic model relating basic beliefs,

technology and behaviour" (Jochemsen, Nonyane, Zaaiman, & Reinecke, 2014). An extensive survey conducted in 2012 on a total of 38 431 respondents and 11 079 households came basically to the same conclusion as our preliminary study. "Levels of accurate HIV knowledge about transmission and prevention were low and had decreased between 2008 and 2012 from 31.5% to 26.8%. … However, there have been worrying increases in most HIV-related risk behaviours. These findings suggest that there is a need to scale-up prevention methods that integrate biomedical, behavioural, social and structural prevention interventions to reverse the tide in the fight against HIV" (Zuma et al., 2016).

I aspired to extend this study by performing empirical research on HIV/AIDS through a proper metabolomics investigation. After an extensive search among various HIV- and AIDS-active groups, I was able to generate interest and enthusiasm for the project, but failed to mobilize the conditions necessary to involve patient participation (whether treated or untreated). Fortunately, Madeleine Bunders, paediatrician in the Department of Experimental Medicine, Academic Medical Centre, University of Amsterdam, reacted positively to the project and had available cord blood samples from neonates exposed to HIV-ART *in utero* and serum samples from their mothers. The samples came from people of mixed blood or from Africans living on the outskirts of, ironically, Amsterdam.

The study formed part of the PhD work of Gontse Moutloatse, for which she received a SKILL stipend from the Embassy of The Netherlands, Pretoria, managed through SAVUSA (South Africa-Vrije Universiteit Strategic Alliance), to enable her to pursue project work in the Netherlands. The object of the investigation was to address the concern that HIV-ART[19] exposure *in utero* could cause induced metabolic perturbations at birth and was the first metabolomics study of its kind. The outcomes of the study indicated that, although the outstanding benefits of ART for HIV-positive pregnant women and their offspring are clear (as recommended by the WHO), ART treatment for prevention of mother to child transfer (PMTCT)[20] remains a matter of concern. Our study adds to the list of investigations that have indicated dysfunctional energy metabolism in some newborns exposed to fetal ART, calling for special care to those newborns following birth. In addition, as these children increasingly form a substantial number of individuals at risk in society, there is a pressing need for longitudinal studies, from early infancy to childhood, following exposure. Our findings were published in *Metabolomics* (Moutloatse et al., 2016) and Miss Moutloatse received her PhD-degree in September 2017 through the North-West University.

In conclusion: I regard my involvement with education, research and science as a spiritual calling. Sytse Strijbos introduced me to the field of Systems Thinking in the realm of science, technology and society. He, and other enthusiastic colleagues from the Netherlands, participated with me in the development of study material for undergraduate students who follow the compulsory semester course in Philosophy of Science at North-West University (Potchefstroom Campus) (Reinecke, 2008). The dedication, inspirational and scholarly cooperation from Sytse was a highlight at the end of my career at the Potchefstroom University for Christian Higher Education.

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[19] HIV-ART: HIV-antiretroviral treatment

[20] PMTCT: Prevention of Mother to Child Transfer

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Public and institutional aspects of professional responsibility in medicine and psychiatry[21]

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1. Introduction

The so-called normative practice model (NPM) of medical practice (Jochemsen & Glas, 1997) was born as a result of discussions that started with Sytse Strijbos' description of the medical relationship as a contact relationship (Strijbos 1988, p. 195). The NPM describes medical practice as a normative practice with a constitutive side and a regulative direction. The distinction between constitutive principles and regulative direction elaborates on the well-known structure-direction distinction (Mouw & Griffioen, 1993). At the constitutive side further distinctions are made between qualifying, conditioning (conditions-enabling) and foundational principles (structures). The regulative dimensions should be associated with the ethos, the core values and the ultimate concerns of a profession and/or professionals (see figure 1).
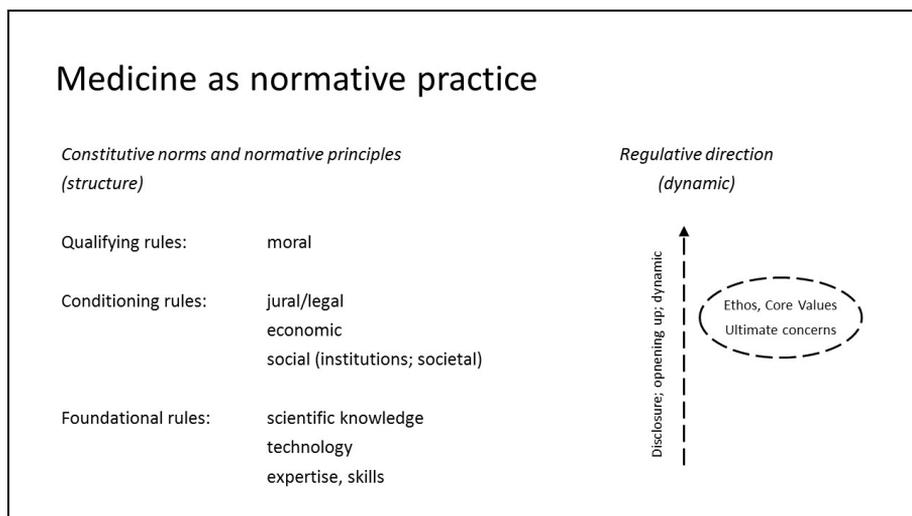

Figure 1. Medicine as Normative Practice

My aim in this paper is to develop the NPM one step further, by investigating the role of contexts in the definition of the different forms of normativity. In its initial formulation the NPM was aiming at the individual professional – patient/client relation mind. I will broaden the perspective and focus also on other actors in the field of health care, actors operating at meso- and macrolevels (institutions; policy making bodies; advisory committees; government). However, I will begin with professionalism itself, because – as we will see – the notion of professionalism has historically evolved out of a responsibility that reaches much further than the individual doctor (nurse) patient relationship. After having reviewed some definitions of professionalism, I will continue with a historical sociological analysis of the concept, then discuss a number of contexts and how they co-define roles and responsibilities; and, finally, close with some suggestions with respect to the further development of the NPM.

2. Professionalism – definitions; the terms

There has extensively been written on professionalism in medicine and other domains of occupation (Abbott, 1988; Freidson, 2001; Larson, 1997; Parsons, 1964; Schon, 1983; Wear & Aultman, 2006). Definitions of professionalism vary. Most definitions mention expert knowledge and skills as one of its core features together with certain jurisdictions or privileges of the professional. These jurisdictions and privileges are granted by society and/or patients on the basis of the professional's commitment, accountability and competence. Among these privileges are self-regulation with respect to standards of excellence, membership of the professional subgroup, training requirements, and criteria for licensing and quality control. Rueschemeyer describes the traditional (functionalist) conception of professionals as follows:

> "Individually and, in association, collectively, the professions 'strike a bargain with society' in which they exchange competence and integrity against the trust of client and community, relative freedom from lay supervision and interference, protection against unqualified competition as well as substantial remuneration and higher social status." (1983, p. 41)

He also emphasizes that the way we think about expert occupations transcends the confines of occupational sociology and comes close to a central theme in classical sociology, the emergence of modern society and culture as such.

> "How expert knowledge is deployed in different institutional forms, how it is controlled, how it is used as a resource of power and a basis of privilege, and how in turn different institutional forms of deployment, social control as well as individual and collective advantage, are affected by other and wider social structures and processes - inquiries into these questions tell us much about the structure and the dynamics of society as a whole." (Rueschemeyer, 1983, p. 38).

Moore gives a practical overview and defines the professional as having a full-time occupation, which sets his efforts apart from amateurism. The professional has a commitment to a calling: the fulfilment of the profession's requirements is a response to a set of normative and behavioral expectations. Professions are set apart from other forms of occupation by various signs and symbols and are identified by their peers via membership of formalized

organizations. Usually the possession of skills and knowledge requires intensive and prolonged training. Professionals need to exhibit an orientation to service, they proceed by their own judgment and authority and are, therefore, professionally autonomous (Moore, 1970, pp. 5-6). Freidson's more recent account enumerates more or less similar criteria, when he says that professionals have "….

1. Specialized work in the officially recognize economy that is believed to be grounded in a body of theoretically based, discretionary knowledge and skill and that is accordingly given special status in the labor force;

2. Exclusive jurisdiction in a particular division of labor created and controlled by occupational negotiation;

3. A sheltered position in both external and internal labor markets that is based on qualifying credentials created by the occupation;

4. A formal training program lying outside the labor market that produces the qualifying credentials, which is controlled by the occupation and associated with higher education; and

5. An ideology that assert greater commitment to doing good work than to economic gain and to the quality rather than the economic efficiency of work." (Freidson, 2001, p. 127).

An important and more recent impetus for the study of professionalism is the educational reform in residency training programs. This reform has occasioned an upsurge of writings on professionalism as clinical competence and on the assessment of this competence. This body of literature focuses on the appropriate attitudes and behaviors of the physician, given her unique privilege of being a professional. It also investigates how these attitude and behaviors can be operationalized in a way that makes them suitable for clinical assessment.

The new CanMEDS framework combines the two broader perspectives – the profession's responsibility for defining its own standards of excellence and the societal legitimation for doing this independently – in its definition of professionalism as core clinical competence.

> "Physicians have a unique societal role as professionals who are dedicated to the health and caring of others. Their work requires the mastery of a complex body of knowledge and skills, as well as the art of medicine. As such, the Professional Role is guided by codes of ethics and a commitment to clinical competence, the embracing of appropriate attitudes and behaviors, integrity, altruism, personal well-being, and to the promotion of the public good within their domain. These commitments form the basis of a social contract between a physician and society. Society, in return, grants physicians the privilege of profession-led regulation with the understanding that they are accountable to those served." (Royal College of Physicians and Surgeons, 2005).

Being a professional consists of a unique combination of roles, excellence and commitment: personal dedication to the welfare of others, mastery at a high level of certain skills and knowledge, sensitivity to the art of medicine, and a wide range of commitments. Note that in the quotation these commitments are positioned as 'basis' for the social contract, instead of otherwise. It is not unusual to see the social contract described as legitimizing the exertion of certain skills and to see commitments narrowed down to the duty to keep the contract, e.g., to

use these skills appropriately. The CanMEDS framework recognizes a broader embedding of the responsibilities and commitments. This is, of course, in line with one of the meanings of the word profession, which not only refers to a paid occupation, but also to the vows people make, i.e. what they 'profess', at the occasion of entering a certain group (most typically religious groups). The Hippocratic oath qualifies as a similar declaration of dedication on entering the medical profession.

All these definitions and their operationalization suggest that the concept of professionalism is co-constituted and co-defined by the relation between professionals and society.

3. Professionalism from a sociological perspective

The social history of the concept of professionalism is complicated, which among others is reflected by the fact that there is no single definition of it, even not for medicine as a profession. It is nevertheless not uncommon to see the sociology of professions described as having gone through at least three stages (Evetts, 2003; Kanes, 2010; Sciulli, 2005).

The first *functionalist* or *structural-functionalist* phase starts in the thirties of the previous century. The early studies give descriptions of the development of the professions and give a rationale for their emergence. Professionalism is generally seen as representing an outspoken, institutionalized form of division of labor. The term 'division of labor' was not new at that time. It was for instance an important topic in the works of both Karl Marx and Max Weber, though, obviously, for different reasons. Marx considered the division of labor as an evil because it lies at the basis of class differences and of man's alienation from the products of his hands. Max Weber on the other hand saw the division as the inevitable counterpart of the process of modernization and rationalization of Western society. This process is characterized by the institutionalization of purposive-rational economic and administrative activities. These activities crystallize in two broad domains: the market (the capitalist enterprise) and the bureaucracy (public administration). Examples of bureaucratic control are activities of supervisory bodies, of authorities which are occupied with the enforcement of legislation, and of institutes which control whether certain standards are met. Characteristic for both domains are the functional and specific relations between providers and consumers; and between representatives of the bureaucracy and those who make use of its services, respectively. Other resemblances are the existence of a restricted domain of competence and/or power and the application of universalistic, impersonal standards.

This first phase in the development of professions is usually seen as the expression of just another form of rational and functional division of labor, with traits of a bureaucracy. Leading sociologists like Talcott Parsons (1963) emphasize not only the rationality of this process, but also its integrating function and uplifting potential. Professions have an integrative function because their members are not only experts but bound to certain norms and codes of conduct. These norms and codes embody goods that never would have been realized when professional – client relationships would have been defined in terms of the market. Freidson suggests in his later work that the professional – client relationship conforms to a 'third logic' (2001), apart from the logic of the market (consumerism) *and* of the bureaucracy (managerialism). Most significant for professions is that they are permitted to regulate and control their own practices. Professions would lose all resemblance with their

current manifestations if they would become on the one hand "mere casual labor in a spot market controlled by consumers" or on the other hand "mere job-holders in firms controlled by managers" (Freidson, 2001, p. 7; also chapter 8). The third logic consists therefore in the specific form of giving-and-taking within the social contract that underlies the professions.

The second, *critical* (or: revisionist, ideological, post-modern) phase in the sociological analysis of the professions puts emphasis on the negative effects of professionalism. The way these negative effects are described sometimes sounds as a far cry of Karl Marx's objections against the division of labor. The professional is now seen as someone who exploits his position of power to sustain his privileged, self-interested monopoly (Evetts, 2005). Larson, for instance, one of the major voices in the critical camp, states about the medical profession in the USA that it has not shown the strength to safeguard its public mandate. Doctors have been more interested in their own private interests than in pursuing the collective value of health. She deplores the lack of benefit the medical profession has yielded for the public good (Larson, 1977; 2003, 460; cited in Kanes, 2006). Illich (1976) goes one step further in his influential book *Limits to Medicine* by suggesting that the system of health care produces its own illness (iatrogenesis). Modern medicine disempowers people and expropriates them of their health. Such criticisms are not restricted to the medical field, however.

Freidson mentions three general issues in, what he calls, the 'assault on professionalism': criticism on the monopoly of professions, on social closure and on credentialism. These three issues hang together. The *monopoly* concerns the privileged position of professions in the market, i.e., their jurisdiction and exclusive command about how expert knowledge and technical means are put to use. *Social closure* refers to the claim that professions have the right to determine their own criteria for membership. *Credentialism*, finally, denotes the profession's right to establish its own 'credentials', i.e., its standards of excellence and systems of accreditation.

Focusing specifically on medicine, Marmor & Gordon (2014) discuss a number of themes in the critical literature. Critics complain that the inherent inequality in terms of knowledge and skills has turned into misplaced superiority and display of authority (paternalism). Another issue is self-regulation. This has become a protective shield, instead of a way to strike the balance between self-interest, service to the public good and striving for the appropriate level of competence. This is the mild version of Larson's criticism. Another issue is the traditional disdain of doctors for any form of competition and competitive commercialism. This disdain has sometimes turned into detrimental indifference to medical costs and the problem of controlling them. And, finally, the individual patient-doctor relationship has been put so central that it has led to a relative neglect of medicine's role with respect to larger societal problems and public health concerns.

Such criticisms have brought some scholars to predict the decline and even the end of the professions (Broadbent et al., 1997; see also Tallis, 2004). Professional elites will become 'proletarian' and this will dramatically change the profession, says Kaul (1986) about journalism. For a while the term proletarianism enjoys some popularity as a way to describe the process of de-professionalization. The idea is that, just like the proletarian has alienated from his labor, so the professional will alienate from his work. Krause (1996) states that professions behave like guilds and that, because they keep doing so, they will die out. However, with the exception of some radical proponents of the free market, only few scholars

really believe that people will be able to gain all the relevant information and to use it in their own interests. The information that is available in the media and on the internet is often incomplete, or distorted by the framing by interests' groups; think of the role of the media and of advertising by the industry. The 'transaction costs' of deprofessionalization will in other words be enormous: inexperienced service users need to work themselves up to a position in which they are able to assess risks and benefits of the different options in a sufficiently realistic and adequate way. Many users will never reach this position or will simply not be willing to deliver the amount of effort that is needed for this (Freidson, 2001, 205).

The third phase in the sociological study of the professions begins in the late eighties and early nineties of the previous century. This phase is characterized by a *cautious reappraisal* of the role of professions, by a *search for* balance and a more *empirical orientation* (Irvine, 2001). Abbott (1988), for instance, puts more emphasis on the internal dynamic within and between professions. Professions are not only interacting with governments and other bureaucratic agencies and financial partners, but also with each other: there are permanent negotiations between professions about their jurisdictions. Abbott also asks attention for the relation between kinds of professional work and the way the respective professions safeguard their credibility, accountability and level of expertise. Different types of work require different credentials and different forms of education, quality control, and organization. Other studies point to the different ways of organizing work and how this has led to a plurality of professional styles, also in medicine. Castellani and Hafferty (2006) mention for medicine seven of these styles: nostalgic, unreflective, academic, entrepreneurial, empirical, lifestyle, and activist. Bloom et al. (2008) see this plurality in the creation of new partnerships between states, market players and civil society organizations. Given the larger role of formal and informal markets in the system of health care, the information asymmetry between experts and clients has become increasingly important. This asymmetry requires additional regulatory arrangements to protect vulnerable consumers against exploitation, misinformation, and insufficient care. These new arrangements require new and targeted negotiations on specific aspects of the social contract. Today these negotiations are more than ever mediated by non-market institutions such as public health bureaucracies, non-profit organizations, advocacy groups, and regulatory bodies.

4. Contexts of professionalism – levels and kinds

Given the increasing dominance and complexity of the context of health care delivery, it is I think helpful to distinguish between levels and kinds of contexts. With respect to *levels* (or: strata) I will refer to micro-, meso- and macro-levels of interaction. Individual patient – professional encounters is obviously located at the micro-level of interaction. Institutional factors belong typically, but not exclusively, to the meso-level of interaction. Legal changes and other governmental actions take place at the macro-level. With respect to the *kinds* I will discern economic, legal, institutional and administrative forms of interaction.

Generally speaking, current medicine is characterized by a much larger impact of meso- and macro-level factors on patient care and research than previous health care arrangements. Instead of discussing a list of all possible contextual factors, I refer to the tentative and

incomplete overview in Figure 2 which gives an impression of the kind of developments and factors with which current health care is intertwined.

Level of influence	*Kind* of influence	Examples	
Meso	Economic	Insurance companies (local arrangements) Local and regional funding agencies Local government (communities, provinces, regions)	
	Legal	Regional regulations	
	Institutional/social	Hospitals/clinics Outpatient facilities Practices	
	Administrative	Management of institutions Managerial rules and regulations	
Macro	Economic	National government Insurance companies (nation-wide arrangements) National funding agencies Industry and other third parties	
	Legal	Laws and regulations with respect to -financing of the health care system -jurisdictions of professions	
	Institutional	Government Professional organizations Service user groups	
	Administrative	Internal professional:	Certification and accreditation Quality control
		Semi-governmental	Registration of demographic and public health related variables Different forms of quality control
		Governmental	Authorities for the enforcement of legislation Health Care Inspectorate

Figure 2 Kind of developments and factors with which current health care is intertwined.

5. A case example

To illustrate this with an example, let me briefly focus on the role of administrative factors, which today form a considerable burden in many health care sectors. The partially new forms of administration serve at least three goals: financial control, pursuit of safety and warrants with respect quality of care. Note how these different factors refer to different stakeholders in the delivery of excellent and sustainable care. *Financial control* refers to the role of the government in maintaining the legal and economic framework of current health care. It also refers to the role of insurance companies, charity funds, and the industry in the financing of the system. *Safety* is also not only a micro-social issue but typically an institutional (meso-) and public health (macro-) concern. It refers to the role of internal rules within health care facilities, but also to the role of all kinds of supervisory bodies. *Quality of care*, finally, is also increasingly defined in terms that transcend the individual doctor – patient relationship. The accessibility of health care facilities is one of the important items in quality assessments. Efficiency and accountability are two other important issues. The supervision and control of these different elements takes predominantly place at a meso- and macro-levels of interaction between stakeholders.

Counter-productive as most of these administrative requirements seem to be from the point of view of the individual professional, they also seem to be more or less inevitable from a broader perspective. It is at this point that two macro-level developments intersect: the profession's attempt to regain trust on the one hand and the need to put an end to the spiraling costs of health care on the other hand. Both developments reinforce each other, in the sense that both lead to an increase of the administrative burden. The weakening of trust in the medical profession was at least partially attributable to individual scandals and improper behavior of the sector as a whole. The profession no longer succeeded in keeping up the image of impeccability and of an unconditional desire to put patients' interests above self-interest. As a result, the prestige of the profession diminished. In order to regain trust the health care sector had to accept additional forms of regulation, beyond its own self-regulation. Examples of the new regulations were already briefly alluded to above and can be found in the sphere of patient safety (medication use, prevention of physical harm), transparency (electronic records; standardization in the form of treatment protocols; digital prescription of medication; registration of compulsory measures in mental health care), efficiency (registering of the activities of doctors and nurses and matching of these activities with treatment protocols) and efficacy (outcome monitoring; measuring of patient satisfaction). In spite of the intention of governments and other stakeholders to deregulate the sector, the new rules laid the basis for a new bureaucracy.

This bureaucracy was in turn strongly enhanced by changes in the financing of the system. These changes took place simultaneously. Rising costs had put the system under pressure. In many countries market incentives were allowed with the purpose of stimulating efficiency and efficacy. Markets themselves, however, did and do not instill trust. They, in fact, tend to have an eroding effect on trust, especially in non-profitable segments of the market (Polder et al. 1996). As was mentioned earlier, these segments needed additional safeguards against exploitation, misinformation, and insufficient care. These additional safeguards came in the

form of rules aiming at the improvement of accountability, transparency, and quality of care; rules that came on top of the rules just mentioned, which aimed at the reliability and transparency of the care process. As a result of these new rules health care providers were obliged to monitor and report about the various elements of the new agreements.

The example shows that there exists an underlying logic behind all these developments. Figure 2 helps us to understand how these different factors intersect. We see that – in terms of the NPM – the conditioning aspects play a decisive role in shaping the practice of medicine at the meso- and macrolevel. There is a lively interaction between the legal, economic, and social kinds of normativity; and between these three and medicine as a larger societal good.

6. Professionalism and the role of expert knowledge; a philosophical analysis

This is a good point to move to a philosophical reflection on the concept of professionalism. I will focus on two issues. I will bend back to the individual professional relationship and discuss the role of (expert) knowledge in the legitimation of medicine. Then I will return to the larger contexts and discuss the impact of differences in context on the definition of the object and purpose of medicine.

We have seen that the expert role is contested today. It is contested by strands within the service user movement. It is under pressure in commercialized sectors of the profession. And it is threatened by inter- and intra-disciplinary competition, by loss of status, and by fragmentation of the field of mental health care – which itself can be seen as a byproduct of ongoing specialization and introduction of market incentives.

At a more fundamental level there are other issues that do influence the very notion of expert knowledge and skills. It has for instance been suggested that the fortunes of professionalism are part of a more general and subtle change in our relation to knowledge and expertise as such (see Beck & Young 2005, who refer to the work of the sociologist Bernstein), which consists in the fact that competence is no longer seen as 'owned by' scholars and that professions are no longer conceived as embedded in scholarly contexts and traditions. Knowledge has been reduced to bits of information that are freely available wherever one lives. And skills are seen as more or less isolated abilities that can be appropriated where and when one wants and can be put to use deliberately. The relation between subject and knowledge and between practitioner and competence has become instrumentalistic (or: functionalistic). Knowledge and skills do not mean anything in themselves. They acquire meaning depending on their use. So, the best thing for a competence to be is to be 'transferrable', i.e., effortlessly transferrable from one context to another. Similar for knowledge: it should be 'generic', i.e., general and suitable for use in as many as possible contexts. As a result, education and professionalism are no longer seen as embedded in practices with different styles, cultures and implicit understandings of the world.

The issue is indeed topical, for instance in discussions about the reform of medical specialists' training. According to the functionalist paradigm it would be recommendable for residency training programs to uncouple contexts from the acquisition of skills. In the Netherlands, there even appeared a policy document in which – based on similar ideas – a

plea was made for marketizing of medical specialists' training. Competences and knowledge, the document stated, are after all 'products' of an educational system that, in order to let it work cheaper and more efficient, can best be dealt with as if it were a market.

The ideology behind these suggestions and proposals is questionable, however. There are, at least, two major drawbacks.

The instrumentalist approach to specialists' knowledge and skills is, first, too *abstract*. It is simply not true that the possession of competences can be operationalized apart from contexts. The competence of 'communication', for instance, involve quite different abilities, abilities that largely depend on the context. Talking with a severely psychotic and violent patient on a police station requires other communicative skills than psychodynamic psychotherapy. Negotiating with a patient about the level of restraint that is needed is in order to keep the situation safe at a closed ward, appeals to different collaborative skills than the negotiating about treatment options with a fully competent anxiety disorder patient. So, competences like communication and collaboration refer to a wide variety of skills that are highly context-sensitive.

Another drawback is the abstractness of the idea that *skills* can be *separated from the persons* who use them. The professional role is more than a set of loosely coupled skills. Professionals relate to their role and the manner professionals do this, becomes part of their professional identity. Residents need to grow into their future roles. This growing requires one to be embedded in the relevant environments. These environments should, ideally, allow residents to discover their own personal fit; the fit between who they are and who they are required to be in terms of knowledge, skills and attitudes.

I am ready to admit, that the relation of so-called 'postmodern' professionals with their knowledge and skills is changing. These changes are not new, they are even not 'postmodern', they are in fact predictable on the basis of Weber's idea of an ongoing division of labor and of increasing interlacements between different spheres of life. However, these changes do not go so far that they offer a conceptual argument for a revision of the notion of professionalism, including a separation between the professional role, the context and the professional as person. On the contrary, they ask for a concept of competence in which 'transferability' is re-interpreted as requiring context-sensitivity. The increasing complexity of current mental health care, contextually and qua expert role, should not be addressed with a de-contextualized concept of competence but with a notion of competence that is even more contextually sensitive than it used to be. Transferability does not necessarily imply isolation and decontextualization. It should be accompanied by increased context-sensitivity.

The dominant role of the context in the shaping of knowledge and skills brings us to a related subject: the role of expert knowledge with respect to the legitimacy of professionalism. What is it in expert knowledge that justifies its special role? And, to which extent does the legitimacy of professionalism depend on the expert role?

One obvious position on this issue is that the authority of the professional is solely depending on the expert role, and more specific, its being based on science and evidence-based interventions.

One-sided emphasis on the scientific foundation of professionalism has important drawbacks, however. If it is science which determines what the 'real' problem is (the real disease), then it is the professional, as representative of science and guardian of truth, who knows best for the

patient. The professional is the one who speaks with authority; the patient can only can give his or her opinion. As a reaction to such paternalism there has emerged another extreme, which consists of a devaluation of the expert role. Both views are related to the same, improper valuation of science's limitations and the same neglect of the distinction between science and worldview. The scientistic defense of the legitimacy of medicine (and psychiatry) requires too much from science, i.e., that it is or will be able to give answer to all uncertainty in the consulting room. The critical view assumes that expert knowledge belongs to a system with totalitarian traits. This system is by definition oppressive and disempowering, according to the critics. Both views don't sufficiently appreciate the inherent limitations in scientific approaches to medical problems; limitations that follow from the abstract mode of observing and thinking of the scientist. Scientists may speak with authority when they do respect the limitations of their methods and say no more than can be justified on the basis of their proper use. But doctors as well as patients will always have to deal with what Gorovitz and MacIntyre (1976) have called the 'inherent and necessary fallibility' of medical knowledge. Even in the ideal case of a complete knowledge of all the relevant causes and mechanisms, doctors will never be able to predict with 100% certainty what will happen in the individual case. There are, in other words, already on epistemic grounds, reasons to argue for a broader than epistemic basis for medicine's legitimacy. Expert knowledge is important; it is even crucial. Without it there is no medical professionalism. But it cannot be the only or the ultimate ground for what doctors do. This is why the expert role occupies a foundational function in the NPM.

To summarize:

- expert knowledge and skills deserve a special status because they are foundational for the practice of medicine;
- the expert role functions in a broader framework of normative relations
- contexts are part of this framework of normative relations
- knowledge is never 'just knowledge', but always part of a practice – a practice of knowing (as in science) or of construing (like in technology) or predicting (as in policy making and treatment). These practices have, as we have seen, normative dimensions.

Expert knowledge in itself cannot fully justify the authority of doctors and undergird the legitimacy of what they are doing. Expert knowledge is, nevertheless, a sine qua non for medical professionalism. For the legitimation of professional practice other norms are relevant: social, economic, jural and moral norms. This broader normative dimension ideally assures that expert contributes to the patient's good, by opening-up of the clinician's understanding, by helping patients and professionals to make the right choices.

7. Contexts and the definition of responsibilities and jurisdictions

I will close with a few remarks on the role of contexts in the definition of professional authority and jurisdiction. Do the roles and responsibilities of the professional and other actors in the field of health care differ depending on the level of context? And what follows is not an analysis of all the relevant elements for the discussion nor a systematic overview of all

kinds of contexts, but a sketch of how the framework we have begun to develop may be filled in further. I will, moreover only discuss *levels* of contexts and how they have an impact on professional responsibilities. Contexts are decisive for the definition of responsibilities. In one of the previous sections I proposed a distinction between a micro-, a meso- and a macro-level of analysis. I will use this distinction for my initial attempt.

Ideally the discussion about duties and jurisdictions of health care professionals and other parties is settled on the basis of a realistic assessment of what can be demanded from the various partners given their competence, their social (contextual) horizon, legal constraints and their specific role in the delivery of care. In practice the picture is much more messy, ambiguous, and characterized by unresolved tensions. What is negotiated is not only the content of care, the 'products' so tot say, but also the terms under which these products are delivered. These terms co-define the rights, duties, and responsibilities of the relevant stakeholders. There is no blueprint for the definition of these responsibilities. Bloom et al. (2008) discuss 'new partnerships' between representative bodies within the state, market players and civil society organizations. Castellani & Hafferty (2006) predict a proliferation of professional styles.

Blueprint or not, it seems obvious that the duties and jurisdictions of physicians at a micro-level differ from duties and jurisdictions of doctors at other social levels and that something similar can be said about it in a more general sense. Differences in duties and jurisdictions are based on differences in responsibility and these in turn by differences in domain (or: object) and the type of good that needs to be realized in that domain. The physician in the board of a regional hospital has other responsibilities than the physician in a private practice. Professionals involved in (macro-)level policy making have duties and responsibilities that – again – hugely vary from the duties and responsibilities of their colleagues in private practices and boards of the hospitals. These differences can be traced back to differences in domain and in types of goods associated with these domains.

The domain of the CEO of the hospital (meso-level) is twofold and concerns, broadly speaking, (a) the relation between the hospital and the practitioners to whom it provides employment; and (b) the relation between the hospital as institution and other players in the field, medical and non-medical, such as the state, the legal system, insurance companies, competing institutions, service users and the public. Much of what the CEO does aims at the improvement and strengthening of the conditions under which practitioners deliver their services. This part of the job has an internal focus. Another part of it is externally focused and consists of negotiations about how to face health care needs at a regional level with all relevant stakeholders. The institution has the purpose of creating stable conditions for the delivery of these services. The duties and jurisdictions of the CEO concern, therefore, the norms, rules, and principles that regulate the 'conditioning' aspects of medical practice. But the institution has also an externally focused purpose, to adequately respond to the needs for medical care in a given catchment area.

This means four things. It means first, that hospitals are no ends in themselves. They exist for a greater good, the care and treatment of people who suffer from illness and decline. But, secondly, the focus on this greater good does not diminish that the responsibility of the hospital representative is focused primarily on the managerial and economic side of the transactions that take place in order to fulfill health care needs. It means also, thirdly, that

what CEOs do is a good in its own right. Current medical practice is unthinkable without the guarantees the institutions offer: housing, administrative support, technical equipment, contracts with insurers, platforms for teaching and education, a living for its employees, and so on. So, the kind of good that is associated with the institutional domain and, more particularly, with the hospital as institution, is that it provides safeguards with respect to the conditions under which health care can be delivered. A fourth, subtler issue is that conditioning norms are not self-contained, but related to and determined by qualifying norms: the promotion of the conditions that make health care possible takes place with an eye on the destination of medical practice, which is to cure, to care, and to console. More technically phrased: the norms and principles of the conditioning aspects are 'opened-up' in the direction of the qualifying aspect (of the NPM).

Something similar holds for the macro-sphere, i.e., for the role of the state, advisory and supervisory boards, professional organizations, patient movements and the legal system. The domain covered by these agencies is diverse and concerns, for instance,

- the laws and agreements that help determine whose behaviors should be sanctioned as deserving professional attention;
- framing of public awareness of mental health problems and of expectations about what mental health care can do (health education);
- registering and reporting of illnesses for public health purposes;
- prevention
- raising awareness of stigma and social exclusion.

Much of these activities are meant to provide the conditions that make health and health care possible. They can be grouped together and placed under the umbrella of medical practice itself, with its own internal, moral destination, which is to serve the ill. This is another way of saying that doing justice to the conditioning aspects is intrinsically related to the moral meaning and the moral purposes of health care. However, given this overarching 'telos', the focus of local actors will usually aim at the conditioning spheres themselves. The medical advisor at a ministry of health can for instance be convinced of the need of empowerment of patients (moral). But she will not undertake action herself in this respect, for instance as campaigner. She will, instead, maximally promote the conditions which make empowerment possible. This aim can be promoted by subsidies, legal reform, and additional regulations. These financial, legal and administrative measures are enabling. They are not itself a form of help, but they enable the good cause of patient empowerment.

8. Conclusion

It is tempting to proceed from here to an analysis of the internal structure of the hospital; or, of health care as such, as a societal phenomenon. This must be left to another occasion. My account so far has shown that at the meso- and macro-level activities of stakeholders are ideally still defined as taking place under the umbrella of healing, diminishing of suffering and consolation; but that these activities more specifically are determined by non-moral types of norms, norms that are related to efficiency, sound policy making, and justice (fair distribution of means in a certain region).

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Preparing data warehousing students to be responsive practitioners

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Abstract

Critical thinkers in Operations Research after the Second World War promoted a more proactive role for practitioners. They argued that we should move away from reacting to reality towards shaping reality, indicating a movement within the Nature-Freedom ground-motive away from nature towards freedom. From a Creation, Fall, Redemption ground motive this argument requires more reflection on the dominant role of man. In the light of the foregoing, even more reflection is required in deciding how to prepare students to be become successful practitioners in the data warehousing industry.

This paper reflects on the implications of the different ground motives for data warehousing practitioners. The Creation, Fall, Redemption ground motive is adopted. Strijbos argues that decision makers should be sensitive towards the intrinsic normativity of the problem situation. He promotes a holistic understanding of the given core nature/purpose of the environment where the practitioner wants to achieve positive change.

The question addressed by this paper is how we can prepare data warehousing students to be responsible agents for change within the context of the intrinsic nature of the organisation. Data warehousing students and industry expect us to teach students the technical knowhow required to handle the vast data requirements for decision support in large organisations. This paper explore "soft skills" required by students to enable them to be responsive in the problem environment. Our motivation for their soft skills development relates to enhancing their ability to understand the intrinsic nature of the problem environment and to act within its context.

The paper shows how the ideas promoted by Strijbos in his work on Disclosive Systems Thinking can shape how data warehousing students are prepared to become more responsible practitioners.

1. Religious ground motives

The philosopher Immanuel Kant uses transcendental thought when he describes the conditions for the possibility of experience. He argues that we cannot experience things in the way they are in themselves; we rather experience them based on our own prior experiences (Larmore, 2003, p. 261).

However, the transcendental reflection of Kant has long been criticised. If one's experience is influenced by your frame of reference, there is a reliance on a first frame of reference that

cannot be validated (Ulrich, 1983). In discussing Hegel's critique of Kant, Habermas (1971, p. 7) writes: "The critical philosophy demand that the knowing subject ascertain the conditions of the knowledge of which it is in principle capable before trusting its directly acquired cognitions." According to Habermas (1971, p. 8), Hegel argues that "reflection is dependent on something prior and given, which it takes as its object while simultaneously originating in it". In effect, Hegel challenges Kant's transcendental reflection because of its lack of an absolute starting point.

The Dutch philosopher Herman Dooyeweerd identifies religion as the absolute starting point of all philosophy when he writes: "Those who think they find an absolute starting point in theoretical thought itself come to this belief through an essentially religious drive, but because of a lack of true self-knowledge they remain oblivious to their own religious motivation.", (Dooyeweerd, 1979, p. 8). He identifies "religious ground motives" that controlled the development of western culture. This paper explores the role of Christianity and modern humanism as ground motives guiding practices in the field of business intelligence.

Christianity is based on the "Creation, Fall, and Redemption (CFR)" ground motive. This ground motive is supportive of the Christian belief in an Almighty Creator that created everything as good, and created man in a perfect relationship with Himself. This relationship was tarnished by the sin of man (the Fall). Sin entered the world and polluted the God-given goodness of man to the detriment of humanity. This disturbed relationship between God and man can be restored only through the belief in Redemption in Jesus Christ which is gifted through the grace of God rather than merited by the achievements of man.

The humanist ground motive is that of "Nature-Freedom (NF)" where nature and freedom are two poles. This ground motive assumes "that man is autonomous and free and that nature is completely determined. Man's autonomy is expressed in the drive to analyse nature in order to master it. Dooyeweerd calls this drive the *domination motive*." (Kalsbeek, 2002, p. 63). Kalsbeek (2002) presents an argument of Dooyeweerd that if nature is determined and therefore can be described by the laws of science, human thinking can also be seen as a causally determined process of nature which jeopardises freedom as a humanist ideal.

A key difference between the CFR and the NF ground motives is the autonomy of man to dominate his environment. A practitioner who is guided by the CFR ground motive does not view himself or his fellow experts as absolute shapers of the situation; rather they will be responsive to the given reality, knowing that although the given reality is influenced by sin, it is still part of the counsel of God. In contrast to this, the practitioner guided by the NF ground motive is motivated to take control of the situation to achieve what he can justify as best for all involved (and affected). It is from this perspective that we want to prepare our data warehousing students to be responsible practitioners.

2. Data Warehousing in context of Information Systems and Systems

Data warehouses are strategic information systems aimed at supporting strategic decision making in organisations based on integrated data from different sources (Kimball, Ross, Thornthwaite, Mundy,

& Becker, 1998). Data warehousing practitioners should have a sound technical programming ability to ensure good integration and performance of the data warehouse. They also need a good sense of business understanding since the data warehouse is mainly used for strategic, as opposed to operational, decision making. The fact that the data warehouse is used for strategic decisions make it more sensitive from an ethical use perspective. Decisions to close down businesses, open up new retail stores, acquire other businesses have a large impact on the well-being of individuals. From the CRF ground motive we argue that after the Fall, man uses tools in a responsible or irresponsible matter in a broken world. The argument of this paper is that we should equip our data warehousing students to become responsible practitioners.

We all know that is difficult if not impossible to use biblical justification for decisions in the corporate world, we therefore have to find other ways of convincing our fellow practitioners to take responsibility for the consequences of their professional activity.

In this paper we propose that methodologies that incorporate an explicit normative stance is taught to the data warehousing students. Checkland and Holwell (1998) discusses the link between information, systems, and information systems. They argue that systems thinking methodologies can be successfully applied to information systems development. The problem environments served by the information systems should be viewed as systems as described in the systems thinking discipline. Systems are interrelated sets of subsystems that work together to achieve an overall objective; they use resources and are influenced by their environment. The activities of the sub systems, resources, and role of the environmental factors are coordinated (managed) to achieve the overall objective (Churchman, 1968).

3. Systems thinking paradigms

Different systems thinking paradigms exist and have influenced information systems development. Traditional software development methodologies are grounded in the hard systems thinking paradigm which is founded on a realistic ontology. Ontologically, soft systems thinkers has a relativistic worldview. They use systems as mental maps to make sense of a messy world. Prototyping and agile systems development methodologies are used to provide tools to incorporate different world views. Critical systems thinkers are influenced by critical social theory and experience the world ontologically as controlled by power struggles and oppression. Critical systems thinking aims at emancipative action through reflection on normative motivations of all involved and affected as described in the work of Ulrich (1983).

4. Disclosive systems as an alternative to traditional paradigms

Strijbos (2000) introduced disclosive systems thinking as a methodology to address the responsibility of people (whom he calls "societal agents") for particular developments. He asks how the responsibilities of different agents relate to one another and more importantly: "What are the norms for actions by the various agents?" He states that every systems methodology implies a particular normative idea of systems ethics. This means that ethics are not just an afterthought, but that it is part of the chosen methodology.

Strijbos (2000) investigates the systems ethics and thus the normative principles that are implicit to hard, soft and critical systems thinking. He follows Dooyeweerd's idea of the clash between the ideal of personality and the science ideal. Strijbos claims that "human freedom is at risk of being destroyed rather than conformed by human scientific intervention in reality aiming to set people free. This tension between the two poles of freedom and control manifests itself through the whole history of modern Western thought." Hard systems thinking is oriented towards the pole of control, while soft systems thinking tries to shift to the opposite pole of freedom, but since it does not accommodate the underlying power struggle in the environment, it accepts the existing power relationships in the environment. As critical systems thinking is oriented towards the pole of freedom, seeking radical change in the environment, it is based on the "ethics of liberation" Strijbos (2000, p. 168).

In contrast to critical systems thinking, disclosive systems thinking views the human being not as an autonomous law-giver or meaning-giver, but rather as a part of created reality. Man is searching for norms, not just creating them (Pothas, De Wet, & Strijbos, 2002). Strijbos (2000, p. 168) states that "'disclosive systems thinking' and the systems ethics entailed in it proceed from the normative view that the various systems receive their meaning from the pre-given reality and order of which these systems are a part. In other words, the idea of an intrinsic normativity is accepted as a leading principle for human intervention in reality and the endeavour to shape the world. Or, better: human action forms a response to this intrinsic normativity and may as such disclose structural possibilities that are enriching for human life and culture." The fact that man is not able to change or intervene in every aspect of the problem situation, differentiates disclosive systems thinking from critical systems thinking.

Strijbos (2000, p. 169) defines four principles of disclosive systems thinking which are quoted and explained in the following paragraphs.

"Primary for the development of human society and culture is the norm for the opening or disclosure of everything in accordance with its inner nature or its intrinsic normativity". In every situation there are natural laws governing that situation that people cannot ignore. However, there are also structure and norms in the situation that were formed over time; the situation can be seen as historically conditioned. There are certain given circumstances that were formed by tradition, culture and history. The expert guiding intervention in the situation must first identify this intrinsic normativity of the situation and secondly, be sensitive to the structure of the situation. Although other systems methodologies see freedom as a result of control, disclosive systems thinking acknowledges that human intervention aimed at liberating people, often put human freedom at risk. A major difference between critical systems thinking and disclosive systems thinking is that in critical systems thinking, formative activity is seen as a way of imposing man's will on a situation, whereas disclosive systems views formative action as a sensitive response to the situation of which one is an intrinsic part.

"Characterising cultural formative activity as 'disclosure by response' leads to the identification of a second normative principle namely, the simultaneous realisation of norms

guided by the qualifying norm for a particular area of human life." There are two ontological distinctions to guide understanding of the intrinsic normativity of a situation. First is the distinction between God, law, and created reality, where law expresses the relation between God and reality, and secondly a distinction between entities and aspects. Disclosive systems thinking states that the simultaneous realisation of norms in an action must be led by the distinctive character of the action, i.e. by the qualifying aspect and its accompanying norms for action.

"A third principle relates to the fact that systems methodology usually concerns human activity in which a diversity of human actors is involved. So disclosure results from a multi-actor process in which the actor bears the responsibility to build a framework of co-operative responsibility for human action". In a hard systems approach, the systems expert is seen as an outsider who is able to objectively determine what is good for those in the problem situation. In soft systems thinking, the expert spends time in determining which actors are involved and what their respective roles are. The expert is still an outsider but responsible to determine the different role players in the situation. In critical systems thinking, the expert becomes a participant in the situation. The expert uses a critical discussion to reach consensus on how to change the situation in the best interests of all involved. The relationship between actors is based on power. Disclosive systems thinking views the expert also as part of the situation, but with the purpose of identifying or disclosing the responsibilities of the different actors. Strijbos (2000) argues that the abolition of power will not lead directly and automatically to responsible action.

"Fourth, in building such a common framework the experts need a critical awareness of the social- cultural context." This view, suggesting that the social-cultural context influences the actors, is similar to that of critical systems thinking. However, there is also an awareness of the fact that norms do not have the status of purely human constructs and that the intrinsic normative structure of reality always pertains, although it can be ignored, even suppressed (Pothas et al., 2002).

5. Data warehousing from a disclosive systems thinking perspective

Since the disclosive systems thinker does not regard human freedom to be absolute, the data warehousing team leader does not belief that he controls the problem situation. His role is to facilitate the disclosure of the intrinsic normativity of the situation and to ensure that team member's responsibilities are performed in harmony with such intrinsic normativity. The disclosive systems thinker views his facilitation as a response to structural conditions in the situation. Although other systems thinkers might not be aware or even choose to ignore the intrinsic normativity, the disclosive thinker aims to disclose the intrinsic normativity.
The intrinsic normativity is the essence or the meaning of the organisation. One might ask: "What is the main benefit of this organisation?" The intrinsic normativity of a hospital system is ethical in nature and focuses on patient care. A disclosive systems thinker keeps the intrinsic normativity in mind during every phase of the data warehousing project. Strijbos (2000, p. 174) states that: "each entity functions in a diversity of modalities or modes of being,

which are aspects of one and the same entity". The qualifying norm of an organisation guides the different aspects of that organisation. A data warehouse also has different aspects such as an analytical, economic, and a juridical aspect according to the list of aspects of Dooyeweerd, but the qualifying aspect is found in the intrinsic normativity of the organisation in which the data warehouse functions such as a hospital. The data warehouse should be designed to support the qualifying function of the organisation.

In a hospital, requirements collection will focus on how the daily actions of managers can be improved with the aim of improving patient care. Disclosive systems thinking emphasises the responsibilities of various actors. Various people from different sections in the organisation will be included in the process to ensure that the data warehousing team better understands the circumstances to which the data warehouse forms a response. The requirements team needs a clear understanding of the social- cultural context in which the data warehouse will be used. The data staging phase will focus on how data quality can be improved to improve patient care. Once again other modalities such as the arithmetic and analytic aspects of data staging are guided by the ethical modality of patient care.

The choice of a data modelling method will be influenced by the degree to which each of the possible methods advance patient care. One might argue that data modelling is very far away from patient care in a hospital. However, it is clear that patient caretakers are able to understand a star schema and therefore to test the model. They are able to ensure that all the information required by management to improve patient care, is available.

The intrinsic normativity of every type of organisation is not as easy to determine as that of a hospital. It is the responsibility of the data warehousing team to disclose the intrinsic normativity, or the internal meaning of the organisation, before starting to develop a data warehouse. It is often found that the intrinsic normativity becomes more clear (is more clearly disclosed) as the development continues. This is only possible when end-users are involved in the development process.

The ideas presented here coincide with Churchman (1968) view of a systems objective that needs to be central to all the subsystems. The difference, however, is that Churchman's central objective is not subject to ethical scrutiny. The disclosive systems thinker accepts the given reality (intrinsic normativity) and also that man cannot change everything. He aims to involve different actors and gives responsibility to people ensuring accountability for actions with regard to the intrinsic normativity. Consensus is used to determine what is best for everybody involved. This is in contrast with the work of Churchman (1968) that uses a central measurable objective, which implies that the main objective should be quantifiable.

6. Soft skills for data warehousing students

The paper aims to propose soft skills for data warehousing students to enable them to become responsible practitioners. This is done from a disclosive systems perspective based on the CFR ground motive. These students are fourth year students who already completed a Bachelor of Science degree in Information Technology. Their graduate module were mostly rooted in the hard systems approach with some reference to soft systems thinking in information systems development, such as prototyping. This discussion is presented according to the principles of disclosive systems thinking:

"Primary for the development of human society and culture is the norm for the opening or *disclosure of everything in accordance with its inner nature or its intrinsic normativity*".
In order for our students to be able to reflect on the intrinsic nature or intrinsic normativity in an organisation, they need to develop a contextual understanding of how different entities in an organisation work together to achieve a desired outcome. Students need to understand intrinsic differences between different entities. The modal aspects of Dooyeweerd can be used to sensitise them to these differences. These aspects are presented in Table 1 from the discussion of Basden (2000).

"Characterising cultural formative activity as 'disclosure by response' leads to the identification of a second normative principle namely, the *simultaneous realisation of norms guided by the qualifying norm* for a particular area of human life."
Once students start to think about the various normative implications of data warehouse in a problem situation they soon realise that many aspects requires reflection. Discussions are facilitated and students start to appreciate the interaction of their knowledge areas, such as entrepreneurship, economics, and system analysis. This discussion is guided by the aspects of Dooyeweerd presented in Table 1. The objective of the data warehouse is then discussed in terms of its functioning in the economic environment of the organisation but also in terms of its role in the normative goals of the organisation.

Table 1: The 15 modal aspects of reality identified by Dooyeweerd as categorised by Basden (2000); using the good it brings

Mathematical aspects		
Quantitative	One, several, many; more or less	Reliable amount
Spatial	Here, there, between, around, inside	Simultaneity, continuity
Kinematic	Flowing and going	Change
Pre-human aspects		
Physical	Forces, energy and matter	Irreversible persistence and causality
Organic	Living as organisms in an environment	Sustained being and functioning that is not wholly controlled by the environment
Sensitive	Feeling and responding	Interactive engagement with the world
Aspects of human individual		
Analytical	Conceptualisation, clarifying, categorising and cogitating	Independence from the world; conceptual and theoretical thinking
Formative	Deliberate creative shaping of things	Achievement, innovation
Lingual	Expressing, recording and interpreting	Externalisation of intended meaning; referring beyond to whole web of meaning
Social aspects		
Social	We, us and them; relating, agreeing	Togetherness
Economic	Managing limited resources frugally	Sustainable prosperity
Aesthetic	Harmonising, enjoying, playing,	Delight that seems non-necessary
Aspects of structure of society		
Juridical	Due appropriateness, debt and reward, structures of policy and	Due for all
Ethical	Attitude, self-giving love	Extra goodness, beyond the imperative of
Faith	Vision, commitment, certainty and belief; aspiring, trusting,	Courage, hope and openness to the Divine; change in the attitude and direction of

A third principle relates to the fact that systems methodology usually concerns human activity in which a diversity of human actors is involved. Such *disclosure results from a multi-actor process* in which the actor bears the responsibility to build a framework of co-operative responsibility for human action".

Although critical systems thinking and specifically critical systems heuristics (CSH) developed by (Ulrich, 1983) was designed from a NF ground motive, one may use it from a CFR ground motive to better describe the normative implication in a problem environment. CSH aims to identify the conflicting views in a specific problem environment. Ulrich's motivation is to elevate the affected to have the same power as the involved. In order to identify the human actors involve and their roles he formulated 12 boundary questions. These questions can be used by data warehousing practitioners to better understand the problem environment in term of actors. The twelve questions of CSH are given in Table 2.

Table 2: Structure of Critical Systems Heuristics of Ulrich (1983)

	Question	Categories	Central Issues Covered		
1	Who is/ought to be the client (beneficiary) of the system S to be designed or improved?	Client	Sources of motivation (of S)	The involved	The social systems S to be bounded.
2	What is/ought to be the purpose of S; i.e. what goal stated ought S be able to achieve so as to serve the client?	Purpose			
3	What is/ought to be S's measure of success (or improvement)?	Measure of improvement			
4	Who is/ought to be the decision taker, that is, have the power to change S's measure of improvement?	Decision maker	Sources of control (of S)		
5	What components (resources and constraints) of S is/ought to be controlled by the decision taker?	Components			
6	What resources and conditions is/ought to be part of S's environment, i.e. should not be controlled by S's decision taker?	Environment			
7	Who is/ought to be involved as designer of S?	Planner	Sources of expertise and implementation (of S)		
8	What kind of expertise is/ought to flow into the design of S; i.e. who ought to be considered an expert and what should be his role?	Expertise			
9	Who is/ought to be the guarantor of S; i.e. where ought the designer seek the guarantee that his design will be implemented and will prove successful, judged be S's measure of success (or improvement)?	Guarantor			

10	Who is/ought to belong to the witnesses representing the concerns of the citizens that will or might be affected by the design of S? That is to say, who among the affected ought to get involved?	Witness	Sources of legitimation (of S)	The affected	
11	To what degree and in what way is/ought to the affected be given the chance of emancipation from the premises and promises of the involved?	Emancipation			
12	Upon what world-views of either the involved or the affected is/ought S's design be based?"	Weltanschauung			

The dominance aspect force of the NF ground motive is clear in the "ought to" mode of these questions but the CRF practitioner can focus the "ought to" questions in support of the intrinsic normativity of the situation.

"Fourth, in building such a common framework the experts need a *critical awareness of the social-cultural context*."

The cultural context in a developing country such as South Africa is of ever increasing importance. People of different cultures work together in data warehousing teams. Different perspectives on culture exists and should be discussed with information systems students. Some view culture as fixed while others view culture as evolving and shaped by our environment. Culture even influence how we experience the intrinsic nature of a specific problem environment. When people of different cultures work together in information systems development teams, different people reacts differently to cultural difference. In a study by Nhlapo and Goede (2010) the different perceptions of culture is highlighted and the need for good communication skill is identified. Van der Stoep (2006) also reflects on the relationships between culture and communication. If we want to prepare our data warehousing students as responsible practitioners we need to equip them with good communication skills and a sensitivity towards cultural differences.

7. Conclusion

Disclosive systems thinking, developed by Strijbos (2000), enables us to provide students with an alternative to critical systems thinking. The key difference between these paradigms is based on the ground motive that guides the practitioner. In disclosive systems thinking the CFR ground motive enable us to understand the role of the decision maker in response to a given intrinsic normativity. In contrast to this, the critical systems thinker functions in the NF freedom ground motive and aims to control the environment. Although critical thinkers

such as Ulrich argues that problems cannot be solved and that the aim is rather that of improvement, the understanding of the disclosive systems thinker is in a different context, namely a context appreciative of the created reality and brokenness of it.

It is our responsibility to open the minds of our data warehousing students to the non-technical, non- financial aspects of their profession. They need to understand that although they are developing an artefact to be used by others, the artefact itself should enable the practitioner to use it responsibly in support of the intrinsic normativity of the organisation. In the multicultural context they require understanding and communication skills to better understand the context where their artefacts will be developed and used.

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Multi-aspectual Interview Technique (MAIT); an alternative approach towards interviewing students in further and higher education

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1. Introduction

This paper reports on the Multi Aspectual Interview Technique as a method for addressing three particular challenges for interviewers practising in the area of educational research. It is important that all kinds of interviewee are able to express that which is most meaningful to them, whether they are familiar with conceptual thinking or not.

Several challenges have to be met that might prevent the full 'voice' of interviewees being heard (Paxton, 2012). One is to overcome barriers that often exist between researcher and interviewee, arising from differences in background, class, culture or ways of thinking (Mullings, 1999; Blommaert, 2005; Mellor et al., 2014; Amoroso et al., 2010). A second is to reveal the many important issues that often remain hidden, some of them being taken for granted (Ybema et al., 2009), some being assumed by the interviewee to be too trivial to mention, or are embarrassing (Morris et al., 2006; Stommel & Willis, 2004; Mooney et al., 2014). A third is to ensure that what is discussed reflects the interviewees' everyday lives, rather than being limited to what the researcher is interested in and what prior theory specifies as important (Bryman & Bell, 2011; Burgess, 2001; Sellar et al., 2011), or what is 'extraordinary' rather than the ordinary things of everyday experience.

It was found that the suite of aspects delineated by the Dutch philosopher Herman Dooyeweerd (1894-1977) provides both a practical device and a philosophical basis for achieving this kind of interviewing. Rather than using a list of questions, aspects provide spaces in which to discuss things that are meaningful. Previous research by Winfield (2000) had shown the power of Dooyeweerd's aspects to elicit tacit knowledge and expertise as a Multi-aspectual Knowledge Elicitation (MAKE) technique (Winfield et al., 1996). This was adapted to interviewing more generally, about issues that are less precise than existing expertise, such as aspirations and future potential.

The sample utilised here to investigate the usefulness of the method is two groups of students in FE and HE. One group consisted of students at a university in the north-west of England

and the other was a group enrolled on an Access to HE course in the same region. The result, Multi-Aspectual Interview Technique (MAIT), was empirically used and tested with the two cohorts of students.

2. Three specific challenges of interviewing

Three specific challenges are examined here, which are important because they distort or hinder what the interviewee expresses: barriers between interviewee and interviewer, hidden issues, and the distorting of everyday experience by theoretical expectations or influences.

2.1 Barriers of culture, background, power and class

The researchers in this study are from university backgrounds; many of the interviewees in this research are not. Many were attending a FE college. HE and FE institutions have different cultures, pedagogy and status, reinforcing the issue of status and class differences and potential interviewee-interviewer incompatibility. Many researchers in HE may have very different perspectives, aspirations or values than those of the interviewees.

Interviewing in cross-cultural settings presents many challenges (Mullings, 1999), including differences in perception, ways of interacting rapport, and power relations between researcher and interviewee, which might be actual or perceived (Mellor et al., 2014). What is said does not translate well across cultural barriers (Blommaert, 2005), and misunderstandings might occur. Trust, empathy and cooperation are particularly important. Many may see the researcher as a distrusted intruder, so the data collected might be suspect (Shah, 2004). Usually it is the researcher who has the power in relation to interviewees and it has been assumed that class matching is optimal when researchers interview interviewees from the same class, but Mellor et al. (2014) argue that this is not the case, citing dangers of working-class backgrounds being romanticised (Hey, 2008), problems with rapport, limitation on the questioning process, and ensuring that the interviewees express what is genuinely meaningful to them. It is often useful to be aware of differences of background and culture, but merely identifying differences might stultify dialog (Mullings, 1999, 349). Even speaking about inequalities can reinforce them (Amoroso et al., 2010).

A common response to such barriers is the critical approach, which emphasises the emancipatory possibilities in interviewing, such as sharing in reflections (Freire, 1996). Emancipation is not only from oppressive life conditions but also from unwarranted assumptions that constrain interviewees' thinking or aspirations (Avgerou, 2000; Myers & Klein, 2011). This approach, however, often sees the world through the narrow lens of power, often misinterpreting situations (Basden, 2008, p. 164).

We suggest an alternative approach, based on meaningfulness that transcends classes and backgrounds, which facilitates interviewees in considering the detail of their own comments and represent their own meanings.

2.2 Revealing hidden issues

It is important to avoid encouraging obvious or simplistic responses from interviewees that would leave other important issues hidden from view. Issues might be overlooked for reasons linked to either researcher or interviewee.

Researchers often arrive with prior theory, as in positivistic approaches, or theoretical lenses, as in interpretivistic or critical approaches, with research questions being at least in part defined by issues that emerge from these (Klein & Myers, 1999; Angharad cited in Bryman & Bell, 2011). What is researched is often constrained by what is already of interest in past and present research, so that new issues are not given their due. Theory frequently defines questionnaire questions (Burgess, 2001; Brewer & Headlee, 2010; Rugg & Petre, 2007) and interview questions (Bryman & Bell, 2011), so the range of issues about which data emerges is limited. Either way, many issues that are meaningful to the interviewee are overlooked.

Interviewees can fail to disclose whole ranges of issues for several reasons. Most interviewees hold tacitly known scripts and schemas (Ybema et al., 2009) and, as Polanyi (1967) argues, tacit knowledge is very hard, if not impossible, to explicate.

Conventions of the community in which the interviewee lives can affect what interviewees talk about (Morris et al., 2006). Interviewees might feel embarrassed to talk about socially sensitive issues, especially in face-to-face settings (Stommel & Willis, 2004, p. 255; Mooney et al., 2014, p. 18). Fear of ridicule or alienation can also suppress disclosures and the alienated interviewee does not recognise issues as relevant or worthwhile (Mann, 2001). Where there is embarrassment or alienation, whole spheres of issues can remain hidden.

Interviewees might not have the linguistic resources to match those of the interviewer, so their 'voice' is not heard, even though the researcher might understand what the interviewee says or writes at a surface level (Paxton, 2012). This occurs especially where the interviewee and researcher are of different cultures or backgrounds, or where they are of a different class or status (Amoroso et al., 2010). The relationship between researcher and interviewees can also prevent issues being raised, especially where cultural barriers exist (Blommaert, 2005). When the researcher and interviewee share the same cultural assumptions, the interviewer may treat some topics as too insignificant for discussion (Shah, 2004). So issues might be left unsaid because the interviewee assumes they are trivial (Mellor et al., 2014).

2.3 Everyday issues

Everyday experience is important because it is diverse in its meaningfulness (Habermas, 1987) and because it often subverts institutional and societal expectations and beliefs (de Certeau, 1984). Two challenges arise. One is that some interviewees don't want to be seen to be 'everyday' they want to appear more knowledgeable. They assume that everyday issues are trivial. The other challenge arises from treatment of the everyday by researchers and the literature.

Ybema et al. (2009) remark that organisational studies have tended to ignore the humdrum, everyday experiences of people and are often remarkably remote from these commonplaces and that we tend to have a blind spot for what is usual, ordinary, routine. Everyday life, far from being uninteresting and even self-evident, is highly complex and, they argue, being immersed in everyday experience need not make us unaware of the social structures that contextualize them. This is contrary to usual researcher assumptions. Ybema et al. (2009)

found very few useful texts in the field of organisational ethnography. In almost every field, everyday life has not been addressed adequately.

Theoretical approaches of any kind abstract from everyday reality, to focus on limited ranges of aspects, and employ limited kinds of rationalities (Basden, 2011; Dooyeweerd, 1955). So the diversity of meaningful issues encountered in everyday experience can be much reduced, and many interconnections missed.

A few contemporary thinkers have begun to respect everyday experience. Bourdieu's (1977) idea of habitus has been useful in some research. Yet Bourdieu sees everyday life in terms of 'struggle' and 'taking advantage', and he holds a strong normative dislike of symbolic violence, where people harm each other by their use of language, and so he tends to miss the joys of everyday life. Bourdieu's idea of habitus is criticised by de Certeau (1984, 58-60) as a fetish, an appearance of reality that is no more than a plausibility.

De Certeau (1984) himself claims interest in the 'ordinary man' who is silently forgotten by academic interests, and in the quiet majority who are marginalised because they are non-producers of culture (de Certeau, 1984, p. xvii). But this claim might be questioned, by a rather dismissive attitude (p.111). In fact, de Certeau falls into the trap of aestheticisation of the everyday, trying to elevate it to the level of poetry or art, rather than understanding it as it presents itself to us (Ganguly, 2002).

We need a way of interviewing that supports the researcher in finding even the humdrum aspects of the interviewee's life interesting, regardless of their prior theoretical standpoint, prejudices or ideological commitments, and one that supports the interviewee in expressing all the richness of these 'ordinary' aspects.

2.4 Reflection

The challenges of interviewing across cultural barriers, of encouraging discussion of the full range of issues found in everyday life, and of disclosure of hidden issues, have been discussed. If the aim of research is not just to gather idiographic detail but to generalise, in order to find the generic ways in which life situations are meaningful (Klein & Myers, 1999), then the challenge in interviewing and subsequent analysis is to ensure that all issues that are meaningful to interviewees are given their due, including those that are usually hidden, deemed mundane, or hindered by such barriers.

The philosophy of Herman Dooyeweerd (1894-1977), a Dutch thinker of the mid-twentieth century, offers a different approach to everyday life and its diversity, which seems promising as a foundation on which to address the three challenges. The next section outlines portions of Dooyeweerd's philosophy that are relevant to this research.

3. Dooyeweerd's philosophy and research methods

Dooyeweerd (1955) made everyday experience and meaningfulness the starting point for his philosophy, rather than treating them as phenomena that require theoretical explanation. Until recently, philosophy has tended to treat the everyday as inferior and meaning as essentially a property we arbitrarily attribute to things. By contrast, Dooyeweerd's idea of meaning echoes the presupposition behind the question 'What is the meaning of life?', that there is some

meaningfulness that transcends us, was already there before us, and by reference to which we live our lives. Meanings that are attributed by us or signified via language, are now seen, not as generated, but as though wrapping up pieces of this meaningfulness in things or words.

In this view, what interviewees say may be interpreted as pieces of this transcending meaningfulness, and its very transcendence offers a basis for meeting the challenges, as will now be explained.

3.1 Dooyeweerd's Suite of Aspects

Everyday experience tells us this transcending meaningfulness is diverse, with multiple aspects (irreducibly distinct ways in which things, events or situations can be meaningful). Dooyeweerd separated out fifteen of these aspects, presenting a suite that has been found useful in a range of studies and methodologies (de Raadt, 1989; 1995; Bergvall-Kåreborn, 2001; Eriksson, 2001; Basden & Wood-Harper, 2006; Ahmad & Basden, 2013).

The aspects that Dooyeweerd delineated each have a kernel meaning, around which a constellation of meanings revolves that involve meanings from other aspects. His aspects and their kernels are as follows, expressed by examples of some human activity meaningful in the aspect:

Quantitative: quantity, number, calculations

Spatial: continuous extension, space required

Kinematic: motion, movement

Physical: energy

Biotic: vitality, e.g. breathing, circulation

Sensitive: feeling, emotional reaction

Analytical: distinguishing, conceptualising, critical thought

Historical: deliberate goals, achieving, culture, formative power (also technology, shaping and creativity)

Lingual: symbolic meaning (development of language)

Social: social interaction, relationships

Economic: frugal management of scarce resources, (budgeting)

Aesthetic: harmony, pleasure, incl. fun

Juridical: what is due; 'retribution', rights and responsibilities, law (negotiation)

Ethical: self-giving, generous love

Pistic: vision, faith, commitment, (aspiration, hope)

Each aspect may be seen as a mode of functioning and existing, and in any thing or situation all the aspects may be exhibited in different degrees simultaneously. The kernel meaning of each aspect is irreducible to that of others, and yet the aspects relate to each other; for example, social functioning depends on good lingual functioning. Aspectual interdependency ensures coherence in life.

It is proposed that Dooyeweerd's suite of aspects may be employed as a way in which interviewee and researcher can share spheres of meaningfulness.

3.2 The promise of Dooyeweerd's Aspects

Three things recommend Dooyeweerd's suite of aspects as a tool for interviewing. Dooyeweerd attemped as full a coverage as he could of ways of being meaningful, taking into account 2,500 years of discourse about them. Thus use of the suite opens up the possibility of gaining fuller coverage of everyday issues and of revealing hidden issues. Eriksson (2001), for example, employed Dooyeweerd's aspects to understand the unexpected failure of an ICT system, by revealing which aspects had been overlooked.

Second, Dooyeweerd's aspects are not grasped by theoretical thought but by intuition. This is built up by our 'dwelling' within the aspects, responding to them as we act and exist, so that primary knowledge of the aspects is tacit rather than theoretical. This implies that the meaningfulness of each aspect should be able to be grasped relatively easily. As Winfield et al. (1996) have found, it is possible to present Dooyeweerd's aspects to interviewees in a way that they can be understood and be referenced and explicate some tacit knowledge.

Third, since Dooyeweerd believed that we all function within and by reference to the same set of aspects, both researcher and interviewee, then it should be possible to find common ground of understanding between them, whatever differences of background, context, culture, class or power there may be. Directing the interviewee to these spheres of meaningfulness, rather than to what the researcher happens to find meaningful, might therefore reduce the power imbalance and remove some of these barriers. Even though intuition can at some levels be modified by culture, there is a deeper level of intuition that is common across all cultures.

3.3 Using Aspects during interviews

Though aspects can be used to generate checklists for use during questionnaires or interviews, here we look at their use in open interviews. Since aspectual meanings are grasped with the intuition rather than with theoretical thought, this implies that during interviews, if we can tap into people's intuitions rather than more explicit or formal conceptualisations, then we might elicit a wide range of aspects of their lives. It also suggests that the aspects can be understood by those not used to conceptual thinking. Conversely, it also implies that by opening up spaces around the aspects, it is likely that what is intuitive and perhaps hidden to people might be revealed. This is what the Multi-aspectual Interview Technique (MAIT), which is introduced here, relies on.

What the interviewees says (the 'text') may be seen as pieces of the transcending meaningfulness 'picked out' and signified in the symbols of speech, gestures, etc. Usually, one or two aspects are the main ones signified (for example, 'It gets you thinking' is mainly of the analytical aspect).

However, since Dooyeweerd argued that things exhibit all aspects simultaneously, utterances and gestures are also meaningful in most other aspects; for example, 'It gets you thinking', might also have pistic meaning relating to the interviewee's vision of themselves. These other aspects may be seen as those of background or context; these are rather amorphous things, which reference to aspects might crystallize. The non-primary aspects also include aspects of social structures. In particular, social norms are collective functioning in the juridical aspect, pervading attitudes of selfishness or generosity are the collective functioning in the ethical aspect, and prevailing beliefs about what is important in life are the collective functioning in the pistic aspect.

This suggests that if the interviewee is encouraged to express what they find meaningful in each aspect, then not only text, but also context and structures will be revealed.

Whether in each aspect is achieved by systematically going through each aspect in turn, or in some more flexible manner, depends on the style preferred by interviewee and researcher. Winfield et al.'s (1996) Multi-aspectual Knowledge Elicitation (MAKE) technique lets the interviewee select which aspects they speak about and then, noting which aspects have not been covered, would prompt them about the others; Winfield found that only two or three needed such prompting. MAIT offers both these approaches.

Interviewees are free to express opinions, tell stories, convey ideas, or even cite formal knowledge, as they wish. All are seen by MAIT as meaningful in relation to aspects, and thus able to be analysed to find out what is meaningful to the interviewees.

Aspects may be asked about in several ways: in terms of concepts, like rights, harmony, commitment or resources; in terms of properties or functions of an object (for example, a key functions physically to activate the lock, spatially to be unique, and juridically to protect property); or as activities, such as enjoying a concert (aesthetic), categorising insects (analytic), feeding the roses (biotic), making a pot from clay (formative), committing to an ideology or faith (pistic). Other ways are possible.

In MAIT, since the reason for using aspects is to stimulate people to think and talk widely, it does not matter if the interviewee's interpretation of aspectual meaning differs slightly from that of the researcher. In any case, since aspectual meaning is not theoretically grasped, the researcher's understanding is always tentative, however much experience they have. There have been cases where the reason for assigning what the interviewer feels is a wrong aspect is tacit (not yet spoken), which suggests that such disagreements offer opportunities for deeper co-exploration.

4. The study

4.1 The research approach and method

Dooyeweerd's aspects were used in an empirical study that aimed to investigate what was meaningful to students in FE and HE. Two cohorts were studied, 16 students enrolled in a

higher education institution (university) and 13 students enrolled at a further education institution (college).

MAIT was originally developed from Winfield, et al.'s (1996) MAKE. In MAKE, the interviewee is given a brief explanation of the aspects, and then asked to suggest aspects which might be meaningful to them (for example a veterinary surgeon might start with the biotic and economic aspects). They are then asked to identify things meaningful in those aspects, which Winfield recorded pictorially. As interviewees wander towards things meaningful in other aspects, these aspects too are recorded, until most have been covered. The interviewer would then ask if they wished to speak about the remaining aspects.

4.2 Steps in MAIT (Multi-aspectual Interview Technique)

MAKE was augmented with extra 'courtesy' steps at the start and end and developed for exploring imprecise issues like aspirations and potentialities rather than expert knowledge. Two versions were used, with ten and nine steps shown in Table 1. The ten-step version was developed from MAKE first and was used to interview the university students. The nine-step version was developed when the need for conceptual thinking proved difficult for some students at the FE college. The bold text expresses important points in common between the two versions, and the italic text expresses where they differ.

Table 1. The Steps of MAIT, Two versions.

10-step version used with students at University	9-step version used with students at College of FE
Introduction	
1 The researcher welcomes the interviewee and asks them to take a seat. They are informed that the interview process will be anonymous.	1 The researcher welcomes the interviewee and asks them to take a seat. They are informed that the interview process will be anonymous.
2 The researcher then **sits next to** the interviewee and places the **list of aspects** before them. The researcher spends approximately ten minutes explaining the interview technique.	2 The researcher then **sits next to** the interviewee and places the **list of aspects** before them. The researcher spends approximately ten minutes explaining the interview technique.
3 The researcher then points to the list of aspects and explains that the *first five aspects* from numeric to biotic are sometimes accepted as given due to the fact that they are obvious. However, the researcher also suggests that *each interviewee is different* and that they are **welcome to use all the aspects** in the	3 The researcher also states that each interviewee *may suggest aspects at any time* and that they are **welcome to use all the aspects** in any *comments* they make.

relationships they make.	
4 The researcher then points to each aspect name individually and **talks about the keywords** which are printed next to the aspect names.	4 The researcher then points to each aspect name individually and **talks about the keywords** which are printed next to the aspect names.
5 Next the researcher explains that the large piece of paper laid on the table will be used to map out the information provided.	5 Next the researcher explains that the large piece of paper laid on the table will be used to make notes from the information provided.
6 The researcher then **asks the interviewee if they have any questions**. After this they are asked to sign an authorisation form and the interview begins.	6 The researcher then **asks the interviewee if they have any questions**. After this they are asked to sign an authorisation form and the interview begins.
The Core of the Interview	
7 The researcher **asks each student to talk about how they feel about** their experience of HE. *Notes of specific points are made* on the piece of paper and the *interviewees are then asked to relate these to any of the aspects* which are again made note of along with any concepts that are stated. This repetitive process carries on throughout the interview building a picture of the interviewee's thoughts and perspective.	7 The researcher **asks each student to talk about how they feel about** their experience of FE. *They are then asked questions which relate to each aspect in turn*. This was a simple process of *asking them to consider each aspect* rather than asking them to state which parts of the information given related to the aspects overall. This repetitive process carries on throughout the interview building a picture of the interviewee's thoughts and perspective.
8 When the interview seems to be nearing a natural end, the researcher checks through the maps to determine *whether any of the later ten aspects have not been utilised*. If this is the case the researcher specifically asks if they can be made reference to or not.	
9 Then the researcher asks the interviewee if there is **anything they would like to say without any reference to the aspects**. If so, this is recorded as stated by the individual and the researcher thanks the interviewee for their time.	8 When the interview seems to be nearing a natural end and the final question has been answered, the researcher asks the interviewee if there is **anything they would like to say without any reference to the aspects**. If so, this is recorded as stated by the individual and the researcher thanks the interviewee for their time.
Conclusion	
10 The interviewee is then asked whether or not they *accept and confirm* the information	9 The interviewee is then asked whether or not they *are happy with* the information and

and relationships and whether they would like to change anything. The researcher then tells the interviewee that a transcript and map will be sent to them for their approval.	whether they would like to change anything. The researcher then tells the interviewee that a transcript will be sent to them for their approval.

5. Analysis of the MAIT format

5.1 Characteristics of both versions of MAIT

What is common between the two versions of MAIT, which makes them good at engaging with interviewees and revealing tacit knowledge, is marked in bold in both columns of the tables.

A number of standard interviewing steps are included, such as the welcome in Step 1, the seating positions in Step 2, the explanation of the process, the checking whether all is understood, in Step 6, the invitation to talk about how they feel in Step 7, and the confirmation that what was recorded was what was meant in Step 10/9. These points may be modified as appropriate to the interview situation.

The list of aspects, presented to the interviewee in Step 2, provides not only a reminder and prompt of the spheres of meaningfulness, but also a tangible symbol that the spheres chosen can be under the control of the interviewee rather than the interviewer. The interviewees were allowed to interpret the aspects in any way they wished (within reason); there was no 'correct' answer. The emphasis that there is no right or wrong interpretation, but that personal perspectives are valued, serves to put the interviewee at ease and reduce the fear of 'getting it wrong'.

The invitation to use all aspects, in Step 3, reinforces the freedom and control of the interviewee. The brief explanation of each aspect in Step 4 helps to activate the interviewee's intuitive grasp of its meaningfulness. Finally, the invitation to talk about anything without reference to aspects in Step 9/8 offers the interviewee freedom from the aspects if they wish to take it.

During pilot interviews, interviewees suggested that the early aspects, from quantitative to biotic, could be 'taken as given', in that, for example, being on the course assumed being alive. So it was decided to focus on aspects from sensitive to pistic. This was made clear in Step 3 to the university students, but was omitted from the nine-step version because the interviewer would go through the aspects. However, both sets of interviewees were explicitly invited to include the early aspects if they wished.

Similarities can be seen here with the interview structure for in-depth interviews suggested by Oppenheim (2003). It appeared that any related guidance statements, which usually reflected what the interviewee had already said, were helpful to the interview process as and when the researcher answered any calls for assistance with encouraging and helpful statements; the interviewees were able to carry on conveying their perceptions. This type of encouragement is noted as a useful 'non-directive technique' by Goodale (1982)

5.2 Differences between the two versions of MAIT

There were a number of differences between the two versions, which are indicated by italics in the table. The fundamental one was that students at the University were comfortable with concepts and relationships and when asked *To which aspect does {what you have said} refer?* they were usually able to give an answer. However, it soon became clear that students at the FE College were less happy with concepts and relationships.

While the University students were able to look through the aspects and apply them to what they had just said, the College students were not, because to do so requires conceptual thinking in a way they had not experienced. Instead, they were much happier when asked to simply go through the aspects one by one. They were allowed to go through them in any order they wished.

The University students could understand the aspects from the names and keywords. But the College students found this confusing as conveyed by comments such as; *Do I have to understand this?* This suggested the need for a new initiative. It was the names of the aspects and the conceptual way in which they were explained, that caused problems, rather than the aspects themselves. Payne (1951) goes to some lengths to show that difficulties in understanding what others might consider jargon should not be judged as ignorance, and positions the responsibility for making concepts understandable squarely on the shoulders of the questioner.

Therefore, the researcher began explaining the meaning of the aspects in terms of 'aspectually informed statements', for example:

When I ask you about your 'role in society' I will link your answer to this aspect'

instead of:

'Therefore if the answer relates to 'role in society' you may wish to reference this aspect along with others'.

From this the interviewees quickly focused on the meanings rather than the names of the aspects. When the aspects were expressed as aspectual statements, these interviewees were much more comfortable and forthcoming about their experiences, and were able to employ the aspects creatively.

6. Discussion

6.1 Findings about both versions of MAIT

Though the intention of this paper is to discuss the Multi-aspectual Interview Technique, and not primarily the findings about the student experience, it is useful to look briefly at this because it demonstrates some of the ability of MAIT to reveal what is often hidden and disclose some of the finer nuances.

Both cohorts of students readily grasped the aspectual kernel meanings intuitively, and were able to employ this understanding in thinking and talking.

Issues to do with aspiration and potential occupied nearly half of the comments. This suggests that MAIT is a useful method for tracing aspirations and potentialities. This result suggests that encouraging students to discuss different spheres of meaning, helps to reveal more diverse issues related to aspiration and potential than is usually the case. Statements related to commitments to education, doing something good and useful, a responsibility to learn, and confidence building, came from both cohorts across the ten aspects. This demonstrates the nuanced complexity of aspiration. Whereas a factor like aspiration is often treated as a unitary concept, as in Croll & Attwood's (2013) study of 'aspiration to enter HE, MAIT treats such factors as inherently multi-aspectual, and meaningful in a myriad of ways and enables analysis of that myriad.

Such aspectual analysis can also be useful to explore what is important and, crucially, what seems to be less important, to the interviewees. In considering the sensitive, analytic and formative aspects of life, many aspiration issues emerged. These three aspects relate to the individual feelings, distinctions and plans or development of the individual, and thus are more personal. The social aspect was found to be reasonably important in aspiration, and accounts especially for those aspiration issues that are to do with standing in family, community or society. A number of aesthetic aspirational issues were mentioned, but only by the University students, and were mainly to do with harmony in life. The juridical aspect was important especially in terms of responsibility and respect. Finally, the pistic aspect, which relates to vision, commitment and religion, yielded the most aspirational issues of any aspect.

What is equally interesting is the aspects that did not seem to yield many aspirational issues. Perhaps the most surprising is the low number for the economic aspect; it suggests that finance is not a major aspiration, which supports the claim by Hertzberg (Huczynski et al., 2001) that money is not strictly a motivational factor. The lingual aspect of being able to communicate well seemed relatively unimportant as an aspiration or potentiality, and the ethical aspect, of giving of oneself, seemed to be an aspiration only for a minority.

6.2 Findings about the different versions of MAIT

Two versions of MAIT have been described here, one suited to those who are used to conceptual thinking and one suited to those not accustom to conceptual thinking. Though the two cohorts are small, some insights may be drawn about the differences.

MAIT Version 1, derived from Winfield et al.'s (1996) MAKE method, relied on thinking about concepts and relationships, and the ability of the interviewee to identify which aspect was meaningful. It proved successful with university students because the kernel meanings of aspects are grasped by intuition. However, when it was utilised in relation to students from the FE college, it was less successful.

MAIT Version 2 was developed, suited to interviewing non-graduates, those who are not used to or trained in conceptual thinking. The three ways in which it differed from Version 1 made it successful: aspects were introduced by means of aspectual statements rather than keywords, the interviewee was not asked to talk about concepts and relationships, and the interviewee was not asked to identify aspects but rather was asked to talk about each aspect in turn (in any order they chose).

Though both cohorts readily grasped the aspectual kernels intuitively, this seemed to be higher when the aspects are expressed as aspectual statements rather than concepts.

6.3 Findings about use of Aspects

The function of aspects in interviewing differed from their function in analysis. During interviewing, aspects were helpful in enabling the interviewee separate out issues, to arrive at tacitly known issues. During analysis, the aspects were used by someone who understood them, to detect ways in which they are meaningful to the interviewees, and to separate these ways out for analysis.

Of the 29 students, 21 of them gave information about every aspect from the sensitive to the pistic without any prompting. Of the other eight, seven University students omitted between one and three aspects but, when the researcher prompted them, they very easily and willingly offered information from those missing aspects. The aspects initially not spoken about were: sensitive, lingual, aesthetic, juridical and ethical. One College student omitted the analytic and lingual aspects but, when prompted, did not offer anything further. This suggests that Dooyeweerd's aspects can indeed be grasped intuitively, by both those used to conceptual thinking and those who are not.

All interviewees were invited to speak about issues without reference to aspects. Only four ventured extra non-aspectual comments; interestingly, these were all University students. This suggests that the suite of aspects was complete enough to largely satisfy the interviewees, and the framework allowed them to consider all issues that they felt were relevant.

6.4 Exploring everyday issues with MAIT

The three challenges are now discussed, beginning with everyday issues because that is where Dooyeweerd started. The transcripts were analysed to identify where interviewees had spoken about everyday life and about theoretical or professional life. Some issues have different meanings, depending on whether viewed from an everyday or professional / theoretical perspective. For example, getting to work on time can mean 'so as not to be rebuked' when seen from the everyday perspective, but can relate to prospects for promotion when viewed from a professional perspective. Some students might take one perspective, some another, and some more than one.

Even though the study was explained to each interviewee as an exploration of the student experience (education having a strong theoretical base), and even though a strong motivation for entering FE and HE is to improve professionally or educationally, everyday life issues still emerged very strongly. Over three times as many everyday issues emerged as professional or theoretical issues, with slightly more among the College students. This shows the power of the aspectual framework as operationalized by MAIT to address the complexity that Ybema et al. (2009) and Sellar et al., (2011) say characterizes the everyday.

Unlike Ybema et al. (2009), who believe it is necessary first to focus on the extraordinary in everyday life, MAIT allows both interviews and analysis to focus on the ordinary. Every 'ordinary' issue is meaningful in at least one of the aspects, and thus identifying its aspect can focus the researcher on its importance and its innate interestingness can be revealed.

Because it is based on a philosophical understanding of the entire range of what might be meaningful in everyday life, MAIT does not constrain the interviews, neither to the prior interests of the researcher and their theories (Bryman & Bell, 2011; Evans & Herr, 1994; Morris et al., 2006), nor the aestheticization of de Certeau, nor to the factors that are already visible in the community of practice. Instead, it provides a space in which the often-unseen issues can be present alongside those which are already more visible, thus addressing the next challenge.

6.5 Revealing hidden issues with MAIT

The aspects linked to aspiration illustrates the nuances that emerged, even without asking for them. Dooyeweerd distinguished two main kinds of assumption, assumptions about facts and states of affairs, and assumptions about what is meaningful and possible. The former might result in individual facts being overlooked, and MAIT might help interviewees to think around their situations, just as any sensitive interviewing process would. The latter results in whole sets of issues being overlooked; in many studies, aesthetic issues or issues of language are often taken for granted. Here MAIT makes a signal contribution, in that reference to each aspect separately helps interviewees to focus on the varied ways in which things are meaningful. Thus MAIT can be expected to reveal whole swathes of issues that other methods might not.

If the researcher finds certain aspects of interest because of the theoretical framework they use, then using all aspects goes beyond this, to find issues not predicted by the theory. Deliberately looking for all aspects can increase the researcher's sensitivity to things that are not expected (Shah, 2004). Surprise discoveries for the authors arose from the fact that all (post-biotic) aspects were equally important.

If the interviewee makes assumptions about what the researcher might find interesting, going through all aspects stimulates them to mention that which might normally be considered 'trivial', obvious or insignificant.

By offering the interviewee the entire set of aspects, as something to which they may refer, MAIT provides the opportunity to speak about things that they usually feel are socially sensitive or embarrassing (Stommel & Willis, 2004; Mooney et al., 2014).

Regarding linguistic resources (Paxton, 2012), the second version of MAIT, can assist interviewees who find conceptual thinking challenging, by introducing intuitively-grasped aspects via statements that contain more concrete examples or situations, by refraining from asking conceptual questions ('Which aspect?'), and by encouraging interviewees to wander through the spaces of meaningfulness opened up by each aspect. As a result, interviewees can disclose many issues without high-level linguistic resources, and their 'voice' can be more readily 'heard' by the interviewer.

Though hidden issues might be revealed by the lengthy ethnographic processes advocated by Paxton (2012), or the 'slow-motion' approach of Baer (2008), MAIT's use of aspects reveals them more quickly.

6.6 Addressing barriers of culture, background, class and power with MAIT

Since the deepest meanings of the aspects are the same across all cultures and transcend differences in individual backgrounds, MAIT's reference to aspects can provide a basis for mutual understanding across such barriers. This does, of course, depend on the aspects being handled aright.

Likewise, since researcher and interviewee are both subject to the same set of aspects, neither party has authority in relation to them. As long as the interviewee's interpretation is accepted, use of aspects does not constitute a power relation in which one party is treated as having the authority to determine what is meaningful or how things are to be interpreted. This was borne out by the final/leaving comments of the interviewees, such as, 'I'm glad to do this. I have a lot to do and this is a way to think.'

The MAIT process seems to have been emancipatory in two ways. One, mentioned above, is that MAIT helps the interviewees to talk about things that they might usually deem either embarrassing or too trivial to mention (Morris et al., 2006; Stommel & Willis, 2004; Mooney et al., 2014; Mellor et al., 2014). Some interviewees expressed gratitude for being encouraged to speak about things they would not normally voice.

The other is that the intuitive nature of Dooyeweerd's aspects can provide a sense of ownership and power for the interviewee. This generates trust, which can be reciprocated and provides the reflexivity, empathy and communication that Mellor et al. (2014) advocate as an alternative to class matching.

6.7 Limitations of this research

The research has a number of limitations. The number of students is not large. MAIT version 2 emerged during the research as a response to encountering problems with MAIT version 1, so a fully rigorous comparison between them is not possible here. Nevertheless, these limitations, which echo those found in much research, should not detract from the indicative value of this research. What we have presented is a new approach, and these results suggest it shows promise and is worth exploring further.

7. Conclusions

MAIT (Multi-aspectual Interview Technique) has been demonstrated as a useful tool to aid qualitative interview practice, which engages people in reflection, giving them freedom to talk about what is important to them. MAIT does not provide questions, but offers spheres of meaning within which interviewee and interviewer might explore together.

The spheres of meaning are Dooyeweerd's aspects, derived from philosophy, which are intended to be those of everyday, pre-theoretical experience, and transcend both researcher and interviewee (Dooyeweerd, 1955; Basden, 2008). As used in interviewing, they have a stimulatory effect, because they suggest spheres of meaning which the interviewee might wish to explore.

This paper has discussed, theoretically, these philosophical foundations on which MAIT is built, practically, steps that can be used to guide MAIT interviews, and, empirically, how MAIT was used in interviewing two cohorts of students. Two versions are offered, one more

suited to those who are used to conceptual thinking, which offers slightly more freedom, and one more suited to those who are not, which offers slightly more support.

MAIT encourages students of both cohorts to 'open up' about a wide range of issues and reveal the nuanced richness of factors like aspiration and potentiality that are often treated as simple, unitary concepts. It has been shown that MAIT addresses three challenges of interviewing, helping interviewees speak more readily about everyday issues, revealing hidden issues, for example those assumed to be trivial or embarrassing, and lowering barriers between interviewee and interviewer, of class, background or culture. MAIT seems to shift power towards the interviewee.

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Food security, agriculture and food systems

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1. Introduction

The second goal of the Sustainable Development Goals runs: "End hunger, achieve food security and improved nutrition and promote sustainable agriculture." How should the realization of this goal be pursued? Different approaches are being put forward. Representatives of industrialized agriculture emphasize the need to 'modernize' agriculture in developing countries in order to enhance the agricultural production. Others claim the major problem is not the production but the distribution of food, a political rather than an agricultural issue. However, achieving food security with a sustainable agriculture for 9 billion people does present a challenge at all levels of food production, processing, distribution and marketing. In this contribution I will focus on a few of a whole array of questions related to this issue.

First, I describe industrialized agriculture and make clear why it is not ecologically sustainable and furthermore closely related to a food system that contributes to public health problems. And secondly, after having summarized earlier work on a normative view of agricultural practices, I elaborate that view by presenting a specific form of sustainable agriculture, agroecology, that has recently be enriched by relatively new scientific insights and experiences. I discuss a few obstacles towards moving to such an agriculture and related food system and briefly indicate a few strategies to promote it.

2. Food security

Food security[1] remains one of the main global issues. Not without reason the second Sustainable development goal (SDG) runs: "End hunger, achieve food security and improved nutrition and promote sustainable agriculture" (UN, 2015). Note that the concept of food security not only refers to access to sufficient food but also to safe and nutritious food. Both are very pertinent and relevant as part of SDG 2, as we will see. Let us first look at some statistics with respect to food security.

The UN World food programme reports the following figures.[2]

- Some 795 million people in the world do not have enough food to lead a healthy active life. That's about one in nine people on earth.

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[1] Definition: the availability and adequate access at all times to sufficient, safe, nutritious food to maintain a healthy and active life; see https://www.wfp.org/node/359289

[2] https://www.wfp.org/hunger/stats

- Poor nutrition causes nearly half (45%) of deaths in children under five, i.e. 3.1 million children each year.
- One in four of the world's children are stunted. In developing countries the proportion can rise to one in three.
- Sixty-six million primary school-age children attend classes hungry across the developing world, with 23 million in Africa alone.

Hunger, lack of the availability and/or access to sufficient food, continues to be horrific problem, largely related to poverty. On the other hand we see that obesity is a growing problem both in industrialized countries and in 'developing countries'.
The WHO reports:[3]
- Worldwide obesity has more than doubled since 1980.
- In 2014, more than 1.9 billion adults, 18 years and older, were overweight. Of these over 600 million were obese.
- Of adults aged 18 years and over were 39% overweight in 2014, and 13% were obese.
- Most of the world's population live in countries where overweight and obesity kills more people than underweight.
- Forty-one million children under the age of 5 were overweight or obese in 2014.

So on the one hand people do not get enough food and on the other hand they do not get good food! The problem at the moment is not that insufficient food is being produced. One third of all food produced (1.3 billion tons) is never consumed. This food wastage represents a missed opportunity to improve global food security in a world where one in 8 is hungry. Producing this food also uses up precious natural resources that we need to feed the people. Each year, food that is produced but not eaten guzzles up a volume of water equivalent to the annual flow of Russia's Volga River. Producing this food also adds 3.3 billion tons of greenhouse gases to the atmosphere, with consequences for the climate and, ultimately, for food production.[4] Yet, even if waste would be reduced considerably, the production of sufficient nutritious food will still be an issue. The UN expects the world population to grow to 9.15 billion in 2050. Combined with changing diets among growing middle classes in wealthier developing countries, this is expected to result in a significant increase in demand not only for cereals but also dairy and meat products. FAO projections suggest that, in the absence of changing food consumption habits in the West and effective action to deal with food waste and loss, overall food production will have to increase by 70% between 2005 and 2050 to meet growing demand. Increasing demand for biofuels and the growing impacts of climate change pose further challenges to maintaining food security (FAO, 2009, p.8). Few still dispute the need for new global sustainable food and consumption systems (IFAD, 2010). The conclusion of this very brief diagnosis of the situation regarding food security is that we need to reconsider the present mainstream food system. Food systems include inputs, mechanisms, and structures

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[3] http://www.who.int/mediacentre/factsheets/fs311/en/; Overweight: BMI >25; obese: BMI>30.

[4] https://www.wfp.org/hunger/causes

for food production, processing, distribution, acquisition, preparation, consumption, and metabolism. A food system approach also considers the participants in that system, including farmers, fishers, industries, workers, governments, institutional purchasers, communities, and consumers (APHA, 2014). In this contribution to the Festschrift for Sytse Strijbos I will not be able to discuss all the elements of the system but will concentrate on the production side and on the main players in the system that form the intermediate between the producers and the consumers. I will first discuss the present predominant production and processing side of the food system and its relation to public health. Then I will briefly present a normative view of agricultural practice and subsequently elaborate that in a presentation of an existing kind of agriculture that embodies that normative view, agroecology. In the following section I briefly discuss ways to further agroecology, especially in the global South. A few final observations conclude this contribution.

One final introductory remark. I approach this topic from a Christian perspective motivated by the perspective of the Kingship of Christ and central Christian values like Justice, compassion, stewardship, without explicitly linking my view to specific philosophical and theological insights or values. For a helpful attempt to give a theological underpinning of food security and right to food I refer to Buckingham, 2006).

3. Industrial Paradigm

In the industrialized countries agriculture has also been industrialized, especially after World War II. This process can be summarized in several general developments (Hardeman & Jochemsen, 2012). The first is *mechanization*: the process of replacing human work forces and techniques with machines and technological procedures. The second is *intensification*, in this case meaning the increase in production per hectare or per animal. The third development is *specialization*, where farms focus only on one type of crop or activity, e.g. dairying, pig-keeping, poultry or maize. The *leading role of science and technology* is the fourth development to be mentioned. Agronomic research has focused on the increase of productivity per unit of labour through the use of new technologies and capital. Hence industrial agriculture is – among others – based on developments in plant breeding, resistance to disease, artificial insemination and the feed conversion rate. The final development to be mentioned is the *increase in the scale* of farming, which has been vigorously stimulated by governments. All these developments required the education of farmers. Four sub-processes can be distinguished here: re-allotment, the introduction of non-land-based farms, the growth in their size and the decrease in their number.

So, the predominant form of agriculture in the industrialized world is characterized by a strong focus on commodification[5] of agrarian products as opposed to a primary focus on a full realization of the right to food security for all; by an emphasis on external inputs of chemicals in the form of pesticides and herbicides and artificial fertilizer, instead of building on soil characteristics and biological relationships; by a focus on a few strains of seeds and animal

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[5] Commodification is the transformation of goods and services, as well as ideas or other entities that normally may not be considered goods,[1] into a commodity, i.e. something that is assigned just economic value (Wikipedia).

races that are controlled by a few companies instead of diverse systems that are controlled by farmers; and by putting technical models before the aspirations of people. This industrialization of agriculture, that in Europe was also motivated by the experience of hunger during the last stage of World War II, has doubtlessly led to an increase in the volumes of agrarian production, especially to an increase of production per farmer and also to the availability of enough food, at least regarding energy content, for those countries at a relatively low price. But this agro-industrial approach has also led to increased genetic erosion, degraded soils and pollution of the environment involving serious threats to ecosystem services, a strong dependency on irreplaceable natural resources and, hence, is far from sustainable in many ways (cf. Jochemsen, 2012). In addition this model raises serious animal ethical problems (Jochemsen, 2013). The dependency on high tech inputs like artificial fertilizer, pesticides, herbicides, sophisticated machines, high-bred varieties and strains of crops and of production animals, including genetically modified crops, has brought about a fundamental change in the power relations in the food system. The companies that produce these 'supports', not least the seed and breeding companies, like Monsanto and Syngenta, as well as the companies in processing the primary products and in retail, have become very powerful. These companies have become transnational corporations that have no loyalty to any nation or population but only to their shareholders. In recent decades a strong concentration of these TransNational Corporations (TNCs) in agriculture and food production has taken place. Some authors and NGO's see the behaviour of Transnational corporations in agribusiness as the main problem. They briefly summarize the situation with respect to agricultural production as follows (Clapp, 2014; Agropoly, 2013)!

-In 1996, the ten biggest seed companies had a market share of less than 30 %. Today, the three largest control more than 50 % of the market. Often seeds become more expensive with fewer varieties available. The three market leaders in seeds are also major pesticide producers. By genetic modification the TNCs can get patents on seeds. Of the global soy production just over 50% is GMO and of corn this is about 30 %.

-Secondly, the powerful control the chain. Farmers are pressurized by corporations. The TNCs pay low prices for the farmers' produce such as soya, wheat, and maize, and they pay high prices for seeds, pesticides, energy, fertilizers and animal feed. The record food prices of 2008 resulted in higher profits for corporations, and not for farmers who have to bear all the risks. Just an example. Vietnamese aquaculture farmers produce Pangasius fish, for which Northern consumers pay around US$ 10 per kilo. The farmer gets US$ 1. After deduction of production costs their income is 10 cents per kilo. And the farmers bear all the risks of aquaculture such as fish diseases and weather problems; many also have debts to the aquaculture companies.

-Thirdly, the TNCs also increasingly control the chain. In addition to horizontal integration, where one company controls a large share of the market, corporate strategies aim at vertical integration by processing the product and producing inputs. This is not about distributing business risks across several sectors but about controlling the value chain and access to cheap raw materials.

-Furthermore, world trade dominates prices. Although 85 % of all food is consumed close to where it is produced, global trade actually has a disproportionate influence on prices. On

the stock market, batches of the same soya and maize may be traded speculatively several times over, thus increasing price volatility.

-Finally, the TNCs in agribusiness display enormous lobby efforts. Thousands of lobbyists promote corporate interests, among others in government institutions. They often successfully lobby for corporate interests on food standards, approval of pesticides, GM seeds, trade agreements, or the public research agenda. Although the TNCs officially promote competition in an open market, in fact they try to achieve favourable positions.

One study of the neoliberal food system summarizes the situation as follows. "Neoliberalism has produced an unsustainable food system, which might prove inadequate to nourish future generations. Notwithstanding the steady food price increases, natural resources deterioration, loss of resilience of agricultural systems and climate change disturbances, international bodies and national governments continue to propose neoliberal policies. Privatization and deregulation are passed off as bulwarks of liberty and efficiency, while they are consigning the system to corporate power and transnational financial elites. All this is made possible not only through the power of organizations with vested interests, but also through the adamant trust of the majority of academics and bureaucrats in the mainstream economics" (Sodano, 2012).

4. Food system and public health

A number of authors have summarized the deleterious effects on public health of the present predominant food system. This is especially seen in the USA but is more and more visible in European countries and other parts of the world as well. Although we can also notice that in the Netherlands and probably in other Western European countries the legislation to protect the environment is stricter than in most other parts of the world.

"For the past 50 years, U.S. farm policy has been increasingly directed toward driving down the price of farm commodities, including corn and soybeans. At the same time, prices for fruits and vegetables, grown with relatively little government support, have steadily increased. Low commodity prices have in turn deeply influenced investment by the food industry. Low prices trigger more investment in using a particular crop, and, not surprisingly, the food industry has developed many uses for these cheap commodities. High fructose corn syrup and hydrogenated vegetable oils—products that did not even exist a couple of generations ago but are now ubiquitous in food products as added sugars and fats— have proliferated thanks to artificially cheap corn and soybeans." (Schoonover & Muller, 2006).

"The APHA policy paper on sustainable food systems for example summarizes the negative health and environmental impacts that accrue in the USA in the production and distribution of food. Of particular relevance are the intensive methods applied in industrial agriculture which requires large quantities of non-renewable fossil fuel, fuel-based 'inputs', such as fertilizers and pesticides, as well as antibiotic overuse in industrial food animal production. All of these can have negative environmental and health impacts. (….) for example, the Institute of medicine estimated in 1998 that antibiotic resistance cost the US public health system US\$ 4–5 billion a year. Worldwide, agriculture and land-use change are estimated to cause about one third of global warming due to greenhouse gas emissions " (Kickbush, 2011).

"A key driver of childhood obesity is the consumption of excess calories, many from inexpensive, nutrient-poor snacks, sweets, and sweetened beverages made with fats and sugars derived from these policy-supported crops" (Wallinga, 2012).

"Replacing fat with sugar has been one of the most disastrous nutritional recommendations in human history, if not *the worst*. With each new study, science is proving the low-fat diet has been an absolute disaster. .... Today's sky-high rates of obesity, diabetes, and cardiovascular disease can be tied directly to changes in how our food has been grown and produced over the past 40 years" (Mercola, 2012).

It will be clear by now that we really need another food system. Before I will present a normative view of practices of agricultural production as well as a description of how such a view would look in practice, I'd like to make a few additional remarks to the above presentation.

First, though the role of TNCs in the predominant food system is very problematic, they do not dictate everything. Farmers and farmer organisations, sometimes together with NGO's, succeed in setting up fair markets for certain products independent of TNCs, in all parts of the world (fair trade value chains). Second, criticising the behaviour of (many) TNCs does not at all mean a rejection of private sector involvement in agribusiness. Private initiatives and investments are crucial in agriculture. Developing fair markets for agricultural products is an essential part of policies that pursue the enhancement of production and access to nutritious food for all people. Third, though above the negative role of the food system for human health has been highlighted, this does not mean that people do not have an individual responsibility for their food and health. But in our liberal, individualist societies this individual responsibility is overemphasized. Bad eating habits do have a strong collective component, certainly for people with lower income; they often hardly have the option of buying healthy - for more expensive- food. But in addition to public policy that makes healthy food accessible for everyone, strategies to inform and influence individual eating behaviour remain important.

Green growth outcomes

Economic
1. Increased and more equitably distributed GDP – production of conventional goods and services
2. Increased production of unpriced ecosystem services (or their reduction prevented)
3. Economic diversification, *i.e.* improved management of economic risks
4. Innovation, access and uptake of green technologies, *i.e.* improved market confidence

Environmental
5. Increased productivity and efficiency of natural resource use
6. Natural capital used within ecological limits
7. Other types of capital increased through use of non-renewable natural capital
8. Reduced adverse environmental impact and improved natural hazard/risk management

Social
9. Increased livelihood opportunities, income and/or quality of life, notably of the poor
10. Decent jobs that benefit poor people created and sustained
11. Enhanced social, human and knowledge capital
12. Reduced inequality

Table 1: Green growth outcomes. From: OECD, 2012, p.9

5. Normative view on primary production practices in agricultural

We have seen that the predominant global food system is being dominated by TNCs. In this system so-called 'developing countries' in fact are kept in the periphery of the global economy, subservient to the interests of the TNCs and the 'developed' regions (Strijbos, 2011). Primary production practices in agriculture are forced to adapt to the dynamics of the neoliberal economic order that also pervades agriculture and food production in the form of those TNCs. In my view systems like the global food systems, should observe forms of normativity at different system levels. In recent years it has become broadly accepted –at least in theory, that economic activities must take into consideration other values, commonly ordered according to the dimension of social and environmental implications. For example the OECD mentions outcomes of what is called Green Growth at the economic, the social and the environmental level (OECD, 2012, p. 9).

Also the Sustainable development goals underline the importance of inclusiveness and sustainability of economic growth, notably in the goals 8 – 12 (table2), (UN, 2015).

Table 2: *UN Goals 8 – 12. From: UN, 2015*

Sustainable developments goals directly regarding the economy

Goal 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
Goal 9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
Goal 10. Reduce inequality within and among countries
Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable
Goal 12. Ensure sustainable consumption and production patterns

These criteria and goals of course also concern the industries in the food sector.

In addition to the normativity at the level of the global system and of the international private sector, also at the primary production sector normativity should be observed. About the normativity at the level of those practices of food production I have written elsewhere (Jochemsen, 2012). Here I summarize my findings of that analysis.

First of all I want to point out that an evaluation of agrarian practice needs to depart from a few fundamental observations. These are:

- Practices like the agrarian practices will flourish only if they do justice to the reality they are dealing with. Reality ultimately is God's creation that rests in lawfulness maintained by the Creator. In spite of degradation and disorder in creation due to human unbelief and disobedience, creation still manifests God's wisdom and goodness towards His work, including humanity, in that nature can provide for all we need for our bodily existence
- In reality we can distinguish a plurality of aspects with their own type of normativity; for example the specific genetic regularities of procreation of animals and breeding of plants, the kinds of food human beings need for life and health, the climate dependence of food security, the importance of fair prices for the farmers to establish chains of sustainable production of food items, etc.

- Agrarian practices as meant here are dealing with living nature; living organisms, as well as the ecosphere as a whole, demonstrate specific regularities and vulnerabilities that should be taken into account;
- As a consequence, a complete formalization and standardization of the dealings with animals and plants, that presuppose a degree of care, is impossible; this is precisely what is pursued in industrial agriculture.
- Hence, the knowledge of the specific local/regional circumstances which implicates that the craftsmanship of the farmers, should be respected.

On the basis of these beliefs and in the light of available (scientific) insights and evidence, I come to the following normative view on agrarian practices

1. The agrarian practice is to be seen as a coherent system, of which soil and crops are subsystems with a naturally determined, limited capacity.
2. For the stimulation of growth and the fight against plagues, biological and agronomical methods are used as much as possible (symbioses, mixed cultivation, biological control of plagues etc.).
3. The performance and policy of the practice take into account as much as possible local agronomic conditions; this in contrast to industrial agriculture that ppursues to standardize animals, crops and keeping/cultivating methods.
4. The agrarian sector improves or at least maintains the biodiversity and soil quality.
5. The farmer and his local situation and his knowledge of it form the starting point of agriculture policy of the political authorities and the supplying industries.

Even though these statements give a clear normative direction to agrarian practices, they are still pretty abstract. How would such a practice look like in real life. Well in recent decades, building on older agronomic insights (cf. Visser, 2010), a form of agriculture has developed that very much embodies the normative observations made above, namely agroecology.[6] On the basis of literature I will briefly describe this approach to agricultural food production.

6. Characteristics agro-ecology[7]

Agro-ecology refers to a science, a practice and a movement. As a science, agro-ecology involves the holistic study of agro-ecosystems. As a practice, agro-ecology enhances the resilience and ecological, socio- economic and cultural sustainability of farming systems. As a movement, it seeks a new way to link agriculture with society (Agri-profocus, 2014). In reality these three dimension are very much intertwined.

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[6] Cf. Agroecology, lemma in Wikipedia.

[7] This section is derived largely from: Policy Paper on Agriculture and Food security**.** Document produced by staff of ICCO, Prisma, Prismamembers and Kerkinactie, for common programmes in the field of agriculture and food and nutrition security, Utrecht 2016; see also the good publication of EAA-WCC, Ecumenical initiative World Council of churches, on agroecology, http://www.e-alliance.ch/typo3conf/ext/naw_securedl/

securea6fa.pdf?u=0&file=fileadmin/user_upload/docs/All_Food/2012/AgroEcology/2012_10_ScalingUpAgroecology_WEB _.pdf&t=1433841544&hash=6cd5a416224fb18a04ab1d67f5578264

As a practice agro-ecology entails a farming system based on a sustainable and dynamic cooperation between man/women and nature, supported by sound relations between farmers and society. This farming system combines agro- and human ecologic principles to create sustainable livelihoods. Agro-ecology functions by making smart use of the ecological interactions among crops, soil biota and livestock – including dairy cattle, pigs, poultry and insects. In this way it minimizes the need for external inputs such as fertilizer and herbicides.

In the literature the characteristics of agro-ecology have been concisely described by different authors (see Table 3). The first five principles in the table constitute the key principles of agro-ecology that have been formulated by Altieri very early in its conception as a science. The other eight principles are later additions. Of these added principles, principle 6, like the first five principles, is an agronomic principle. The other additional principles are methodological and socio-economic principles.

From the above it will be clear that agroecology very much meets the criteria that were formulated on the basis of a theoretical analysis of agricultural practice.[8] I like to stress that agroecology is not going back to a more primitive agriculture. It is highly scientific and 'technical' but in an agronomic sense. It builds on relatively new research on all kinds of interactions and synergies between different types of organisms both in the soil and above it.[9]

Table 3. The thirteen principles of agro-ecology as identified by GIRAF (Stassart et al. 2012). Table adopted from Stassart et al. with translation by Stineke Oenema and Corné Rademaker.

Altieri (2002), Reijntjes et al. (1992)	A. 'HISTORICAL' AGRO-ECOLOGICAL PRINCIPLES 1. **Recycling of biomass** and balancing nutrient flow and availability 2. Securing favourable **soil conditions** for plant growth, through enhanced organic matter and soil biotic activity 3. Minimizing losses of solar radiation, air, water and nutrients by way of **microclimate management**, water harvesting and soil cover 4. Enhancing species and **genetic diversification** of the agroecosystem in time and space 5. Enhancing beneficial **biological** interactions and **synergisms** among agrobiodiversity components resulting in the promotion of key ecological processes and services 6. Valorising **agro-biodiversity as the point of entry** for the re-design of agricultural systems that ensure the autonomy of farmers and food sovereignty

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[8] From a methodological point of view it is important to point out here that the theoretical analysis was done before I got a more detailed knowledge of agroecology.

[9] See literature mentioned above and below in this contribution

	B.METHODOLOGICAL PRINCIPLES
Départment Sciences et Action, **INRA** (Tichit et al. 2010)	7.Promoting and equipping the **multi-criteria steering** of agro-ecosystems in a long-term transition perspective, including arbitrations between the short- and the long-term and in accordance with the importance of resilience and adaptability properties 8.Valorising the **spatio-temporal variability** (diversity and complementarity) of resources, i.e. take advantage of local resources and characteristics, and work with diversity and variety rather than seek to overcome it 9.Stimulate the exploration of **situations far removed** from optima already known, e.g. "extreme" systems at very low levels of inputs and/or on an organic approach in animal husbandry as well as in crop production 10.Promoting the construction of **arrangements for participatory research** that allow the development of "finalized" research while guaranteeing the scientificity of approaches. The design of sustainable systems indeed is complex and implies the acknowledgment of interdependence of actors, of their ambiguities, as well as of the uncertainty of socio-economic impacts of innovative techniques
Groupe Interdisciplinaire de Recherche en Agroécologie FNRS **GIRAF**	**C.SOCIO-ECONOMIC PRINCIPLES** 11.Creating **collective knowledges (*connaissances*) and capacities of adaptation** through networks involving producers, citizens-consumers, researchers and technical advisers of public authorities, which promote deliberative forums, public debate and knowledge dissemination 12.Promoting possibilities of choices of **autonomy** relative to global markets through the creation of an environment favourable for public goods and the development of socio-economic practices and models which strengthen democratic governance of food systems, notably via systems co-managed by producers and citizens-consumers and via systems (re)territorialized with high labour intensity 13.Valorising the **diversity of knowledges** (*savoirs*) by taking into account: local or traditional knowledges and practices (indigenous technology knowledge; ITK), ordinary knowledges both in the framing of problems and the framing of the **public concerned** by these problems, and in the search for solutions

However, an important question that is often raised in the debate about the kind of agriculture that has to produce 70% more food during the coming decades, is whether agroecology can bring forth sufficient agricultural produce in a sustainable way. In the scientific literature there is an ongoing debate about the productivity of organic (and agro-ecological) compared with conventional or industrial agriculture or with mixed practices. In a relatively recently publication Altieri, an initiator of the actual agroecology movement, renders the following data (Altieri et al., 2012).

-In Cuba, a group of about 100.000 family farmers practicing agro-ecology, produce over 65% of the country's food on only 25% of the land.

-Further, in a study 208 agro-ecologically based projects and/or initiatives throughout the developing world clear increases were documented in food production over some 29 million ha, with nearly nine million households benefiting from increased food diversity and security. Promoted sustainable agriculture practices led to 50–100% increases in per hectare food production (about 1.7 Mg/year/household) in rain-fed areas typical of small farmers living in marginal environments; that is an area of about 3.58 million ha, cultivated by some 4.42 million farmers (Altieri et al, 2012, p. 6,7).

-A study of farming in the Philippines compared findings from 280 full organic farmers, 280 in conversion to organic agriculture, and 280 conventional farmers to act as a reference group. The analysis focused on food security, income and livelihood, yields and productivity, environmental outcomes, and farmer knowledge and empowerment (Altieri et al, 2012, p. 9,10). The results demonstrate:

Food security: 88% of organic farmers find their food security better or much better than in 2000 compared to only 44% of conventional farmers. Of conventional farmers, 18% are worse off. Only 2% of full organic farmers are worse off.

Diversity of diet: Organic farmers eat 68% more vegetables, 56% more fruit, 55% more protein rich staples and 40% more meat than in 2000. This is an increase between 2 and 3.7 times higher than for conventional farmers.

Diversity of crop range: Organic farmers on average grow 50% more crop types than conventional farmers.

Experience of health outcomes: In the full organic group 85% rate their health today better or much better than in 2000. In the reference group, only 32% rate it positively, while 56% see no change and 13% report worse health.

In 2007, a meta-analysis of global yield data showed that, globally, ecological farming can, on average, produce about 30% more food per hectare than conventional agriculture. In developing countries, it can produce about 80% more food per hectare than conventional agriculture (Badgley et al., 2007).

Other studies have shown yields of organic farms to be, on average, about 20% lower than those of conventional farms (De Ponti et al., 2012; Jansen, 2015). The 20% difference in yields also reflects a difference in investments between organic and industrial agriculture. Investments in agriculture have been estimated to be around 90-95% (or higher) in favour of industrial agriculture since the onset of the Green Revolution. This is a small estimated difference in yields given this extremely uneven playing field (Greenpeace 2015, p.30). Furthermore, on other factors like soil fertility, climate resilience and biodiversity, organic and eco-agriculture score better than conventional agriculture.

Again other authors argue that in, what is called conservation agriculture, some elements of conventional agriculture have a positive effect on the farmers' situation regarding food security and poverty (Vanlauwe et al, 2014).

All these results should be read with caution since it should be realized that situations differ enormously and in different situations different approached may be most appropriate. However, there is a broad consensus that main stream conventional agriculture with its high input of artificial fertilizer and chemical pest control is not sustainable, less climate resilient and less smallholder-friendly, and that other, more sustainable forms of agriculture can potentially produce sufficient food (Tittonell, 2014; Liebman & Schulte, 2015; Wegner & Zwart, 2011).

I conclude that a development of agriculture worldwide towards a form of agroecology, depending on local and regional circumstances is highly desirable if not unavoidable to achieve the goal of food security in a sustainable way.[10]

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[10] I have foregone the contribution of fisheries to global food security, but it is clear that also in that field more just and sustainable practices are required (OECD, 2014).

This does not mean that such a development will take place or is even likely to happen. There are strong resistances to overcome. In this final section I will make a few preliminary observations regarding this controversy and with respect to the way forward.

7. Furthering Agro-ecological practices

In recent years a lot of knowledge and experience has been obtained in agro-ecological practices (see above; sometimes agricultural practices are indicated with other names but embodying similar approaches, like conservation agriculture, organic agriculture and others). But at the global level the, above-mentioned 'old paradigm' is very much alive in the mind-set of transnational corporations in agriculture and food and of policy makers. In that view the process of industrialisation of agriculture– accepting that it must become more sustainable- is the best way to rationalize and enhance food production. It is their business. So we see that at a global level there are strongly conflicting interests manifesting themselves in conflicting lobby agendas directed at governments and at international and multilateral bodies like the EU, FAO and others. An important committee in which the conflicting interests are often notable but in which at the same time consensus is pursued, is the Committee on World Food security.[11] This committee produces, on the basis of reports of a High Level panel of experts in a certain field, policy recommendations for all its stakeholders. An interesting set of recommendations in the context of this study are the recommendations regarding smallholders. The CFS recommends that more is invested in the position of smallholders, especially in the global South (CFS, 2013). However, the several nice guidelines and policy recommendations do not immediately change reality on the ground.

An interesting study of agroecology in Uganda shows that there are a number of serious constraints to the extension and upscaling of Agroecology (Isgren, 2016). Isgren's mentions four interacting clusters of constraints.

The first cluster regards the farmer level and concerns the small holder productive assets and economic incentives; they may well frustrate the implementation of agro-ecological practices. The second type of constraints came from the agricultural knowledge system that may hamper agroecology e.g. because leading experts do not have an intimate knowledge of agroecology and promote the practices they know about. Political and economic interests vested in particular pathways of agricultural development are identified as third cluster of constraints. The mind-set of many stakeholders in industrialized countries as well as vested interests in industrial agriculture resist such a change towards a different kind of agriculture. In the fourth type of constraints discursive and ideological dimensions of agricultural change are clustered. These, for example, refer to Ideological conceptions of what constitutes 'modern' and what 'backward' kinds of agriculture. The paper indicates that at this and the former type of constraints people involved sometimes speak about a clash, about 'waging war', and similar language. This situation requires that work be done at different levels. At the level of the farmers it is important to understand their situation, their own local knowledge and their

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[11] The Committee on World Food Security (CFS) is the foremost inclusive international and intergovernmental platform for all stakeholders to work together to ensure food security and nutrition for all. The Committee reports to the UN General Assembly through the Economic and Social Council (ECOSOC) and to FAO Conference; see http://www.fao.org/cfs/en/

preferences with respect to farming practices, before they are offered the option of being helped in further developing their practice according to agro-ecological principles. Research by Ang (2014) demonstrates the importance of this close interaction and intimate knowledge at the local level. The second level is the level of stakeholders at the regional and national level. Here, the role of broker between the different partners and of providing adequate knowledge and information is important, but also of supporting farmers' organisations to lobby. The third important level is the level of international relations, both bilateral and multilateral. At this level NGO's also have a broker and policy influencing role.

8. Final observations

In this contribution to the Festschrift for Sytse Strijbos I have argued that food security is a very serious problem at global level. The most pressing element of it right now is not the quantity of agrarian production – enough is being produced. Major elements of the problem of food security are the unsustainability of mainstream industrial agriculture, the low production in several countries in the global South and the high waste of food, partly related to the long chains of primary produce to food items for the consumer. Is has been argued above that low agricultural production in the South should not primarily be addressed by high tech, high input industrial agricultural techniques. In most cases it concerns smallholders whose production can best be enhanced by 'high tech' *eco-agricultural* practices, that sometimes can be usefully combined with techniques of industrial agriculture (e.g. machines).

Furthermore it is argued that the lack of crop variety in industrialized agriculture and the strategy of the big food companies is related to public health problems, in particular obesity.

In other words the problem of food security is closely related to our present predominant food system. This needs to be changed. This involved a struggle with big vested interest in the transnational corporations in agriculture and food, in the context of a neoliberal economic system.

In this analysis a number of concepts are used that have played a role in the work of Sytse Strijbos. We can identify the systems approach, the idea of inherent normativity in professional practices that should be observed in policies at a higher level in society, the need for a rational analysis of what really is going on in a certain field before a concrete normative stand is being taken. And, of course the inspiration and guidance by the Christian faith that can be noted in Sytse's work. In this paper I have not elaborated this element, but just referred to it briefly. But it pervades the whole study. The earth is of the Lord and He has given it to all people as common home to live on it and of it. Creation, though fallen by human disobedience and unbelief, still manifests God's goodness towards His work, including humanity, in that nature can provide food, clothing and shelter for all the people on earth. God wants the hungry to be fed, the poor to be sustained and to be done justice and His creation to be tilled and kept! This is possible in a form of agriculture that respects agronomic and social normativity reflecting creational normativity. In such a practice faith and reason come together in a synergetic way. This view of human life and the world, in which I experience a close affinity with Sytse Strijbos has motivated me to write this piece.

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Reason, faith and practice in our common home, South Africa

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"No one can be clever and ecstatic at the same time" Sir A Quiller-Couch

1. Introduction

Three elements of the overall theme, *Reason, Faith,* and the idea of *Our Common Home* are found in different cultural constructions or formations in the South African context. These formations have often combined or interacted with destructive results, and have at other times formed constructive, life-giving combinations.

Firstly, a few examples will be given of specific cultural formations and combinations of these themes. That will be followed by reflection on how we can arrive at constructive, life-giving combinations of these formations, with a practical example from the African context of what could be done. There are more factors that could be included in the mix that are not considered here.

2. The view of reason and "our common home" in the *Verligte Beweging* among Afrikaners

In the 1970's and the 1980's there was a movement in the Afrikaner-establishment that was called the *Verligte Beweging,* the Enlightened Movement, that reminds one of the Aufklärung in Europe. The leading figure of this movement was Willem de Klerk, a theologian and journalist and the brother of FW de Klerk, the leader of the National Party (NP). FW de Klerk was the person who, as president of the white minority government, officially declared that the policy of apartheid would be replaced by a full democracy, in a historic speech on 2 February 1990.

In a book about his brother FW that was published in 1991, Willem de Klerk stated that the basic concept of the Enlightened Movement was *togetherness* (gesamentlikheid), based on *reason as the natural law of the human soul*. He quoted the historian Barbara Tuchman's *The March of Folly* (1984): "Rejection of reason is the prime characteristic of folly…. When desire disagrees with the judgement of reason, there is a disease of the soul. And when the soul is opposed to knowledge or opinion or reason, which are her natural laws, that I call folly…." (De Klerk, 1991 pp. 130, 144-145).

Togetherness was seen as the opposite pole of separateness (apartheid), which was not rejected out of hand, sometimes for strategic reasons and sometimes, it seems, as a matter of principle. The idea was to find a balance between togetherness with other cultural groups and

maintaining an own identity. Willem de Klerk described how this movement convinced the Afrikaner in general, and FW himself, to move their policy from the one pole (separateness) closer to the other (togetherness), and to leave apartheid behind. In his conclusion he talked of FW's *conversion* to the idea of togetherness based on reason (1991, pp. 145-146). This thought construction became dominant in Afrikaner circles at the time, and when it combined with the drive for reconciliation of leaders like Nelson Mandela and Desmond Tutu, a peaceful transition to democracy in a deeply divided country became possible, which led to a lot of optimism. This was a noteworthy contribution!

Twenty-five years later this optimism is under a lot of pressure, but it is still alive. The question is if it was, and is, sufficient to put all one's confidence in reason as answer to all the movements of the human spirit in this turbulent country.

In his book Willem De Klerk presented his expectation of the way in which the five years after 1990 would evolve. On pp. 174-200 he presented an overview of the *seven* forces that would determine this period. He mentioned the difficulties that were to be expected: *four* situations that put pressure on negotiations (p 178) and *three* fault lines in the South African situation (p. 179). The powers that opposed reason were duly noted, counted and allocated their place in the bigger reasonable picture painted by Willem de Klerk. He looked all the difficulties and unreasonable ideologies in the eye and assured his readers that these forces could be contained by the processes of reason: by education, persuasion, negotiation, compromise. He was full of confidence that all would work out: economic realities would force all groups to find solutions (p. 187). With leaders like FW, he stated, it was quite possible. He even ventured that it was not far-fetched that FW could become president again in the next 10 years (p. 199).

It seems that the *Verligte Beweging* underestimated and consequently neglected the extent to which reason itself can be understood or constructed in different ways. What is reasonable to one is often unreasonable to another. And where Willem regarded reason and the economy as the binding forces that would keep all together, the African National congress (ANC) as ruling party expects minority groups to bow to the majority. The idea that the ecology is our and our children's common home hardly features.

On 27 April 1994 a government of national unity (GNU) was elected in a fully democratic national election. FW de Klerk became a member of the cabinet of president Nelson Mandela. Two years later and five years after his brother Willem de Klerk's book, he and the other National Party members withdrew from the GNU, complaining that the ANC refused to share power or to search for consensus in critical matters (Giliomee, 2004, p. 619). De Klerk's successor as leader of the once mighty National Party, Marthinus van Schalkwyk, became a member of their former arch enemy, the ANC, in 2004. The rest of the party followed about a year later. Van Schalkwyk was rewarded with a cabinet post and after serving as a minister for 10 years, keeping a very low profile, he resigned from parliament when president Zuma left him out of his cabinet (Makinana, 2014).

And recently Dave Steward (2016), Chairman of the Board of Trustees of the FW de Klerk Foundation, wrote an article *Slegs "goeie" blankes (Only "good" whites)* about a ruling of the Constitutional court on street names in Pretoria. Steward warned that the ruling implied that all the cultural, economic, and other contributions of the whites in the history of this country are now in principle disregarded. He complained that the only legacy of whites in

general that is recognised is oppression; individual whites who supported the struggle against oppression are the only "good" whites who may, in this case, have streets named after them.

It is noteworthy that Willem de Klerk, a *pastoral* theologian, worked with a rather simplistic anthropology that puts its ultimate confidence in reason. The anthropology of Christian theology, at its best, works with a very sophisticated and realistic anthropology that would have served him better. As example of the role that such a theology can play in the political arena one can refer to the contribution of Karl Barth after the Second World War in Europe. Barth did not reduce the complexities of life to neat rational categories. He did not work with a simplified anthropology. He always spoke as a theologian, and his theology and his view of political activity as a "free, direct approach to human beings and their welfare" is said to have contributed in Europe "toward breaking down ideological politics in favour of a more pragmatic and practical approach to problems of state" (Herberg, 1960, pp. 64-65, quoting Charles West).

Secondly, it is noteworthy that De Klerk, as *Christian* theologian, accepted Tuchman's view that *self-interest* should be the basis of reason: "…if the mind is open enough to perceive that a given policy is harming rather than serving self-interest…and wise enough to reverse it, that is a summit in the art of government" (De Klerk, 1991, p. 145, quoting Tuchman). Self-interest is a powerful force than can be directed towards positive goals, but unchecked and blatant self-interest, as is found in many sectors of society in the present-day South Africa, has destructive consequences such as rampant corruption, a growing gap between rich and poor and ecological devastation.

In April 2013 the prominent anti-apartheid activist Peter Hain, who later became a member of Parliament in Britain, wrote in a short article *My South Africa, riven by self-interest:* "… ANC leaders now seemed to be preoccupied with corruptly enriching themselves at the taxpayers' expense, not sticking true to Mandela's values. 'They are looting the country,' ANC members told me time and again as I travelled around this amazing and beautiful country". There is wide agreement with this view of many ANC members. By 2017 the term state capture had become dominant in the public discourse on the role of the ANC.

The people of the *Verligte Beweging* did very little to present an alternative to self-interest. The same can be said of many Christians, even if the Christian faith proclaims service to others and the search for the common good, more than self-interest, as a basic motif to direct practice (cf Benedict XVI, 2009). The theologian Leslie Newbigin (1989, p. 229) says what is required of the church is to become a servant church, 'a community that does not live for itself but is deeply involved in the concerns of its neighbourhood'.

What is needed is a life-giving combination of factors which achieve synergy through creative tension. It is important that reason and a measure of self-interest are part of this combination, but they are not sufficient on their own. The *Verligte Beweging* can serve as example of that. It was helpful to bring an end to apartheid but it was not sufficient to find a way after apartheid.

One reason for the failure of the *Verligte Beweging* is that it did not recognise that "reason" is not a given entity, it functions within a larger cultural framework or construct. To illustrate this point, a few cultural formations of reason are considered below.

3. Views of reason of some African writers in the 20th century

In this section attention is given to some African views of reason over almost a century, followed in the next section by a discussion of the tradition of resistance to Western concepts of reason.

In 1936 H I E Dhlomo (1936, p 232) wrote:

"Action! Rhythm! Emotion! Gesture! Imitation! Desires … The origin of African drama was a combination of religious or magical ritual, rhythmic dances and the song. These ceremonies were based on what anthropologists call Sympathetic Magic… The dances were rhythmic and expressive; the songs emotional and devotional…."

In another article, Dhlomo (1939, p. 89) rejected rhyme as a "suitable outward form" for the "emotional content" of African poetry. He quoted Sir A Quiller-Couch who said "No one can be clever and ecstatic at the same time". Taking Hebrew poetry and Shakespeare's later works as examples, Dhlomo propagated the use of rhythm as the form best suited to the African genius. This comparison seems to point at a unifying transcultural formation in which people from different cultural backgrounds can feel at home, although one must remark that Hebrew poetry and Shakespeare's later works were, if anything, clever and/or inspired rather than ecstatic.

Dorsinville (1976, p. 70) stated that the famous poet from Senegal, Leopold Senghor "himself says that meaning is less dependent on discourse, analysis, linear thought than on breath, rhythm, sensibility".

The following statement by Ibe Nwoga (1976, p. 26) may also find some correlation with certain Western schools of thought, such as phenomenology, which will be discussed below:

> "My understanding of the issue is related to a distinction between modes of knowing – that whereas traditional western man has evolved a more detached, analytical mode of understanding of his world, environment and aspects of human functioning, traditional African man retained a more holistic, instinctive mode of understanding**.…** I try various expressions to describe this mode – spiritual absorption, instinctive perception of whole meaning, sensitive interaction – but these are words that have their meaning in the language of a cultural mode of perception which is particular and rationalistic. The total of these expressions, however, comes close to what I mean, for which the word **rapport** may be used… (if the African should be found to have a predominating tendency towards this type of knowledge, then it should be recognised, not indeed as exclusive, but as characteristic".

Other statements suggest that the cultural gaps may be deeper, that correlation may not be found so easily. In 1964 the well-known South African literary scholar Ezekiel Mphahlele (1964, p. 221) wrote: "It is significant that there is much more creative writing than scholarly prose by Negroes in Africa. Perhaps it is because a poem or short story or a novel is so close to individual experience, and therefore more natural modes of expression than argumentative prose; and further, because intellectual systems and the arguments involved are not natural to Africa."

And the philosopher K C Anyanwu (1984, pp. 87-93) wrote:

> "The unity of the self and the world, mind and matter, is something magical because it defies any rational understanding. We can only say that the self and the world

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interpenetrate each other in such a way that we do not know where the self begins and ends for the world to begin .... the West seeks rational causality in all things. What happens if nature is alive, if spirit permeates the whole universe, if consciousness cannot grasp the factors of causality? Effects would then be interpreted as magical and so also the method.... Magic raises up the question of causality .... the whole truth about cause is magical, that is, it belongs to the non-material world."

The word "harmony" is often used to describe the African worldview. The Ghanaian writer Kofi Awoonor comments as follows on Chinua Achebe's book *Things fall apart* (first published 1958): "To Achebe, the African world before the arrival of Europe was a well-integrated one, with dignity and honour". In spite of contradictions and struggles "the search goes on inexorably for that fundamental harmony on which their cosmic destiny rests". It is this "pristine integrity" which has been "traumatically shattered... (by) the tragic encounter between Africa and Europe..." The first "seeds of havoc" are planted with the coming of the Christians: "Order and coherence are followed by that slow, imperceptible and disguised process of decay" (Awoonor, 1976, pp. 252-254).

African Traditional Culture is still alive and powerful. In August 2016, two church ministers submitted their doctoral theses in Theology with me: rev Simon Munyai of the VhaVenda in South Africa, and rev Peter Nyuyki from the 'Nso in Cameroon. Independently from each other, both state that the missionary era has passed, that the missionaries from the West did not understand their particular culture and religion, and that the African church now has the task to develop a meaningful relationship between their traditional cultures and the Christian faith. Both use the word *harmony* to describe their African worldviews: Munyai (2016, p. 70) states that healing is regarded by the VhaVenda of South Africa as an act of reconciliation by God, who brings order, stability and harmony to the whole universe. Nyuyki (2016, p. 177) states that in the worldview of the Nso' people, the self and the phenomenological world are inseparable because the Nso' people experience life in harmony with nature. The universe, for the Nso' people, is not static, inanimate or dead. "The worldview of a people and their ways of worship tell us how they see and conceive the cosmos and interpret the things and events around them. That of the Nso' people like most of Africa is imbedded in music and dancing, fellowship, corporate living, their traditional religion and socio-economic and political organisations."

This relation to reality is threatened by Western forms of reason and Western education, which leads to resistance.

4. Resistance to Western forms of reason

In 2015 and 2016 there have been major incidents of burning down of schools in the Vuwani district, a rural area in the province of Limpopo, and buildings on the Mafikeng campus of the University of North-West and at the University of Johannesburg. At the time of writing this article, news reports are still coming in on more campus violence, specifically the burning down of buildings and vehicles.

In a news report, "'Let the schools burn, let them burn!' - Vuwani resident" Lizeka Tandwa (2016) quoted a police officer who said that 20 school were burned and four damaged in this

rural area. This happened when protests broke out about plans that the area would fall under a new municipality. Damage was estimated at more than R500 million (Whittles 2016).

In comparison, a house of 200 m² with a decent garden in an upper-middle class suburb can be bought for under R2 million.

In Vuwani, local *politics* triggered a spontaneous mass action by the communities who then turned against the *education* facilities of their children. On several university campuses there were also incidents where buildings were burned down, sometimes in mass protests about different complaints (North West University Mafikeng campus) and sometimes in secret at night (University of Johannesburg). Minister Blade Nzimande (2016) detailed the cost of student protests to university campus properties around SA, saying the total between October 2015 and June 2016 stood at R459.8m.

The question that many ask is: Why do people burn down schools and university buildings?

One factor could be that resistance to Western forms of reason has a long history in South Africa.

In the 1920s the church leader Isaiah Shembe broke away from the missionary churches in search of an own identity. One of his reasons was the suppression of oral traditions by the epistemological and cognitive authority of the Western tradition of print (Brown 1998, 124).

The mass actions that started in Soweto in 1976 led to the introduction of a fully democratic constitution for South Africa in the early 1990's. These uprisings were, especially in the early years, inspired by Black Consciousness with its slogan: *Black is beautiful!* The leading figure in this movement was Steve Biko, who was beaten to death my security forces in 1977 at the age of 31. Biko was not opposed to education and reason. He was also not anti-white. "Steve Biko did more than any other political leader to form a political movement whose primary aim was to challenge the intellectual foundations of European modernity while engaging with that modernity itself through the weapons it had itself furnished" (Mangcu 2012: 34, 39). He took his arguments to some of the most exalted academic forums in the country (Mangcu 2012: 178).

This objection to Western rationalism can be compared to responses to high levels of rationality in human history such as the Romantic movement in the West (Mangcu 2012: 273-2750).

However, by 1974 Biko was losing his grip on the movement as it became more radical and activist (Mangcu 2012: 192, 193). The movement raised the political consciousness of students and on 16 June 1976 demonstrations by school children led to violent responses by the police and the burning down of schools and other government property by the students. This was followed all over the country by frequent incidences of the burning down of schools and university buildings, and other buildings, which still flare up from time to time. It is often interpreted as expressions of political frustration, but there was also resistance against "Western values" such as individualism, a resistance that was repeatedly expressed, inter alia, in popular slogans such as "Pass one, pass all!" at universities.

Toyi-toyi, which is rhythmic dancing and singing by groups of advancing protesters, is the most prominent traditional cultural form during mass protest demonstrations. It has played a major role since the time of the struggle against apartheid, and it is still prominent in mass protests by communities, trade unions, students and others. Toyi-toyi is described as "the war dance of black South Africans"; a resident said it can be seen as South Africa's 12th official

language, "since it's nearly as old as the country itself and everyone knows it, including the government." It is very effective to give the protesters courage and to intimidate the authorities. "Toyi-toyi is a powerful and infectious statement, by which the oppressed may voice their grievances to the government" (Nevitt, 2016).

Toyi-toyi does not make a rational statement. It is rather ecstatic than rational. Sometimes it is combined with the processes of reason that were described by Willem de Klerk: by education, persuasion, negotiation, compromise, written submissions. In some circles, however, political protest that was expressed in a literate form was regarded with suspicion because the literate form itself was seen as foreign to African identity. Traditional oral forms at times involved "a return to the ancestral source", cyclical construction, parallelism and repetition (Brown, 1998, pp182-185). The oral form expresses another relationship to the world than the relationship that is expressed in literate forms. Brown quotes the literary scholar, Michael Chapman, who wrote in 1984:

> "Underlying such an approach is the vision of an African anthropomorphic universe wherein all relationships – from God to the ancestral spirits, through man to the animals and plants – are mutually co-existent. It is a universe which evinces beauty-in-harmony; it is (to quote Senghor) 'a dictionary, a web of metaphors, a vast network of signs' and is characterized by the depth and intensity of affective life. Thus artistic technique, in its attempts to express rhythmic essence, is at the same time felt to be an ethical principle; the poet, by chanting his poem, gives audible substance to those life forces which, according to African ontology, are deemed to emanate from God and are Being – for Being is Force, Life is Energy. As far as the poet is concerned, therefore, the ideal (again to quote Senghor) is 'total art', in which a world of static appearances gives way to one of dynamic realities; 'imitation is superseded by participation, the master-word of Negritude" (Brown, 1998, pp. 193-194).

This search for participation, (rapport – Nwoga, fundamental harmony – Awoonor) rather than control of nature through reason, which is pivotal in the modern West's belief in progress, was one of the inherent motives in the struggle against apartheid: it was more than political protest, it was also a search for an African identity. Toyi-toyi can be interpreted as one such an oral form that expresses a rhythmic essence and an ethical principle that are rooted in African ontology.

A more recent development on university campuses is the movement for the decolonisation of the university system. It includes the burning and vandalising of "colonial" art works, libraries and buildings, but there are also academic debates about the diversification of epistemology, bringing marginalised groups, experiences, knowledges and worldviews emanating from Africa and the Global South to the centre of the curriculum, challenging the hegemony of Western ideas and paradigms and foregrounding local and indigenous conceptions and narratives. At the University of Pretoria a copy of a book, *Decolonising the University. The emerging quest for non-Eurocentric paradigms*, was circulated electronically in 2016. In the Forword with the heading '*Our universities are the purveyors of an imperialist worldview* SM Mohamed Idris writes:

"Our universities are the purveyors of the imperialist worldview and ideology. They play the role of perpetuating Western hegemony through their education models that are so destructive to our culture, language, way of life, knowledge systems and dignity.

To achieve true liberation and recover our authentic selves, we need to purge the West that is within us.

….Even at our universities, to bring about such a change would be seen as a radical exercise. So steeped in our psyche is the Western hold that to think in any other way is unimaginable for fear that we end up in poverty and backwardness - as if there were no other civilisation before the coming of the colonialists".

The reference to "our culture, language, way of life, knowledge systems and dignity" and a civilisation that is not Western indicates that the drive for decolonisation cannot be understood fully by using Western insights, for example that it is merely a search for power or that it is frustration with the struggle to get funding to study at existing universities. It may be such things, but it is more.

It is interesting that Idris names Al Jazeera as example of what should be done; it shows that his view of reason may be quite compatible with at least some Western schools of thought.

There are also political motives for attacks on Western education. In Martin Meredith's book *The state of Africa* (2006) there is a chapter, *The coming of tyrants*, in which he describes the two decades after political independence. It was an unstable period, marked by a high number of coups. The educated were often the target of violence by political leaders. In Zanzibar, Abeid Karume came to power through a coup; he was distrustful of intellectuals and executed some of his advisors (p. 223). In Uganda, Idi Amin "…took sadistic pleasure in humiliating officials, usually men with wide education and experience, for whom he held an instinctive distrust" (p. 237). In Equatorial Guinea, Francisco Nguema took power. "Given unlimited powers to arrest, torture, rape and murder, Nguema's security forces wreaked vengeance on the country's educated classes…" (p 240). In Ethiopia, under Mengistu Mariam, "…armed gangs hunted down students, teachers and intellectuals deemed to be 'counter-revolutionaries'" (p. 246).

In May 2000 a newspaper reported: "Mugabe thugs target black professionals" (Makhanya and Malala, 2000, p. 1). "Teachers, nurses and other professionals have been subjected to sustained abuse by supporters of President Robert Mugabe's Zanu-PF party, raising fears of a repeat of the '80s 'Gukurahundi' (wipe out everything) campaign. Then, teachers and other professionals were among the first targets in a campaign of terror in which 20 000 people were murdered, many of them by being buried alive".

I could not find evidence that this level of violence against educated people or academics has been prominent in Africa in recent years. There are, however, political leaders who do show anti-intellectualism. Recently, the political columnist Prince Mashele (2016) wrote in the influential newspaper Sowetan: "African leaders don't like the idea of an educated populace, for clever people are difficult to govern. Mandela and Mbeki were themselves corrupted by Western education. (Admission: this columnist is also corrupted by such education.)….Zuma remains African. His mentality is in line with Boko Haram. He is suspicious of educated

people, what he calls "clever blacks". Remember that Boko Haram means "Against Western Education".

Linking the South African President's remarks about "clever blacks" to Boko Haram is ominous, but Zuma's remarks as such can also be compared to the remarks of, for example, some leaders of the Republican Party in the United States, cf the article by an experienced person in American politics, Max Boot (2016): "*How the 'Stupid Party' Created Donald Trump*". According to Boot, Republicans have often distanced themselves in their rhetoric from intellectuals, in order to attract a certain section of voters: "Rather than run away from the anti-intellectual label, Republicans embraced it for their own political purposes." Boot quotes a certain William F. Buckley Jr. who said, "I should sooner live in a society governed by the first 2,000 names in the Boston telephone directory than in a society governed by the 2,000 faculty members of Harvard University".

To conclude: in Africa, resistance to Western forms of reason is expressed in different ways, from engaging Western intellectuals in their own terms to violence against intellectuals, from the destruction of educational facilities to the academic debates in African philosophy and the recent movement for the decolonisation of universities. It also has different motives in different cases, such as the need to express "African ontology", the need to "recover our authentic selves" and the desire to maintain political power. It can be radical and destructive but it can also be moderate and constructive.

5. Movements in the West that challenge the hegemony of reason

The modern age, where reason and science are central, is traced back to Descartes' "I think, therefor I am".

Descartes set the human soul apart from the body and the world itself, a dualism that has plagued Western thinking over the centuries. Blaise Pascal (1623-1662), a younger contemporary of Descartes, presented another form of dualism, the dualism of *methods*: he made a distinction between *esprit de géométrie,* the method of natural science, and *esprit de finesse,* the sensitive disposition of the heart ("gevoelige instelling…van het hart"), which is more than the difference between reason and emotion. *Hart* means for Pascal: feeling, sensing, intuitive knowledge (Van den Berg, 1973, pp. 11 – 19).

There is a tradition in the West, especially in the English world, to see only natural science as science. There is an equally long tradition of resistance to this notion. In the 19th century a brand of psychology was developed that used only the methodology of the natural sciences. This tendency was resisted by people like Percy B Shelley, whose *In defense of poetry* was published in 1840. He made a distinction between *reason,* that builds up the whole out of the parts, and *imagination,* that understands the meaning of the parts from the whole. This view stands in the tradition of Pascal who spoke of the truth of the head and the truth of the heart. Wilhelm Dilthey (1833 – 1911) made the same distinction: psychology can understand something like sorrow after the death of a child by using the methods of natural science to describe aspects such as the ensuing emotions and physical processes, or it could understand the sorrow by using the methods of the *Geisteswissenshaften,* giving attention to the relations in which the child existed and what its death means in the whole context in which it was living. Both methods are valid in a discipline such as Psychology. The insight that Psychology

must not only attend to the individual as isolated object, but as a person in relation to others, led to the understanding of the importance of culture and the cultural formations of human identity (Van den Berg, 1973, pp. 40-44, 79).

This approach is expressed in Phenomenology. Emmanuel Levinas (1906-1995) was also in this tradition: for him, being in direct relation with the Other is the basis of all truth (Peperzak, 2007, pp. 97-99).

The question is how compatible the moderate and constructive forms of resistance to Western forms of reason in Africa are with movements in the West that also challenge the hegemony of reason.

6. Convergence between African and Western concepts of reason?

The interaction between Western and African ways of thinking that has been going on for centuries has brought about different possibilities.

The first question is whether the Western tradition that claims a place for Pascal's *esprit de finesse,* the sensitive disposition of the heart as a way of knowledge, and perhaps even some debates in quantum physics about causality and about the impact of the observer on what is observed can be related to some of the ideas of African writers. Can Levinas' view that knowledge is found in direct relation with the Other be compared to Nwoga's "rapport" for example? Such questions are not debated here, attention is rather given to what happens in practice. It can be noted, however, that Nwoga's warning that the African way of understanding cannot be described by "words that have their meaning in the language of a cultural mode of perception which is particular and rationalistic" may also apply here.

One possibility of what may happen is that mutual influence may bring the traditions closer to each other. Half a decade ago, the well-known writer Es'kia Mphahlele (1964, p. 231) wrote: "We seem to forget that our neo-African culture, by its very nature, is going to absorb much more of European techniques – a process that should not worry us, really: our writing can only be valid if it interprets contemporary society in a mode of expression that hits on the intellectual, emotional and physical planes of meaning".

Many African and Western people can agree with Prigogine (1984, pp. 34-5) that modern science has been remarkably successful in unlocking the secrets of nature and in utilizing the potentialities of nature through a strong emphasis on the superiority of reason. But this emphasis has had a reverse side: scientists tended to dismiss all the non-rational, yet vital elements of human life and reality, such as the destiny of humanity, human freedom and spontaneity.

A very important opportunity - and need - for the different ways of thinking to interact and find synergy is presented to us by the practical problems of everyday life. The Nova Institute has been engaging in trans-disciplinary research where researchers from different disciplines and people who are in the actual situation put their heads together to search for meaningful solutions to concrete problems that the people in the particular situation is struggling with. Klein (2001) describes this approach well: "The core idea of trans-disciplinarity is different academic disciplines working jointly with practitioners to solve a real-world problem".

Real-world problems in South African communities are huge and complex, and they are almost always trans-cultural in nature. The problems emerge when elements from different

cultures interact, a continuous process where these elements meet and mix, seek each other out, attract and/or repel each other, combine and clash, merge and break up. There is chaos but also patterns that emerge.

It becomes a problem when the combinations that form are destructive. In order to understand what is going on and to develop life-giving combinations, a combination of insights from al the cultures that are involved is needed, from within different scientific disciplines, as well as the insights from the people in the situation, who know the practical situation from the inside. Western ways of thinking and African ways of thinking all contribute to get a grasp of the complexities of every day processes and practices in households and communities, such as practices to produce and prepare food and to care for vulnerable children.

The desired result of the trans-disciplinary process is that a life-giving domestic practice emerges or is designed that is functionally integrated into the given context. Nova sees a domestic practice as a set pattern in which different household members play different roles, making use of artefacts and products, to satisfy a fundamental need. A technical solution or artefact will only be taken up and used in daily life if it has become part of a domestic practice. It is not the technical solution on its own that is needed, it is the practice as a whole that must be developed.

In the African context, African Traditional Religion and the Christian faith form different combinations that play a pivotal role in many people's decisions about everyday practices, for better or for worse. One of the factors that hamper the potential contribution of the Christian faith is the gap between faith and practice in Christian circles.

7. The gap between faith and practice in Christian circles

In his book *De eeuw van mijn vader* Geert Mak (2009, pp. 105, 106) relates some events in Reformed circles in the Netherlands around the year 1920. The focus was on the implications of the natural sciences for the Christian faith, but, says Mak: "Here and there people whispered the name of a Swiss theologian, a certain Karl Barth, who taught that theology and every-day life should be integrated with each other" (My translation. The original reads: "Hier en daar fluisterde men de naam van een Zwitserde theoloog, een zekere Karl Barth, die leerde dat theologie en het leven van alledag in elkaars verlengde lagen"). Whispered? Is it not most obvious that theology and life, that faith and practice should be integrated with each other?

Something similar happened in Evangelical circles. According to Black (2016: 59, 60, 62) the church connected evangelism and social responsibility for most of its history. However, that changed for the evangelical church between the years 1865-1930. In this period the evangelicals' interest in social concerns had, for all practical purposes, been obliterated and the social conscience of an important part of American Evangelicalism atrophied and ceased to function.

The Reformed tradition in the Netherlands and American Evangelicalism are both later fruits of the Reformation. In 1938 Karl Barth wrote an essay *Rechfertigung und Recht* (Justification and justice; translated as Church and State). Barth said that the Reformers did not set out what the "inner and vital connection is between the service of God in Christian living … in the worship of the Church as such, and another form of service, which may be described as a 'political' service of God …" (1960, pp. 101–102). The 'political' service of God refers to the

affairs of human justice and every-day life. If there is no inner connection between the 'political' service of God and the service of God in the worship of the church, it would be possible to build a highly spiritual message and a very spiritual church with a message that 'has ceased to seek or find any entrance into the sphere of these problems of human justice'. On the other hand one can build a very effective society which has lost contact with the vital values and direction that we as humans cannot provide for ourselves.

In his book *Metabletica van de Materie* JH van den Berg (1969, p. 206 ff) provides a gripping description of the earlier antecedents of this gap in the spirituality of the West, where the church started to define faith as turning away from the world into one's inner experience, such as mysticism and the ascetic movement around the year 1 000 A.D.

Africa has not gone through this process of the secularisation of every-day life. But still, the privatised, inner spirituality that was imported by the missionaries may explain the widespread dilemma that the church is growing strongly in Africa, but with little impact on the urgent questions of the continent, such as poverty, violence and corruption. It is well illustrated by the experience of Brian McLaren in 2004 when he attended a gathering of 55 young Christians, mostly from Rwanda and Burundi, after the violence in which more than a million people died. One of the people at the conference said that he had attended church all his life, and he had only heard the message of future personal salvation from hell – no mention was ever made of the hatred and distrust between tribes, of the poverty, suffering, corruption, injustice, the violence and killing that caused the country to fall apart – *even in the weeks when the killings were going on* (McLaren, 2007, p. 19).

The former president of the Republic of South Africa, Thabo Mbeki, started the movement for an African Renaissance because, in his opinion, the traditional values of black people have been destroyed by modernization, and Christianity did not fill that space because it was a "Sunday religion". (Gevisser, 2007, p. 324). There is more truth to this observation than one would have wished.

In order to play a life-giving role in the African context, the church will have to find a meaningful way to overcome such a separation of faith and practice wherever it occurs.

8. A way forward

To say that all religions are paths up the same mountain is, in fact, crypto-exclusivist, because it implies that there is only one truth that you posit or assume, even if there are different paths to that one truth. If one recognises the integrity of religious ways in themselves, it becomes clear that they may not be after the same kind of final fulfilment. *Nirvana* is the religious end of Buddhism, for Hinduism it is complete absorption into the One. (We can add: Traditional African Religion sees the continuation of life in your offspring and in the cyclical journey between the living and the ancestors, also called the living-dead: if you have children, you become an ancestor when you die. And a child that is born comes from the ancestors.) Only Christianity presents *salvation,* that can be described as "a perfect communion of human beings with God, each other and God's creation, and this can only be reached through faith in Jesus Christ and following him as disciple" (Bevans and Schroeder, 2009, pp. 380, 381, following S. Mark Heim).

The Christian message of salvation has been expressed in numerous religious formations. Not all would describe the message of salvation as is done in the previous paragraph. In South Africa, there is a wide range of spiritualities: there are thousands of African Initiated Churches who operate in the thought-patterns and symbolic horizon of Traditional African Religion and culture, spanning from those who are highly syncretistic to those who see the traditional religion as demonic; there are the churches that stand in the tradition of the different Western churches, and there are Pentecostal and charismatic churches. The influence of the prosperity gospel is widely felt across the spectrum.

All of these are expressed in different practices and have a different impact on every-day life.

It seems important that, in the trans-disciplinary search for domestic practices that would improve people's quality of life, African Traditional Religion and the Christian faith in particular should also be involved, in different ways and for different reasons: for people in the situation to express their views; to understand what is happening in practice from a phenomenological point of view; and from a general ethical point of view, to improve the quality of life of the people involved. The specific mission of the Christians involved can be described as an obligation to promote the flowing of life, and to try to understand and communicate, within the specific context, the meaning of the statement of Jesus in John 10:10, in a context long ago where death and life were also in grim opposition: "I have come that they may have life, and have it to the full."

9. A practical example of a life-giving practice

Globally as well as in Southern Africa the level of domestic wood use has become unsustainable. It is estimated that two to three billion people around the world still make use of traditional cooking methods that require biomass for fuel.

In the Lowveld of South Africa, adjacent to the Kruger National Park, a not-for profit company, Nova, set out in 2010 to embark with about 20 residents of Molati, a rural village in the Limpopo Province of South Africa, to design a stove that can be built and maintained with the materials, skills and finances available to these residents.

First of all, notice was taken of a large number of stoves that are produced and sold worldwide. Six stoves that were representative of the most important available models were purchased and a group of about twenty residents of Molati used and evaluated the stoves.

None of the stoves complied with the requirements of the residents. In the process of evaluating different designs the group started to think of the possibility that they can build a stove for themselves according to their own requirements, using materials that are locally available (e.g. cow dung, clay, salt, water, etc.) and skills that people normally use to build their own homes. This means that the residents "saw" the idea of an improved stove as a possibility for themselves and began to design ways in which this idea could work in their context.

Technical expertise from outside the community and the insight in the local context from within the community were combined to design a stove together.

Initially, five different prototypes of the locally built stove were designed and implemented in households where they were evaluated, compared, redesigned and iterated until a final prototype emerged. When most of the group had used this prototype for almost a year, this

model was identified as the one to take to scale. That was the first milepost: the technical solution had been taken up into a domestic practice of at least one representative household – in this case nearly twenty!

The next phase was to find ways to take the stove to enough households in a given community to make a significant contribution to the impact of wood use on the local environment, and to generate carbon credits in order to get finance to take the stove to many communities. The process is still underway. So far, the stove has been taken to more than 5000 households, not by selling stoves as products, but by community projects where people were assisted to build their own stoves and use them and maintain them themselves.

The whole process was driven and managed out of the local congregation.

Different elements from outside and from inside the community were combined with each other through a process where a certain type of reason and faith played a role. The result was that a certain domestic practice was designed that is being used by a number of households.

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Three secular seductions:

one nation, one government, one science

Rob Nijhoff

1. Introduction

Is *evidence-based politics*[12] an idea with a strong bias towards a monolithic view of society? In one version of such a monolithic view, it is (a) the government that directs a society within (b) the boundaries of a nation-state, giving much credit to (c) the 'oracles' of *science* in the process to take its policy decisions.

In this essay I try to clarify why *this* monolithic view of society is dangerously flawed. Part of the reasoning below will be a description of

i) pluralities that are real, but obscured within a seemingly monolithic view of a government, a nation-state and/or science.

ii) a religious or pseudo-religious status that willingly or unwillingly can be assigned to (a) the role of a *government*, (b) a *nation-state* and its boundaries; and/or (c) an *evidence-based* approach of political decision-making. The focus of this essay will be on the latter (c), which usually implicates an appeal to *science*. However, from the outset it must be clear that this essay is not a plea for fact free politics. On the contrary, the careful, methodical or scientific, academically embedded search for relevant information is recognized as an asset. Dangerous effects of the evidence-based approach are related to the supposed status of the academic expert and its possible anti-democratic or other restrictive effects.

Although applicable within the wider context of North-Atlantic ('Western') culture, Sytse Strijbos' homeland, the Netherlands, is the assumed political context for the contentions that follow. Specifically, at the end of this essay (section 6.2) I will refer to a recent report published - in Dutch - by the Council for Public Health and Society in the Netherlands. In this report the approach of evidence-based practices in health care is criticized and at least relativized. This report is important because the government – every government – has a responsibility for public health and its funding.

Disclosive Systems Thinking, to which the name of Sytse Strijbos adheres firmly, represents an interdisciplinary and pluralistic, multi-aspectual approach to societal issues. Because of its pluralistic nature it provides several clues to dissect monolithic views. Specific philosophical sources fuelled this pluralistic look and feel of *Disclosive Systems Thinking*. These sources

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[12] See e.g. http://www.lse.ac.uk/government/research/resgroups/CPPAR/Documents/Evidence-based-politics-Government-and-the-production-of-policy-research.pdf. Accessed 13-10-2017.

will be used to guide this dissection of 'one nation, one government, one science' into its constituents and to understand clashes both between these three domains and within each of them. These clashes can be multicultural tensions, parliamentary debates or deadlocks, or scientists disagreeing because of conflicting paradigms. The selection of these three seductive domains out of many more domains (money, music, drugs, …) is guided by the current popularity of *evidence-based politics*[13] and its context: 'evidence' is expected from science; 'politics' is expected from the government; and a *national* government, to which I restrict myself here, assumes a nation state as context for its policies.

In the title 'Three secular seductions' the term 'secular' deserves clarification. I use 'secular' in the general (unreflected[14]) sense of 'this-worldly', not 'otherworldly'. In the title, and in writing for example about 'oracles' of science, I deliberately mix religious or moral terms like 'oracles' or 'seductions' with phaenomena usually considered as belonging to *this* world, this *saeculum*: nations, governments, sciences. So to these domains or phaenomena the adjective 'secular' is attached, not necessarily to the people dealing with them. On the contrary, I don't consider religious people – here: people acknowledging some otherworldly influence – to be more immune to the seductive effects of an undivided, impressive nation, a strong government or the supposed objectivity of science than other people who would call themselves secular. Nor do I consider secular people more immune to these seductions than people who would call themselves religious.

My point is: these immanent, this-worldly, phaenomena can have similar effects that usually are ascribed to supposedly otherworldly or transcendent phaenomena. Examples of these effects are: producing energetic zeal, putting a devotee under a spell, untying strong loyalty or absolute trust, or demanding absolute obedience or unconditional acceptance of verdicts. These effects can lead to both positive and negative behaviour. Usually these effects are associated with religious people. For people living comfortably in 'a secular age' with its generally presupposed 'immanent frame' (Charles Taylor) it is more likely that supposedly *secular* phaenomena are triggering these effects than overtly supposedly otherworldly ones. Writing about nationalism below, I appeal to the late Lancaster professor of Religious Studies, Ninian Smart, to defend such a blended treatment of religions, worldviews and some encompassing -isms.

After introducing several *types of plurality*, this essay provides a closer look at the three domains of nation-state, government and science, in order to bring to light inherent pluralities within each of them. These pluralities are easily ignored by types of nationalism or patriotism, by centralistic views of governance, and by types of scientism. The essay converges into a plea for these pluralities to be explicitly acknowledged within society and government, in order to prevent oppressive styles of politics.

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[13] In the section 'Evidence-Based Policy' of his book *I Think You'll Find It's a Bit More Complicated Than That* (London: Fourth Estate, 2014), 169-218, psychiatrist and science writer Ben Goldacre gives a dozen (often funny) examples of insufficient or misguiding use of evidence, by politicians too. I myself have no statistical evidence whether 'evidence-based politics' is a hype that has reached its peak already or will reach that peak soon, or that this approach will be a more permanent legitimation style in politics. I assume the latter.

[14] The relation between 'this' and the 'other' world is more complicated than these terms suggest, even to the point that the terms themselves are misleading. See works by theologians who emphasize the 'immanence' of God, e.g. John Milbank (2006).

2. A plurality of pluralities

One of Strijbos' prominent academic concerns has been to promote an *interdisciplinary* approach to theoretical reflection, especially to reflection directed towards practices in society. Not only he 'fathered' the *Centre for Philosophy, Technology and Social Systems*, but from 1996-2012 he was one of the driving forces for the annual working conferences of this CPTS. Looking back on the 9th one, Spring 2003, he wrote a discussion paper: 'Towards a new interdisciplinarity' in which he wrote: "It is the main objective of the CPTS to create a kind of interdisciplinarity which enables to address the broader societal issues in the research process and the design stage of technology".[15]

Systems theoreticist Gerald Midgley considers as one of the 'significant strengths' of this interdisciplinary approach that it 'is inclusive of ethical debates', for example by dialogue during the design stage of new technologies. However, he fears that in real life during these dialogues ethicists will be 'captured' by 'scientists with a nascent technology, employed by a company'. Does anyone know of a technology under development, that has been abandoned 'after hearing the arguments of philosophers'? He seems to prefer another option for ethicists, that is the option, 'through alliances with other stakeholders, to make their case in various civil society fora'.[16]

A key term in interdisciplinarity is *plurality*. However, the previous two paragraphs make clear that not only a plurality of academic disciplines is relevant for the type of systems thinking Strijbos advocates. There is a plurality of practices in society, too (practices broadly taken). Among these practices 'doing science' and 'doing technology' themselves already are two, and, if you want, 'doing philosophy' another. Other societal practices are focussed on economy (business, banks, factories), politics (in formal or informal ways), art (orchestras, musea) or spiritualties (churches, mosques); on family life, education (primary schools, high schools), social life or leisure (clubs) or whatever.

Another type pf plurality is pointed to by Midgley writing on (the lack of) fora for 'ethical debate'. When and where interpretative steps or normative issues are involved, human beings often appear to approach these issues from differing perspectives, as if they arrive at the issue from differing directions. It is one thing to signal global climate change (and even that is not without interpretation debates!), it's another thing how to react to it: which and whose behaviour has to be restricted, and to what extent, if any behaviour at all? Exactly these different perspectives explain the lengthy political debates in parliament or in the press.

Yet another type of plurality is not yet mentioned. Although the CPTS working conferences were organised in the Netherlands, participants came from Sweden and South-Africa as well. These participants, being aware of their own specific societal issues, brought their own context with them. This led to debate, not of course debate about arithmetical results like that

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[15] Sytse Strijbos, 'Towards a New Interdisciplinarity', in Rob A. Nijhoff, Jan van der Stoep, Sytse Strijbos (eds.) *Towards a New Interdisciplinarity. Proceedings of the 9th Annual Working Conference of CPTS* (Maarssen: CPTS, 2003), 133-138; here: 137.

[16] Gerald Midgley, 'Reflections on the CPTS Model of Interdisciplinarity', in: Sytse Strijbos, Andrew Basden (eds.), *In Search of an Integrative Vision for Technology. Interdisciplinary Studies in Information Systems* (New York NY: Springer 2006), 259-268; here: 267.

of 2 + 2, but debate about for example the acceptable level of technological complexity to be used to facilitate decision making processes: mobile phones are broadly used worldwide, but 'virtual meeting rooms' certainly not.

Summarising this 'plurality of pluralities': this last type of plurality can be called 'contextual plurality'; the perspectival one 'directional plurality'. Although Mouw and Griffioen[17] dubbed the plurality of societal practices 'associational plurality', I prefer to use the term *structural plurality* in order to refer not only to the diversity of institutional constellations, associations or practices that together can be called a society, but also to the diversity disciplines that together can be called 'science' (taken as a formalised activity or as a body of knowledge). Both of these diversities can be explained primarily by structural features according to which reality appears to us as human beings or by the structural features according to which we human beings engage our environment. Our life conditions appear to be such that we need at least some economical behaviour and (institutionalised) economical practices, or even, so it seems, an academic discipline called economics.

3. One nation

In this and the next two sections I will explore which types of pluralities are relevant within the domains of the nation, the government and science. Every section I start however by supposing there are some pluralities to be found and to be defended. Given that assumption I mention a tendency that carries in itself a danger of ignoring or threatening at least one of these pluralities, putting under pressure what corresponds with this kind or these kinds of plurality in real life.

The dangerous tendency I want to explore in the domain of the nation(-state) is that of *nationalism*, identifiable by a series of features described by Ninian Smart. Nationalist movements are vigorous, not only in for example India or Sri Lanka (Hindu or Buddhist nationalism), but also in East- or West-European countries (Hungary, Scotland). In Hungary, for example, this nationalism is visible in the fences at the border by which refugees from Middle East of African countries are kept out.[18] This nationalist and avertive attitude is not only triggered by ethnic differences, but by religious differences too, especially by anti-islam sentiments.

Smart, who uses a seven-dimensional model to describe religions in his introduction to *The World's Religions*,[19] adds the question: does this model also apply to 'systems … commonly called secular: ideologies or worldviews such as scientific humanism, Marxism, Existentialism, nationalism, and so on'?[20] As the first of three examples he selects

[17] I am following here the analysis in Mouw, Richard, and Griffioen, Sander. *Pluralisms and Horizons: An Essay in Christian Public Philosophy* (Grand Rapids: Eerdmans, 1993), summarised: on pp.168-173. Mouw and Griffioen share with Strijbos awareness of the philosophical legacy of the Dutch philosopher Herman Dooyeweerd (see note 28).

[18] Migrant crisis: Hungary declares emergency at Serbia border. BBC News. 15 September 2015; see http://www.bbc.com/news/world-europe-34252812 (accessed June2, 2017).

[19] Ninian Smart, *The World's Religions. Second Edition* (Cambridge: CUP, ²1998), 13-22. The seven dimensions are italicised in the description of nationalism (immediately following).

[20] Ninian Smart, *The World's Religions,* 22. The example of nationalism follows immediately (22-25).

nationalism. He describes its *rituals* of nationhood (e.g. the singing the national anthem), its powerful *emotional side* (the sentiments of patriotism), its *narrative* of the national history, its *doctrines and principles* (e.g. of self-determination and freedom), its *ethical* values (e.g. loyalty and a law-abiding attitude), its emphasis on the *social* and *institutional* aspects of the nation-state (e.g. the head of state), and finally the *material* embodiment of national pride (e.g. in great buildings and memorials). Marxism is described by Smart with a shorter but similar seven-dimensional list. More caution Smart shows mentioning features of scientific humanism, because it does not 'embody itself in a rich way as a religious-type system'. His conclusion is nuanced:

> Though to a greater or lesser extent our seven-dimensional model may apply to secular worldviews, it is not really appropriate to call them religions, or even "quasi-religions" (…). However, (…) the various systems of ideas and practices, whether religious or not, are competitors and mutual blenders, and thus can be said to play in the same league.[21]

For Smart it doesn't matter whether someone has reasons to *categorize* a worldview or some -ism, for example nationalism, as secular or religious. His point is: a worldview or -ism can have observable features similar to that of religions: they 'play in the same league'.

Now, back to nationalism itself, and the question: (how) does it put one or more types of plurality under pressure? For types of nationalism, either some nation as a (supposed) ethno-cultural entity or some nation-state as a political entity is the focus. Its unity is an essential feature of this entity – by definition, one can say. But in a more pregnant sense, emotionally, this unity has a seductive force for nationalists of most, if not all types. On the descriptive level this unity does not so much refer to geographical contours of some nation or a nation-state (the British empire consisted and still consists of several not well connected areas). However, the entity is and *has* to be distinguished from other nations or nation-states. It is *this* nation or nation-state that deserves a special role in world history. For this special role, all internal capacities and forces have to be united. So this unity of the nation(-state) is not only descriptive, but prescriptive as well: it contains a normative ideal, or better: an anti-normative ideal. This ideal, this unity has to be defended *at all costs* against possible intruders. Mind the absolutism here that easily gets religious overtones.

When we observe this stress on national unity, then: which types of plurality are in involved within the domain of the nation(-state)? And which types are possibly in danger? The structural plurality of diverse societal institutions or associations (postponing the diversity of disciplines within science to section 5)? The directional plurality of diverse worldviews or religions? And/or the contextual diversity, especially within the nation or nation-state?

All three of them are involved, and all of them appear to be put under pressure too – albeit in different ways, as the following examples illustrate. Let's start with the *structural* (associational) plurality. Already in the Roman Empire – admittedly bigger than what is usually considered to be *one nation*! – *collegia*, brotherhoods related to some guild, mystery

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[21] Smart, *The World's Religions*, 26.

religions, or whatever) were raising suspicion as soon as they had some membership code that pointed to secret, members-only activities. Nowadays Russia provides an example of pressure on the freedom of media, (international) NGOs and even large companies. Putin's party is called *United Russia* and in 2016 with more than 50% (!) by far (!) the biggest party of the country. The Russian Orthodox Church, like a lot of eastern orthodox churches, has strong nationalist inclinations, and is allowed to continue its public presence. Other Christian 'flavours' (Baptists, Pentecostal) however are having difficulties in getting along, not to mention Islamic groups. Greenpeace or Baptists are dubbed as 'foreign' influences. So not a secular anti-religious sentiment is threatening a *directional* plurality here, but nationalist feelings are threatening all kinds of 'deviant' societal associations.

For awareness of directional plurality, in the North-Atlantic cultural sphere immigration politics and 'islamophobia' is enough, too. However, not only nationalist movements (mixed with *Pegida*-like anti-islam sentiments) are putting this plurality under pressure. In the Netherlands part of the official integration program for immigrants consists of the presentation of 'our' country in a movie. Debate arose about the inclusion in this movie of topless women at the beach and of the legal marriage of a homosexual couple. A one-sided emphasis on 'our', modern or Western values, easily blots out the presence of allochthone critics sharing a modern worldview without supporting a libertine ethics, or of Dutch homosexual citizens that for religious reasons choose for celibacy and for communities or congregations that supports them in this choice. A supposedly majority worldview or religion endangers the (public) continuation of minority worldviews or religions.

What about the *contextual* plurality? Here the effects of nationalism depend on the scale of observation. Because the national context is sharper delimited from other nations or nation-states, on an international scale the contextual plurality is enhanced. But *within* the nation(-state) conformity can smooth out regional, tribal or other differences when defined as deviances (local folklore, ethnic traditions, etc.). A primary example is Nazi-Germany where the slogan sounded: 'Ein Volk, Ein Reich, Ein Führer' (one people, one empire, one leader). This type of nationalism chose (not only homosexuals and gipsies, but especially) Jews as scapegoat, erasing much of their presence in Europe. Jewish quarters in towns have lost much if not all of their Jewishness. More complicated is the Brexit-case. In reaction to 'Brussels', the *United Kingdom* as a nation-state was led into a Brexit by anti-European nationalism (among other factors). Immediately, Scottish nationalism pointed to the different voting results in their 'nation' (as was the case in London, too, to be honest). Internal contextual differences within a nation-state are not easily wiped out, as African and Middle-East countries like Sudan and Syria show, too.

Structural (associational), directional and contextual pluralities are all relevant, can be concluded. And, whatever the nuances, whoever is stressing the unity of a nation or nation-state, will be aware of or reminded about the existence of these pluralities, because their participants easily will fear some pressure of homogeneity.

4. One government

Having the types of plurality and section structure clear, the sections on government and science can be shorter. Although the unity of the government is closely related to that of a

nation-state, the attention in this section will be focussed on the pluralities *within* a government. Although decentralising (or privatising) and centralising tendencies can occur simultaneously, I focus on the centralising tendencies. Often, a centralising tendency is related to the call for a strong leader – and someone creating or 'listening' to such a call...

Among the dimensions of nationalism, mentioned by Smart, the sixth one refers to the emphasis on national social institutions, for example the head of state. Of course, a government is more than a head of state. You can think of institutions like the cabinet council, government departments, parliament and senate, local governments with mayors and city councils, or, by taking the government of a country in a broad sense: political parties, public services, the police, national security service, courts and other organisations to prepare or administer laws, or to enforce 'law and order'.

With this list, the awareness of the role of *structural* plurality *within* the government is laid bare. For this structural plurality here, 'institutional plurality' is a more specific term. Is this plurality put under pressure by stressing the unity of the government? And what about the other types of plurality? Starting with the former question, indeed the pressure put on the different institutions cannot be ignored. The framing of 'the strong leader' more often than not is followed by a degradation of the role of their party or the parliament into a mere applause machine. Power is seductive. Dictators like to give the impression of rule of law, but democratic institutions or even courts are functioning as empty shells. By reordering departments a new government (a new coalition) can show its priories. In the Netherlands a department of 'Agriculture, Forestry and Fisheries' in 2010 has been combined with Economical Affairs and Innovation. So yes, institutional diversity, advocated already by Montesquieu to balance power, are not immune to the strong government.

The role of a parliament immediately makes clear the importance of *directional* plurality in a government. In a serious parliament exactly the diverse value systems of different parties, of different worldviews or even religions are providing the reason for political debate. So any tendency stressing the unity of the government at the cost of *real*, in depth political debate is an attack on directional plurality: it diminishes the (formal[22]) possibilities of directional plurality that exists within society to become public and politically visible.

Finally, what about *contextual* plurality within the government? A typical example of the importance of contextual awareness is the decision at what government level laws have to be formulated. In some parts of the Netherlands, the so-called Bible Belt, Sunday opening hours for shops are a sensitive issue because of a majority (or at least a significant percentage) of citizens affiliated to a pietistic strand of Christianity that insist on a public Sunday rest. On the national level debates entered parliament about the stress of 24/7-consumerism, the freedom of individual consumers, and the coercive effects on shop-owners to open their shops on Sundays against their convictions or beyond their financial (employee payment) possibilities. These arguments were raised by both religious and secular parties (so religious diversity is not the only factor in this debate). In the end the decision and policymaking about opening hours

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[22] This critique is touching the work of Jürgen Habermas as well. Although Habermas certainly opposes any oppressive government and (especially since 2001) explicitly invites religious traditions to join in in public debate. He is too afraid for religious views to allow them to be voiced by people having formal political function during their professional activities – even members of parliament! See the recurrent debates of this restriction in Craig Calhoun et al. (eds.), *Habermas and Religion* (Cambridge: Polity Press, 2013).

of shops was referred to the local level. On the one hand this decentralisation of the decision seems to do justice to the contextual diversity within the country. On the other hand this awareness does not prevent coercive effects between neighbouring municipalities. A neoliberal free market emphasis, dominant in the central government, is influencing local contextual circumstances.

Our conclusion is that *within* the government of a country (government levels included) structural (institutional), directional and contextual pluralities are relevant, All three of them are under pressure when the central government, a head of state or some other of the governmental institutions becomes a position dominating the – then lost – balance of powers.

5. One science

Science can be considered as a worldwide methodical activity or project by humanity, aiming at the clarification of domains or aspects of our existence. The resulting, growing body of knowledge of this project can be called science, too. History of science makes clear that in a process of diversification more and more disciplines and sub-disciplines have appeared on stage, which on its turn gave rise to different types of interdisciplinarity.[23] These types differ, among other aspects in degree of cohesion or boundary crossing that results from the cooperation between scientists from the different disciplines involved. 'Encyclopaedic interdisciplinarity' is just the availability of different disciplines next to each other (without any boundary crossing), 'integrated interdisciplinary' allows concepts and insights from one discipline to contribute to the problem-solving or theory-development of others.

When on this scale some ideal of 'unified science'[24] is taken as summit of interdisciplinarity, in the work of Strijbos this unity is *not* taken as an ideal. His plea for interdisciplinarity is called interdisciplinarity precisely because of his conviction that irreducible pluralities exist and are to be acknowledged within the worldwide project of science or its resulting body of knowledge. So again, let's ask whether the different types of plurality are relevant here, too, and whether an ideal of 'unified science' is endangering the acknowledgment of these pluralities.

As a process leading to a *structural* plurality the diversification of disciplines has been mentioned already. An important point here, however, is obscured by talking about diversification. It is true that 'philosophy' has been a container word, encompassing for example 'natural philosophy' for the branches that we now call 'natural sciences'.[25] This

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[23] Sytse Strijbos, Andrew Basden, 'Introduction: In Search for an Integrative Vision for Technology', in: Sytse Strijbos, Andrew Basden (eds.), *In Search of an Integrative Vision for Technology*. *Interdisciplinary Studies in Information Systems* (New York: Springer, 2006), 1-16; here: 1-2, with reference to M.A. Boden 'What is interdisciplinarity?', in: R. Cunningham (ed.) *Interdisciplinarity and the Organisation of Knowledge in Europe* (Luxembourg: Office for Official Publications of the European Communities, 1999), 13-24.

[24] Otto Neurath (1882-1945) is one of the names related to such an ideal. For an overview of at least 15 types of scientism: see Rik Peels, 'A Conceptual Map of Scientism', in: Jeroen de Ridder, Rik Peels, and René van Woudenberg (eds.), *Scientism: Prospects and Problems* (New York: Oxford University Press, forthcoming). Peels categorizes the type of scientism that Neurath advocates as one of the 'eliminative' types of scientism, within the spectrum of 'academic' types of scientism that Peels distinguishes.

[25] Cf. the title of Isaac Newton, *Philosophiae Naturalis Principia Mathematica* (London: Royal Society, 1687).

unity of ancestry suggests that a 'unified science' in the end is an interesting goal. However, exactly this origin and seduction does conceal the irreducibility of the diverse disciplines to each other – an anti-reductionist stance that is implied by the concept of 'structural plurality' here. For example, (socially) intelligent behaviour should not be reduced to (the result of) the interaction of subatomic particles. Physics is *not* the discipline to study psychological, social or political affairs. Types of reductionism are a permanent pressure on all sciences, apart from probably the exemplary ones: mathematics and physics.

Going over to *directional* plurality within science often a first reaction is that worldview or religion should have no influence on science. If it would not have been an example of is/ought-reasoning, someone could easily add: worldview or religion has no influence whatsoever on mathematics (2+2=4) or physics (a quark behaves as a quark). True enough. However, in real life the development of science takes place in a cultural and political environment in which worldview and religion does play a role. And that is not only a matter of external context, it is part of the mind-set of the scientists themselves, not to mention the managers of universities. Choices about research direction are made by groups of people with their specific interests, problem priorities, value systems and other personal or institutional resources. The claim that science is able to have an autonomous development, ruled by scientific reasoning only, will be difficult to substantiate. The reality is: there are scientists adhering worldviews or religions that fuel a value system in which science *should* serve urgent societal problems.[26] Should the work of these last type scientists be excluded from the worldwide project of humanity called 'science'?

The reality is, too, that not only the choices of research direction, but also the subsequent work is laden with personal views and convictions: what about the interpretative and normative questions that especially in the humanities are part and parcel of the work? Either you are a behaviourist, or not. Are human beings 'nothing but' an emergent phaenomenon 'ultimately' based on matter and energy, or is there some ontological irreducibility that explains the epistemic irreducibility mentioned before? So here: directional plurality will be visible in the real life development of sciences. Some ideal of 'unified science' can lead to nervousness about the existence of parallel paradigms in research development or to devaluate research directions that do not sit easily with one's convictions (whether reductionist or not, for example).

Turning to *contextual* plurality, the context in which scientists live and work and make their decisions is mentioned just before. Nobody can deny the different circumstances in which scientists worldwide are doing their work. This *does* influence the development of their research. In Cameroon, scientists can have an interest in the Benoué valley in the North.[27] I guess that it will be difficult in most African countries to develop frontier knowledge in the field of nanotechnology or nuclear physics. In dealing with scientific contributions from all over the world, scientists usually will be aware of these kinds of contextual differences. However, here I don't see compelling reasons to think that some ideal of 'unified science'

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[26] See e.g. Nathan D. Shannon, *Shalom and the Ethics of Belief. Nicholas Wolterstorff's Theory of Situated Rationality* (Eugene OR: Pickwick Publications, 2015).

[27] This is a real life example: this year, Gustave Gaye defended a PhD-thesis on this region (2016) at the Cameroon *Institut Universitaire de Développement International* (see http://www.iudi.org).

would be disturbed by the contextual differences within our global village. Academic standards usually are guarded by international journals and accreditation organisations.

Within science, we can conclude, all three types of plurality again are relevant. However, under pressure by some ideal of 'unified science' are only two of these three types: the acknowledgment of structural plurality of irreducible disciplines, and the acknowledgment of directional plurality because of worldviewish and religious influences. The contextual plurality itself will be too unavoidable not to be acknowledged (see the just mentioned Cameroon example). Potential pressure on the *structural* plurality of sciences becomes clear when observing non-natural sciences (e.g. sociology, cultural anthropology) having to defend their methodologically 'weaker' approaches in comparison to the 'exact' sciences. Potential pressure on the *directional* plurality of sciences becomes clear when observing that for example within the economic sciences some paradigms or schools (e.g. the Chicago school of economics) can gain (and have gained) prominence at the cost of other approaches.

6. What do we gain, acknowledging this plurality of pluralities?

6.1 In a pluralistic world

In what ways can citizens, politicians or scientists profit from the foregoing discussion of types of plurality? By distinguishing types of plurality and by giving a range of quite diverse examples, I have shown the relevance of these pluralities within nation-states, governments and sciences. Ignoring them will lead to social unrest or more serious disharmony among groups of citizens, among sensitive politicians or among groups of scientists. So, paradoxically, the acknowledgement by politicians or scientists of both a plurality of pluralities and of the existence of those pluralities in the reality of real life and real science, will promote a kind of unity among people that can be called harmony, a multicultural harmony, if you want. By acknowledging the pluralistic complexities of the real world, politicians and scientist do more justice to people in their real circumstances.

Talking about a plurality of pluralities is not just word play. In political terms, it is a matter of justice, in the end: a matter of doing justice to human beings in their diverse associations (e.g. schools), with their diverse beliefs and values, in their diverse contexts. The complexity of reality asks for complex social or epistemological philosophies, refined enough to do *justice* to complexities of real life or real science. *Disclosive Systems Thinking* is a type of systems thinking that has been informed by traditions of complex philosophy, among which the 'Amsterdam School' founded by Herman Dooyeweerd (1894-1977) has been a prominent source.[28] Only a real understanding of complex reality can lead to mutual understanding of human beings and to relevant development of their practices.

6.2 In the assessment of evidence-based politics

This essay started with the question: Is *evidence-based politics* an idea with a strong bias towards a monolithic view of society? In the first place, by exploring different types of plurality *any* monolithic view of society itself is made object of debate. Whether or not society is

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[28] See Jonathan Chaplin, *Herman Dooyeweerd. Christian Philosopher of State and Civil Society* (Notre Dame IN: UNDP, 2011). Chaplin's writing style is more precise and readable than Dooyeweerd's.

considered to be an association of associations, it is not *one* social body or *one* political pyramid at the top of which *one* government can act as a Pharaoh considering all that is below him to be his possession. Maybe, within a society some worldview or religion is a dominating, a worldview or religion considered by a majority of the citizens to be a trustworthy and reasonable guide for a serious or even meaningful way of life. But nobody should force any of these citizens to forget his or her own worldview or religion when interpretative or normative views are involved in politics or scientific work. Maybe, contextual differences in regions, tribes or social strata of a (global) society are not that big that people don't understand each other anymore. Even then, people should be aware of the contextual differences that do play a role in the (scientific) ideas and ways of life that they develop.

Secondly, an *evidence-based* approach of *politics* is inclined to ignore the different types of plurality that have been presented. There are *structural* differences between sciences, some being more quantitative, others being more qualitative – just to mention one important difference. Is an *evidence-based* approach in practical reality not having a bias towards those sciences in which quantitative or specifically statistical methods play an important role? Furthermore, isn't evidence-based politics inclined to legitimize policy proposals with an appeal to (some) sciences, ignoring *directional* differences and debates that nevertheless are important in real life? Examples here are (Dutch) debates about vaccination (e.g. against polio). Several groups in society opposed vaccination at all (e.g. anthroposophical groups, strict Calvinist groups). Statistics about the positive results of vaccination do not take into account the real convictions behind this opposition. Debates in parliament can make these differences explicit. Finally, evidence based politics fails to do justice to *contextual* differences. Political priorities are not only a matter of numbers, but are related to societal situations and the personal convictions and circumstances of groups within this society. A debate about ritual slaughter of animals is no only a matter of pain indicators, but a matter of religious or freedom as well.

This critique of the reductionist effects of an *evidence-based* approach to politics echoes the critique voiced in report about 'Evidence-Based Practice' (EBP) in health care, published June 2017 in the Netherlands by the Council for Public Health and Society. Although the authors acknowledge the value of systematic reflection on the consequences and results of medical interventions, they signal the limits of this EBP-approach, too. In their main criticism the authors refer to the role of the context and the context-related issue what good care is within this specific context. This is easily ignored by an EBP-approach: 'What exactly is the good to be done – that can differ for every single client and his or her situation. Furthermore, changes occur in what is considered to be good care.'[29] In these two remarks we see a defence to acknowledge both contextual and directional pluralities. A second criticism is directed towards the risk of an EBP-approach to argue mainly on the basis of quantitative (statistical) experiments. This criticism is a defence of the structural plurality that a diversity types of academic or practical reasoning can be relevant in the specific health care situations. Omitted

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[29] 'Wat het goede is om te doen kan per patiënt en per situatie verschillen. Opvattingen over wat goede zorg is zijn bovendien aan verandering onderhevig.' (RVS 2017:9).

here is a third criticism which targets the authoritative status of quality standards formulated using an EBP-approach: this easily leads to unwarranted standardization.

Governments are – at least indirectly – responsible for the nation-wide public health care, its quality standards and its funding. Given the fact that the EBP-approach can be criticized along lines as mentioned here, governments themselves should be careful in their appeal to evidence-based policies in the domain of health care. More generally, governments should be aware that evidence-based policy making is evoking similar criticism as worded about the EBP-approach within health care. Politics is related to specific contexts (the nation as a whole, and/or their differing local areas), to debate about different values hierarchies (of liberals, social-democrats, conservatives, Christians, humanists, etc.), and to structurally different styles of theoretical and practical reasoning and other types of communicative exchange.In conclusion: in this essay three secular seductions have been explored: the seductions to be one strong-and-special nation (with a special 'calling' in world history…), to have one strong government, and to strife for one all-encompassing science. At least three different types of plurality are presented to make clear that things probably are *a Bit More Complicated Than That*. *Disclosive Systems Thinking* can be interpreted as an approach to social studies that tries to do justice to this complexity of the real world that politicians, citizens and scientists all live in.

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Relationships as basis for understanding social structures – an enriched theory of enkapsis

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1. Introduction

I have first met Sytse Strijbos through his network of researchers called Center for Philosophy, Technology and Social Systems (CPTS, now called International Institute for Development and Ethics (IIDE)) in 2006. I was a student of the *International Master Christian Studies of Science and Society* at VU University Amsterdam and I studied the role of technology in relation to social structures. At the annual working conferences of the IIDE I had the opportunity to learn more about systems thinking and moreover, to learn the norms, rules and mores of the academic arena. The annual working conferences took place in a unique atmosphere: they were academically 'thorough' and friendly at the same time. Junior and senior scholars challenged one another by asking questions (and learning to ask questions) on the level of assumptions, were challenged to take a clear position and defend it through sound argumentation during one and a half hour paper sessions. Although the intellectual and philosophical level of the discussions were high, the personal and friendly atmosphere was never compromised and gave rise to several longstanding academic friendships. I am very grateful that Sytse modelled this way of academic mentoring and also that he integrated faith and reason in a very natural manner during our annual working conferences.

I have continued my reflections on the role of technology in relationship to military practice during my PhD studies, in which I kept visiting the IIDE annual working conferences. During the annual working conferences the theme of 'practices' was often present. I found the theory of normative practice, inspired by Dooyeweerdian thinking (Dooyeweerd, 1953), which was discussed during the conferences, a helpful framework in my journey to understand how soldiers can use military technology for creating or safeguarding something 'good'. The pre-theoretical stance that we live in a broken world, in which the brokenness pervades all aspects of life was yet another helpful insight. Throughout the ages, humans have responded to alleviate the effects of the brokenness of this world. A clear example is that humans care for the sick and tend to provide basic needs for orphans and widows. In the same vein, people stand up against situations where people suffer from gross injustice, and in some cases the use of force is needed to restore or protect justice where other means fail. A positive note on the pre-theoretical assumption of the brokenness of the world is that human's creativity, intellect, determination and vision can bring great cultural upheaval and enrich people's life to partially restore, with medication, material prosperity and peace, however, it can never fully overcome

the brokenness of the world. Therefore, our human efforts, for which we ought to be thankful, can only restore the brokenness of this world in part and never fully, as also Augustine reminds us of.

The supposition that there exist specific human needs in this world to which people respond in a better or worse way, foreshadows a theoretical elaboration on specific constellations of human actions. Strijbos has captured this in the notion of 'disclosive systems thinking', in which he builds a framework for understanding technology in relation to human action and thinking, and in which the process of opening up possibilities and capacities for human flourishing are an important factor. It rejects the socio constructivist idea that people invent, ex-nihilio, constellations of actions, be it technologically mediated actions or not. Strijbos' disclosive systems thinking points towards something prior to the constellation of human actions. He concurs with De Raadt "that rationality may not be separated from reality as it is given and from the intrinsic normative order of reality." (Strijbos, 1995, p. 374). According to Strijbos, the normative order of reality can be *disclosed*. In Strijbos writings the idea of disclosure comes up on several occasions. It refers to humans response to the pre-given order of reality. A further explanation of the "pre-given order of reality" is given in the next section. Another lesson that I have learned from Strijbos is that in order to probe the normativity of a social constellation, one needs to understand the basic human relations that give rise to the practice. These relationships are for example the relationships between the doctor and patient, student and teacher, farmer and flock, buyer and seller. In the following section I discuss a specification of these relationships and also the normativity inherent in these relationships. I close with an example of novel constellation of relationships in society, evoked by smartphone application based company Uber.

2. Normative structural principles

Things in reality often have a remarkable stable appearance: trees usually point towards the sky, water feels wet when touched and freezes at temperatures below zero, cups drop down when kicked from the table, bridges bear the weight of cars and chairs luckily bear the weight of people (but not of cars), seasons come and seasons go, greeting one another seems an intercultural habit, paying for groceries is the universal standard, and family members take care of each other. These examples show that things (artifacts and natural objects) and common events (such as economic activities) or relationships (family, friends) in reality, at first sight, act according to recognizable patterns. These patterns are often not ex-nihilio invented by humans, but reflect some deeper foundation or order in reality as it presents itself that underlies these actual patterns. This pre-given order can also be referred to as a specific 'normativity' to which the matter or event or relationship 'ought' to respond to in order to function, or simply to 'be'. This normativity can also be captured in terms of a law-sphere (cf. Dooyeweerd). To be, means to respond within a specific law-sphere that holds for that entity. To be water, means for an element to respond to certain laws in a characteristic manner and humans can experience water through every day experience as well as through scientific methods. To be a bridge, or to be a chair, means to respond to certain demands and traits that hold for these artifacts. To be a priest, means to perform certain actions at certain times and to live life in a specific manner.

It may be clear that in the case of water and the bridge, the elements and the materials don't have much choice in responding to the laws that hold for being water and being a chair. There are simply laws in nature that determine the strength of a material and that make the chair collapse or not under certain weight. In the case of the priest, there is room for interpreting the laws and norms that hold for being a priest, which makes it a normative law that can be disobeyed or neglected. In Dooyeweerd's philosophical framework there is a distinction between pre-normative aspectual laws and normative aspectual laws (1953). According to Dooyeweerd, there exist aspectual norms for social reality:

"Dooyeweerd claims that social structures are rooted in the order of cosmic time. This is to assert that they are subject to the law-side of reality. All social structures are subject to lawful principles rooted in created order. While they are in every case established by human initiative, they are governed by "invariant" (or "enduring", or "constant", or "immutable"), universally valid, typical structural principles that condition and indeed make possible their factual existence." (Chaplin, 2011, p. 86)

Therefore the human establishment of a social structure is not merely a matter of subjective choice, as if social structures develop within an unconstrained, unconditioned realm. It is always a "human response to-a historical positivation of- given, normative imperatives embedded in social reality." (Chaplin, 2011, p. 87).

Churches, states, business corporations, hospitals, families, friendships, market exchanges, etcetera exist through normative principles that govern their fundamental internal structure. The structural principles can be found, because they reveal themselves through human experience and human interactions. However damaged a particular factual structure may have become, human beings cannot alter the *structural* principle that makes possible its factual existence. It is essential to Dooyeweerd that human freedom does not generate moral norms ex nihilio but is always responsive to divine sovereignty, meaning that it must occur within a framework of normative created order. This is no static order, but it requires and makes possible human action.

This position connects to Strijbos's, who has critiqued social constructivist approaches to reality, that focus on the contingent process of social interactions in which people simultaneously make and destroy their social realities and calls for a view on society, including technological infrastructure of society, in which human efforts are not neglected, but in which the work of humans evinces normative moments of choice and motives in the development of society (Strijbos, 1998). According to Strijbos, social constructivists lack a normative position regarding the social and technological questions that form the object of study. Strijbos emphasizes that human action does not take place in a spiritual vacuum, but individuals and also societies and cultures, gain their bearings from a meaning perspective on reality (Strijbos, 1998). In the next section I elaborate on the characteristics of normative structural principles and what distinctions can be made that directs a normative understanding of societal developments.

3. Characteristics of things found reality

Social structures, like things, are shaped by a structural principle (Chaplin 2011). This entails the whole configuration of its (modal) functions, characterized by two key functions, its qualifying and founding function. The qualifying function determines the distinct identity of a

social structure and has a leading function for the other aspects in which the social structure functions. The founding function is what is presupposed for the thing or event to exist, it is the indispensable support for realizing the qualifying function. It often says something about how the thing came into being.

I will pay attention to the relational structure to other structures, since in Strijbos works the emphasis has always been on relations in order to understand the normative principles at work in social systems. Another important distinction which Strijbos values in Dooyeweerd's approach and which he often put on the table, is the distinction between two fundamental kinds of variability, those arising from the "structural" factor of cultural disclosure and those arising from the "directional" factor of religious orientation (Wolters, 1986). This leads to a "great cultural variety in norm-positivising" (Griffioen, 1986, p. 105) The law-side and the subject-side are two sides of the same created reality; they are not outside reality, like Platonic Ideas, but frame reality from within (Dooyeweerd, 1953).

4. Relationships between things in reality

In his questions to students and senior researchers in the IIDE annual working conferences, Strijbos has always been particularly interested in two things. First, he demanded clarity on the problem and second, he stressed the importance of relationships between the actors who caused or experienced the problem. If I understood Strijbos correctly he considered systems scientists as scientists who are looking for a solution to a problem which entails an intervention in societal structures, which should eventually lead to the flourishing of the entities as well as society at large. Understanding the structure of the basic relationships between societal entities is indispensable for understanding how societal entities contribute to human flourishing. This view on social relationships and human flourishing is another way of describing that "All typical structures of individuality of human societal relationships are of a normative qualification." (Dooyeweerd, 1953, vol. 3, p. 172)

In addition to the structural and directional factors producing variability in social structures there is a shaping effect of "societal forms": "no single structure of individuality can be realized in isolation and […] everywhere the intertwinements between the different structural types […] are *realized* within typical forms". (Dooyeweerd, 1953, vol. 3, p. 174). Societal forms are distinct both from structural principles and factually existing structures and are the "necessary links" between the two, intermediary principles of order. They can be classified according to structural types, which is a further distinction. These transcendental categories can be divided according to four different pairs of contrasting characteristics, which are stated below (see also Chaplin 2011).

1. "communities" or "interlinkages"

> Communities are "any more or less durable societal relationship which has the character of a whole joining its members into a social unity, irrespective of the degree of intensity of the communal bond." (Chaplin, 2011, p. 112).
> Interlinkages are "relationships in which individual persons or communities function in coordination without being united in a solidary whole." (Chaplin, 2011, p. 112) The term 'coordination' embraces various different modes of interaction, such as cooperation (in friendship), or competition (in market relationships).

2. "natural" or "organized" communities

    Natural communities are founded in nature (e.g. families, kinships, neighbourhoods, marriage – it depends on individual members: if a spouse dies, the marriage ceases), whereas organized commuties are founded historically, on the basis of deliberate human action or organization (e.g. states, churched, businesses – they are independent of the duration of the lives of their members);

3. "differentiated" or "undifferentiated" communities

    Differentiated communities are characterized by hosting a variety of distinct social structures (e.g. modern societies), whereas in undifferentiated communities, the various structural principles are realized in one and the same form of organization (e.g. primitive societies).

4. "institutional" or "voluntary" communities

    Institutional communities include both natural and organized communities, which "encompass their members to an intensive degree, continuously or at least for a considerable part of their life… in a way independent of their will". (Chaplin, 2011, p. 112). Examples are marriage, family, state and church.

    Voluntary organizations are organized communities whose members can freely join or leave, such as business corporations, trade unions, clubs, cultural societies, etcetera. Voluntary organizations, more than all other communities, show a correlation with interlinkages (explained below). An interlinkage becomes a voluntary association when it becomes organized, which implies newly implementing (or positivizing) a structural principle.

Can these distinctions be helpful in understanding current societal challenges? In order to better understand novel smartphone application based companies such as Uber, I will give special attention to interlinkages here. As we have seen in the previous section, relations between social bodies (that have structural principles of their own, such as church, state, neighborhood) have structural principles. Thus, interlinkages have structural principles too. Chaplin proposes an adapted version of Dooyeweerd's claim, namely that interlinkages lack authority relations (except kinship group and neighborhoods), whereas communities have authority relations. It is important to note that a lack of authority relations does not mean that relationships are equal. Parties may show inequalities with respect to gender, knowledge, age, character, class, occupation or political or psychological power. In the case of Uber this is clearly the case: drivers and passengers may be very different in this respect, but there exists no hierarchical relationship between them, and neither exists a hierarchical relationship between the company and the drivers or between the company and the passengers. This type of relationship (i.e. an interlinkage in Chaplin's words) is typical for a market: neither a seller nor a buyer has the authority to force the other party to buy or sell them something. Social inequalities are not integral elements of the structural principles of interlinkages. In communities however, inequalities of position are determined by the structural principles of the community. Uber can be seen as a technological platform which coordinates relationships between individual persons or communities without uniting them in a solidary whole. There

are no hierarchical relationships between the parties. Thus, Uber is a technology based interlinkage.

Before elaborating further on Uber, let me recall a discussion with Strijbos during the 2011 IIDE annual working conference in Maarssen. Strijbos emphasized inter-individual relationships as a means to determine the qualifying function of the structural whole. He discussed my research on the military practice and asked questions about the inter-individual relationship between a soldier and the 'other', in which the relationship with the 'other' defines the inner normativity of the military practice. Strijbos asked me and the audience who the 'other' is in the constellation of a military practice. Is the inner normativity defined by the relationship between the soldier and his or her enemy, or between the soldier and those he or she protects? What is, or should be, the basic structural relationship? This is a normative concern: is what one is allowed and is not allowed to do as a soldier defined by the relationship between soldier and civilian in need of protection, or between the soldier and the enemy? The normativity of the military practice depends on what one considers the most important structural relationship, but it is not limited to one structural relationship. The discussion circles around issues of justice: justice needs to be done towards the enemy (wrong-doer) as well as towards the one whom the soldier protects (the vulnerable one who has been wronged). This means that the practice of a soldier consists of a web of relationships of which the vulnerable and the enemy are two most important relationships. Being aware of human dignity of the wrongdoer (a soldier should use force in a limited manner) as well as the limitations to the protection of the one who has been wronged (a soldier should not use force for enrichment) is an inherent norm of military practice.

The military practice is but one practice that has been the topic of investigation during the annual working conferences in Maarssen. Also other practices have been discussed, such as business practice (Eriksson, 2001), engineering practice (de Vries, 2006), information technology practice (Basden & Ahmed, 2011) developmental practice (Jochemsen, 2011) and the practice of water management (Lems, 2011). This reflects the vast diversity of structural types of inter-individual and intercommunal relationships of modern society, such as publicity, fashion, sporting events, the press, public traffic, public artistic performances, charitable work, diplomacy, international political relations, political communication, and missionary activity. These are all examples of normatively structured types of relationships into which individuals or communities can enter without entering into communal ties. Each has a distinct structural principle; all are historically founded, though each has a distinct qualifying function. Fashion and sport are socially qualified, charitable work, morally qualified; and so on. The individuals functioning in inter-individual relationships, or the communities functioning in intercommunal relationships, are indeed independent, but each maintains an essentially "coordinate" status in which authority, hierarchy, or solidarity are lacking." (Chaplin, 2011, p. 116).

The market can be considered under de same theme. Dooyeweerd treats a market as an economically qualified interlinkage. This is in contrast with an employee in a business, because signing a labor contract brings the employee into the communal whole of a business enterprise. The awareness of the market as an economically qualified interlinkage is important for understanding current developments in several markets where smartphone application based companies disrupt the status quo, such as the taxi market (disrupted by Uber) or the

hotel market (disrupted by Airbnb.com). Companies such as Uber and Airbnb connect potential customers to anyone who wants to earn some money with a privately owned car or private room in his or her house. No labor contract exists between Uber and drivers or Airbnb and hosts. How can we evaluate this development in light of the previous sections? Therefore I discuss three constellations of social structures below.

4.1 Enkaptic interlacements

Dooyeweerd holds that "no individuality structure can exist apart from a variety of interlacements with other individuality structures", which is a principle that applies equally to the social realm (Chaplin, 2011, pp. 130–131). The interlacements are "a necessary requirement for the realization of the inner nature of a thing" (Dooyeweerd, 1953, vol. 3, p. 93). Chaplin uses the example of marriage, which is not *determined* by its internal structural principle but by its interlacements with other structures (such as the tribe, class, religious community, state). A societal form is the concrete structural nexus – the "real nodal point" – of an enkaptic interlacement between two social structures; the nature of the societal form is determined by the nature of the enkaptic interlacement. (Dooyeweerd, 1953, vol. 3, p.174). In the same way as structural principles of individuality structures can be positivised in antinormative ways, thus distorting the concrete structure concerned, so enkaptic interlacements can distort the interlaced structures. This happens when one community begins to dominate the other. Each party in the interlacement should respect the internal structure and independence of the other. Enkaptic interlacements are not ad hoc relationships between normative structures, but the interlacements themselves must conform to the norms given in these structures. Another way of putting this is that qualitative distinctions between different types of social structures exist. Dooyeweerd contrasts enkaptic interlacements to "whole-part" relationships (see next subsection), which are structures existing within a single unified social structure.

In enkaptic interlacements, the encapsulating structure respects the independent functioning of the encapsulated structure that is determined by its structural principle. In other words, the functioning of one encapsulated structure does not depend on the other encapsulated structure. Enkaptic relationship fall under the intercommunal relationships, whereas interlinkages fall under both intercommunal relationships and interindividual relationships. Enkaptic interlacements are a specific type of interlinkages. Chaplin counts enkaptic interlacements as a special category of intercommunal interlinkage, characterized by (1) relative permanence, (2), proximity and (3) intimacy (2011).

Below a helpful overview of properties of both interlinkages and interlacements (Chaplin, 2011):

Interlinkages are relationships:

(1) between formally equal structures,

(2) between structures of any radical type, and

(3) having a distinct (typical) structural principle.

Interlacements:

(1) are characterized by a relationship of subservience of one to another (one is the encapsulating, the other the encapsulated, structure),

(2) hold only between structures of different radical types, and

(3) lack a distinct structural principle.

Enkapsis does not mean that structural principles of one are compromised by the other, rather, certain functions of one structure are in a specific respect enlisted in the service of another.

4.2 Part-whole relationships

A part-whole relationship can be defined as follows: "In all those things whose structure is not that of a homogeneous aggregate, a part is essentially qualified by the structure of the whole. In this case the structure of a whole can never be construed by means of its parts, because the parts, as such, are entirely dependent on the whole. The question what is a part of a non-homogeneous whole cannot be decided by a functional mathematical-physical analysis, but only by an inquiry into the internal individuality-structure of this whole. This fact has always been lost sight of on the functionalist standpoint." (Dooyeweerd, 1953, vol. 3, pp. 638–639) Strijbos contrasted this position with its careful distinctions between different whole-whole, part-whole and enkaptically interwoven relationships with sytems theory, in which any system may be seen as part of a yet wider system (Checkland, 1999).

4.3. Insights and consequences

What can we learn from this, at first sight, slightly complex system of thought? Firstly, that normativity exists and even enables a variety of societal relationships. These relationships are normative in character, which is generally overlooked in systems thinking.

Strijbos has tried to incorporate this philosophical stance in his work on systems thinking, and questioned the mainstream position of social constructivism, which has influenced the social sciences to a large amount. Strijbos argreed with the social constructivist position that humans are free to shape their environments, but he pertinently disagreed with the assumption that this ability of humans to shape one's own environment is unrestrained and unguided by pre-given norms. The norms enable the shaping of social environments. Second, that according to Strijbos, disclosure of structural principles is done through creative human interactions, which leads to human flourishing.

A critical reader might be allergic to the idea of normative structural principles as if this does not allow for human freedom. However, creative human action cannot exist without individual liberty to express oneself in the different societal structures. An example of human creativity is the development of smartphone application based companies that create novel societal interactions, such as ride-sharing company Uber, which I address in the next section.

5. An application – transportation network company Uber

Uber is an application based transportation network company which develops, markets and operates the Uber smartphone application, or the "Uber app". The Uber app enables smartphone users to submit a trip request, which the underlying software program then automatically sends to the Uber driver nearest to the consumer, alerting the Uber driver to the location of the passenger. Uber drivers use their own personal cars (Uber.com, n.d.). In October 2017 Uber is available in 84 countries (uberestimator.com, n.d.) and 632 cities worldwide (Uber.com, n.d.). The Uber app automatically calculates the fare and transfers the payment from the passenger's smartphone to the driver. Since Uber's launch, several other

companies have replicated its business model, a trend that has come to be referred to as "Uberification" (Stark, 2016).

I will now apply the rather abstract theory that was exposed in the previous section to the complex case of Uber. Insights in the relationships between stakeholders can help explaining what is important and should be protected and what seems not so important at a closer look. In the section below I elaborate on a selection of relationships that are listed in Table 1.

Table 1. Types of relationships between stakeholders in the digital taxi networking business and Uber

Relation to Uber:	Part-whole	Enkaptic Interlacement	Interlinkage
Driver	X		
Passenger	X		
Regular Taxi company			X
Regular Taxi driver		X	
Regulators		X	X
Credit Card Company		X	
Local Community	X	X	

Uber has a part-whole relationship with the *information technology infrastructure*: without digital technologies, Uber loses its meaning and will not function according to its leading or qualifying function, namely to connect drivers to passengers and earning money through this activity. For Uber is it of major importance to be aware of technological possibilities of digital infrastructures now and in the future, in order to remain in business.

Uber has an enkaptic interlacement with the *credit card company* that takes care of the automatic payments. Uber can exist independent of the credit card company system, since it can handle payments in different ways, even in cash, as it does in some countries where credit cards are a rarity ("Cash Trips," n.d.). The credit card company and Uber share the same qualifying function (they are both qualified by the economic aspect) and for the actual functioning and the success of Uber, automatic credit card payment is an important feature which is often mentioned as a benefit (Frostick, 2016).The other way around is also true: the credit card payment system does not depend on Uber for its existence.

Uber forms an interlinkage with regular taxi companies and legal authorities (although there are cases where legal authorities have entered in an enkaptic interlacement with Uber, such as in the Philippines (Alba, 2015b).

Surprisingly, the relationship between Uber and the *drivers* has the character of an interlinkage too: the drivers do no sign a labor contract with Uber. If they would sign a labor contract, the driver would become an employee and therefore enter into the community of a business enterprise, which is an enkaptic interlacement which entails a certain degree of hierarchy. An interlinkage has a much more voluntary, non-hierarchical character. Uber cannot force drivers to work at certain hours, or in certain areas, which is in contrast with the regular taxi drivers. Another feature of an interlinkage is that the entity, the Uber driver in this case, can be replaced by something else, for example an automated driver. What is needed for

Uber's long term continuation is availability of a physical platform which can move from A to B (i.e. currently the car), but which not needs a human driver per sé. Uber is experimenting with automated driving (Isaac, 2016; Levin, 2016), which is in line with their actual primary process.

Uber's relationship with *legal authorities* such as municipal, regional and national transportation regulation boards, is not univocal and has caused conflicts in many places. In some countries Uber has been banned (GrantSimran Khosla, 2015), in others it has been embraced (Mardiste, 2016). In most cases, Uber has an enkaptic interlacement with legal authorities. This is so, because the state and a business have different qualifying functions that should not dominate one another: a state should remain a state (juridically qualified, protecting and enabling justice) and not become a business (economically qualified, aimed at the continuation of the business through frugal allocation of means) for a community to flourish. Uber cannot be forced by legal authorities to adopt a certain way of doing business (for example, it should not tell Uber where to invest) and Uber cannot force the government to implement a new transportation law. It does not mean that in the actual functioning of the state or of the functioning of Uber they cannot inform one another about these issues. This happens for example in Manila or in Estonia, which are cases where there is a strong enkaptic relationship, because each Uber driver has to be registered with the national transportation board. (Alba, 2015a; Reuters, 2016). From a normative perspective, business and the state should remain functioning in an enkaptic interlacement (and not a part-whole relationship, such as is the case of the relationship between a state and an army).

The relationship between Uber and the *passenger* seems at first sight a part-whole relationship: without potential passengers, an automatic systems that connects drivers to passengers would not make sense. However, at a closer look, Uber can and does use its underlying software not solely to the transportation of human passengers. Theoretically, one can order a taxi to transport anything from A to B and Uber is actually experimenting with several options, such as delivering food (Hempel, 2015) or a parcel ("UberRUSH," n.d.) and since 2016 Uber is investing in taking over freight transportation (Love & Somerville, 2016), see also (Ascher, 2015). Therefore, the passenger as such is not what makes up the part-whole relationship to Uber, but any human or non-human entity that (is) wished to be moved. Thus, if a general need for transporting something or somebody is gone, Uber will no longer exist, since its part-whole relationship falls apart.

6. Conclusion

Strijbos fruitfully connected systems thinking with a philosophical position that considers normativity and creational order important for understanding reality. He stressed that, in order to point out the normativity of practices and societal structures, it is important to understand the basic relationships of practices and constellations of societal relationships. Novel technologies can give tensions in relationships between existing societal wholes and in some cases it requires a rethinking of the structures that characterize the relationships, such as is the case with Uber. The philosophical framework of interrelations between entities posed by Dooyeweerd (1953) and which was further refined by Chaplin (2011), can help determine which relationships are important to a societal structure, and which are, at a closer look, less important. A distinction is made between three main types of relationships between societal

wholes, namely part-whole relationships, enkaptic interlacements and interlinkages. An example of a digital technology that has challenged existing relationships between traditional businesses, legal authorities and the public is smartphone application based company Uber. I have applied the theory of enkapsis and interlinkages to the case of Uber to explain how Uber relates to a variety of societal entities and to help distinguish between more and lesser important relationships.

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Ethical Reflections on Consequences of Technological Displacement

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Summary

This chapter presents ethical reflections on consequences of technological displacement. As technology is progressing quickly and becoming more sophisticated, it is time to reflect on a human position as the basic and the most valuable unit of analysis to align technological features and new technological possibilities. More and more academics emphasize the need to search for new solutions from the core normative ethical premises on what do we want from technological advancement for humans. Yet, these common solutions can only be reached through extensive reflections, discussions and debates as this chapter calls for.

1. Introduction

Since the emergence of industrialism, humans began widely use advanced machines to facilitate their work. Both processes such as mechanization and automatization replaced hard physical as well as mental labour activities. For example, online banking and mobile applications, self-service machines at the airports and terminals, self-checkout machines at the stores, data-driven healthcare transformed our activities and became inseparable part of our life (Autor and Dorn, 2013; Frey and Osborne, 2013). However, the widespread penetration of modern technologies in everyday life brought not only substantial benefits to businesses and economies, but also gave rise to the concern of whether technologies will kill most of the

existing jobs and leave a majority of workers unemployed (Brynjolfsson and McAfee, 2011; 2014).

It is predicted by different studies that the probability of job elimination due to technological development my rise up to 30% – 80% over a few decades (Frey and Osborne, 2013; CEDA, 2015). Moreover, more and more technologies purport to replace non-routine human mental capabilities what might lead to massive unemployment not only physical workers, but also knowledge workers (Autor and Dorn, 2013). Despite these warning signals companies in different industries continuously automate activates worldwide. For example, Adidas – the German sportswear company – opened the first automated factory in Germany and plans in the near future to open the same type of factories in US and Europe (Alvarez, 2016). British outsourcing firm Capita plans to replace around 2000 employees with robots to reduce costs (Davies, 2016). Apple supplier Foxconn Electronics aims to fully automate their activities (Lee and Hwang, 2016). The company plans to not only substitute workers in dangerous work, but also to reduce a number of excess robots and minimize a number of workers who are involved in production, logistics and control activities (ibid.). These are the only few examples of the job replacement by modern technologies, yet they clearly demonstrate that many of the current tasks and activities have been either modified or completely replaced with new technologies. What is less certain is what happened with all those unemployed people worldwide. Most probably, a majority of them lost their income, social status, self-estimation and became isolated from society and unhappy.

Studies that acknowledge technological deployment and as a consequence massive unemployment propose some implications for policy makers, including slowing technological development, work sharing, new jobs' creation, educational changes, fostering a new social contract and redistribution (Marchant et al., 2014; West, 2016; Kim et al., 2017). The last idea about redistribution in terms of basic income received particular attention among researchers and policy makers. However, this initiative received little support from public in Switzerland over the referendum 2016 (Geiser, 2016). Currently, Finland, Canada, Scotland and the Netherlands initiated experiments in introducing basic income in order to reduce income inequality and dependency (Brooks, 2017). Another ethical challenge on how to incorporate a sense of ethics into algorithms for driverless cars triggers different stakeholders to a large extent (Bonnefon et al., 2015; Thierer and Hagemann, 2015). More challenges emerge in response to the use of technologies for baby and elderly care, nursing, and surgery instead of human contact (Sharkey and Sharkey, 2010; 2012). All this demonstrates that technologies create new ethical dilemmas and points to the need to further discuss whether massive technological displacement is wanted or not. In this chapter, we elaborate on this question in more detail.

This chapter is organized as follows. The next section reviews economic theory and current empirical evidence on the relationships between technological advances and displacement. This will be followed by a review of ethical theories and moral challenges that arise due to technological displacement. The next section presents some attempts that were undertaken to resolve key ethical challenges of technological displacement. This chapter ends with a discussion of a need to take into account ethical considerations in a scientific context to meet consequences of technological displacement.

2. Economic Theory and Current Empirical Evidence about Technological Displacement

The concept of "technological unemployment" has been widely discussed among economic theorists since the late 18th century to understand the effect of technological changes on the level of unemployment (Postel-Vinay, 2002). Currently, two polar standpoints such as equilibrium and disequilibrium exist in economic literature based on different theoretical premises. For example, neoclassical economists believe that IT development is beneficial to employment as markets can work freely and competitively. Proponents of the Neo-Schumpeterian approach claim that technological unemployment is a transitory phenomenon and a compensation mechanism for employment through effective demand will eventually stabilize the level of employment. Followers of the Keynesian tradition suggest that high growth rates of output can, in principle, compensate decreasing labor requirements in the long-run. Finally, supporters of the Ricardian view claim that IT progress is harmful for employment since automatic compensating factors are generally absent.

In general, supporters of the equilibrium perspective argue that even though technological progress destroys jobs, new occupations emerge that can employ the released labor force (Stadler and Wapler, 2004; Kreickemeier and Nelson, 2006; Michelacci and Lopez-Salido, 2007; Barnichon, 2010). Another stream of research recognized that although the conventional way of modeling the technological effect on unemployment does not work, because the market responds differently to neutral and investment-specific shocks, eventually, technological and non-technological shocks balance the link between productivity and unemployment (Barnichon, 2010; Canova et al., 2013). Proponents of the disequilibrium perspective demonstrate recent statistics and claim that is difficult to predict innovations, extrapolate technology from other macroeconomic effects and that IT progress indeed can lead to a jobless world (Vivarelli, 2007; Baddeley, 2008; Shahkooh et al., 2008; Pavisou et al., 2011). For example, Brynjolfsson and McAfee (2011; 2014) demonstrate that technological displacement due to technological progress is observed in all sectors of the economy and warn that fewer and fewer workers will be required to produce goods and services which will lead to "near-workerless" world.

Currently, there is a growing concern among the research community on how the structure of employment will be changed due to computerization. Below, we present a summary of studies that made attempts to statistically demonstrate how many occupations under the risk of technological displacement (Table 2.1).

Table 2.1: Summary of recent studies on jobs being replaced by automation

Study, year	Country	Jobs being eliminated due to automation	Occupation/Industry
Frey and Osborne, 2013	US	47%	Logistics, office and administrative work, production occupations
Autor and Dorn, 2013	US	30-80%	Automotive sector, oil, chemicals, coal, rubber, metal and plastic products, shoe and textile sectors, security, surveillance and defence sector, health care sector and tourism
Bowles, 2014	EU-28	45-60%	Economy as a whole
SSF, 2014	Sweden	50%	Economy as a whole
Pajarinen and Rouvinen, 2014	Finland	35%	Shop sales assistants, secretaries, bank tellers, and office clerks
CEDA, 2015	Australia	40-60%	Economy as a whole and specifically agricultural sector
Frey et al., 2016	OECD countries UK US South Africa China Developing countries: Uzbekistan, Ethiopia, China and India	57% 35% 47% 67% 77% 55-85%	Economy as a whole

Note: The reviewed studies applied an occupation-based approach

For example, Frey and Osborne (2013) reached a conclusion that among 702 occupations in the US, 47% of current occupations are at risk of disappearing. It is projected that occupations such as transportation and logistics, office and administrative work, production occupations are at great risk of vanishing. By studying the structural shift in the labour market, Autor and Dorn (2013) noticed that by 2050, 80% of activities in the automotive sector, 70% in oil, chemicals, coal, rubber, metal and plastic products, shoe and textile sectors, 60% in security, surveillance and defence sector, 45% in the health care sector and 30% in tourism will be substituted by computers. Another study demonstrates that EU-28 countries are under 45-60% risk of technological job displacement (Bowles, 2014). It is also established by '*Stiftelsen for strategisk forskning*' (SSF, 2014) that in Sweden half of today's jobs will be eliminated within 20 years. It is predicted that nearly 40% of existing jobs in Australia will disappear due

to automatization and computerization (CEDA, 2015). In rural and regional Australia jobs are even at higher risk to disappear (ibid.). In developing countries, the share of job elimination also varies from 50% to 80% (Frey et al., 2016).

Although the aforementioned studies provide a rigid statistical analysis, recently they have been criticised by applying an occupation-based approach without taking into consideration heterogeneity of tasks within occupations performed by workers (Arntz et al., 2016). By applying a task-based approach, it was identified that across 21 OECD countries only 9% of jobs are automatable, 6% in Korea and 12% in Austria respectively (ibid.). Yet, the authors recognize that their approach in data analysis is still based on technological capabilities rather than on the actual use of technologies. Although this study argues about overestimation of job automatibility, the majority of studies that demonstrated frightening statistics on technological displacement force us to further reflect on this matter.

While current debates about job elimination due to automation are intensive, it is noticeable that there is a lack of solid ground in empirical assessment of the labor markets and the contextual economy. We lack knowledge about the ongoing trend and underlying mechanisms of technological displacement. Some fundamental questions remain still unanswered. For example:

- What is the rationale and dynamics of killing jobs?
- What kinds of jobs are subject to being fully or partly substituted by computers and why?
- What kinds of jobs are most probably not subject to substitution by automation in the near future and why?
- What kinds of jobs are created and what are the conditions for their creation?
- What skills will be needed in the near future (generic, specialist, or complementary)?
- What impact does the digital economy have on our understanding of work?
- Will be sufficient work opportunities on the labour market for all citizens in the future?
- Will technological innovations give freedom to pursue more creative and rewarding endeavours?

On the one hand, these questions require further empirical investigation to develop conceptualization of digital societies, their economies and transformations due to digitalization and thereby inform related policymakers. Indeed, we have quite vague understanding of the ongoing trend and underlying mechanisms of technological displacement. On the other hand, it becomes clear that technological progress leads to vast changes in the nature of work, leisure time and the way we consider social issues (Aronowitz and DeFazio, 2010). Most probably, automation will change working life allowing humans to work with more creative and interesting challenges (Nordic Labour Journal, 2014). The idea that new occupations will require involvement of creative and social intelligence in performing the job becomes more and more pervasive. Already at the present time companies require creative employees rather than simple technicians. While policymakers widely discuss educational policies to develop special knowledge and skills to fill in a skill gap in non-routine task performance, they rarely pay attention to the fact that humans have different mental abilities. Therefore, although economic research provides us with some knowledge

about current trends in the labour market due to technological progress, we also need to include social and ethical characteristics into our investigation.

3. Ethical Theories and Moral Challenges that Arise Due to Technological Displacement

Technologies are increasingly integrated in all aspects of our life, including professional and private lives. Current evidence mostly demonstrates that in the near future less deployment of labour force will be required. The nature of work is also changing towards higher demand of creative skills. One consequence of this changing conditions is that the future technological displacement can have significant ethical implications that policy and education makers need to be aware of. For example, it is recognized that while technologies already make effect on different life aspects, social and ethical implications of these technologies are still not well established (Veruggio et al., 2016). Below, we discuss theoretical prerequisites of moral principles on human beings and labor, how technological advancement challenged them and possible ways of their modification and re-interpretation in relation to the current situation of technological displacement. This section demonstrates that the main ethical challenge of technological displacement is based on the core normative ethical premises on what is "right" and "wrong" for humans in the technological society.

In the moral and ethical literature, there are a number of the core theories of human beings. Historical ethical theories such as virtue ethics, stoicism, hedonism, Cyrenaic hedonism, Epicureanism, state consequentialism, in some sense, formed the basis for modern normative ethical theories (Terence, 2007). All those theoretical premises belong to one of the standard ethical theories such as teleological, deontological and contemporary virtue ethics and depend on whether we judge actions based on motive, act itself or consequences of actions (MacKinnon, 2011). Unlike teleological theories, deontological theories are based on the intrinsic qualities of moral behavior and not on the end product. In deontological theories, evaluation of right or wrong behaviour is mostly based on the nature of behaviour itself. It assumes that behaviour can be right if it is done from a sense of duty even if it leads to wrong consequences (Johnson, 2001). Contrasting teologists, deontologists believe that to establish moral principles, there is a need for fairness and justice for each individual, and only after that promoting social utility. Proponents of contemporary virtue ethics address the question of moral character and try to identify characteristics of possible virtues. Virtue ethics develops ethical principles based on moral character. This theory is considered as a powerful theoretical support for both teleological and deontological theories as it is based on excellence of human character. While the information age and technological advancement transformed human beings (Munoz, 2004), the question is whether a traditional moral system is capable to respond to the situation when technologies displace human labor comes to the first place.

Over decades, a lot of debates have been devoted to the pros and cons of teleological, deontological and virtue ethics approaches in policy development. At the same time, it is accepted that there are some difficulties in separation of those polar views on moral principles and norms at the present time. For example, MacKinnon (2011, p. 13) points out that "…*No theory completely and easily fits one classification*". What we can observe nowadays is some

surrogate between those theoretical premises. In relation to this, the EU's core principles of sustainable peace, social freedom, consensual democracy, associative human rights, supranational rule of law, inclusive equality, social solidarity, sustainable development and good governance are based on the pluralist approach of normative moral principles (Manners, 2008). All those traditional norms and laws have been functioning for a long time until the emergence of computers. It becomes more accepted that new features of technological advancement and new opportunities cannot be supported by a common moral system (Bynum and Rogerson, 2004). Which ethics will help us avoid policy and economic vacuums and formulate new social policies in responsible ways to new technological features? Computer age brought new entities, features and ways of doing things. The fast speed of the development and implementation of new technologies led to a situation when society cannot appropriately react to changing conditions. Moreover, it became difficult to draw on traditional moral system to avoid policy and economic vacuums. Current moral landscape and the broken link between productivity growth and technological unemployment is exactly an issue that deserves particular attention from the economic and philosophic communities.

The Association of Computing Machinery, the Information Technology Association of America, the Data Processing Management Association, and International Federation on Information Processing are companies that develop and reconsider codes on computer ethics. The main postulate of these codes from a macro-perspective is that computer technologies are not supposed to produce side effects that harm humans and society. However, current data demonstrate that widespread use of computers led to technological displacement and consequently unemployment. Many people lost their working places. Job insecurity has a set of negative effects on health and well-being (De Witte, 2005). Job losses increase the rate of suicides, alcohol-related mortality (Eliason and Storrie, 2009) and crime (Nilsson and Agell, 2003). Thus, the most negative effect unemployment has on psychological well-being of humans because individuals cannot meet their financial obligations; their social position becomes worse, people are insecure in their future. Hence, the question arises: why people should experience such emotional traumas in a society where productivity is growing and living standards increasing? New changes in the level of employment and its structure introduced by IT gave rise to questioning the norm and right on whether everyone needs to work for a livelihood.

One of the basic and universal human rights is the right to work and to be engaged in the productive working environment. Based on these rights, humans receive education, compete for working places and take a position in a social hierarchy. Following the theoretical prerequisites on the moral principles on human beings, we can easily determine that we judge people by their profession and occupation with underlying assumptions about occupation income and social class. Social norms force us to judge people based on their material importance and to define price for every human. Moreover, we accept and believe that every human in the working age has to have a job and, following the legislation, spend established time at work. Even when we try to challenge this materialistic perspective on human beings, very little knowledge we have about the underlying reasons of why specific behaviour is wrong or unfair. For example, Johnson (2001, p. 26) claims that "… *sometimes it seems that individuals who are expressing moral opinions are simply reacting as they think most people in their society react*…". While until recent time this materialistic judgment of human position

in society was not a highly discussed topic, impending situation of growing technological unemployment will definitely force us to modify and re-interpret these traditional moral principles in order to be able to timely respond to changing conditions of human beings.

Although the notion of all being employed is rather a new invention of western societies, in general, our society has a predominant market orientation and uses functionalist and instrumental view on humans (O'Donnell and Henriksen, 2002). People are mostly evaluated by their input to society and methods of distribution became unfair (Johnson, 2001, p. 36). "*We are now in the middle of a paradigmatic struggle. Challenged is the enriched utilitarian, rationalistic-individualistic and neoclassical paradigm which is applied not merely to the economy, but also, increasingly, to the full array of social relations*" (Etzioni, 2010, p. ix). New situation when forthcoming IT may eliminate jobs, create unfamiliar ethical issues. When we are faced with unfamiliar ethical problems we apply analogies knowledge from the past and if it is not possible there is a call to reconsider and discover new moral and ethical values (Manner, 2004). Moreover, when people discuss ethical issues they have very little knowledge about the underlying reasons of why specific behaviour is wrong or unfair (Johnson, 2001). Thus, we have to come to a common understanding on what do we actually want from technological progress. Do we want to create more working places, or do we want to free people up and let them enjoy their leisure time? Eventually, this will force us to reconsider our basic assumption on what is "right" and "wrong" in relation to the concept of employment in the technological society.

4. Some Attempts to Resolve Key Ethical Challenges of Technological Displacement

Based on the key premise of the global technological ethics on the relationships "*… between the weak and the strong, the rich and the poor, the healthy and the sick worldwide – and it should explore the ethical problems from the point of view of both parties involved*" (Gorniak-Kocikowska, 2007, p. 56), it was proposed to introduce basic security income as a basic human right (Van Parijs, 2004; Standig, 2005). This basic income implies unconditional income granted to all individuals in the society without work requirements (Hughes, 2014). However, this idea of basic income was criticized by Meyer (2016) who introduced five reasons of why this attempt will not solve the problem of technological unemployment. Among them are the following: (i) reduced value of work to mere income, (ii) inefficient use of public resources, (iii) inability to solve inequality issue, (iv) inability of basic income to be implemented in the EU due to migration, and (v) potential abolition of the welfare state. As an alternative to the basic income it is proposed to implement a public job guarantee. Yet, from this proposition it is unclear how to provide this public job guarantee if less and less jobs are created and the pace of creation of new jobs is much slower (Brynjolfsson and McAfee, 2011; 2014). Some countries such as Finland, Canada, Scotland and the Netherlands make experimental attempts to introduce basic income in order to reduce income inequality (Brooks, 2017). In contrast, in Switzerland this idea received little support from public (Gaiser, 2016). All these debates and attempts demonstrate that more knowledge is required on how to introduce this changes and not to destroy intrinsic motivation of people to express their creativity in socially useful form.

Besides a challenge of technological unemployment and basic financial support, another ethical challenge emerged due to utilization of technologies such as driverless cars. For example, most carmakers, such as Tesla Motors, Audi, Mercedes-Benz, Volvo, and General Motors are testing self-driving cars (Knight, 2016). Driverless taxis can become so cheap and easy to use that it would make little sense for anyone to actually own a car (ibid.). However, some recent studies demonstrated that more ethical and legal challenges emerged in the use of these cars in case of an accident (Bonnefon et al., 2015; Thierer and Hagemann, 2015). For example, it is unclear what is ethically correct concerning how an algorithm should make a decision between killing a passenger or pedestrian in case of a car accident. One possibility to solve this issue could be to program cars in a way to avoid any collision. Another question is to think what would do humans in a situation of collision and program machines in a better way. For example, it is recommended to involve psychologists and apply experimental ethics in situations of unavoidable harm (Bonnefon et al., 2015). These ethical challenges of how to incorporate a sense of ethics into algorithms trigger engineers, programmers, researchers as well as philosophers for a long time, yet remain still under consideration.

Another ethical challenge due to technological displacement to think of is the use of robots for baby and elderly care, nursing, and surgery instead of human contact. Some ethical issues related to emotional and psychological wellbeing of children are discussed in the current literature (Sharkey and Sharkey, 2010). For example, the authors demonstrate that currently it is unclear how to use robots and protect a right to privacy for kids, how much decision authority has to be given to a robot to keep a child from serious physical harm, how to save a child from emotional dependency from robots. It is also unclear who is responsible for leaving children in the care of robots (ibid.). In case of the use of robots in elderly care Sharkey and Sharkey (2012) argue that the following ethical concerns emerge. First, the use of robots leads to a loss of privacy and personal liberty. Second, people under robots' control experience a feeling of objectification, infantilisation and a lack human contact. Third, it is still unclear in which situations elderly people are allowed to control robots. In case of robotic surgery, it is still uncertain whether a physician, hospital or producer of the robotic system is responsible for the failure.

These are only a few ethical challenges that emerge due to technological displacement. We do not review here ethical challenges of the use of technologies and robots for military and industrial purposes. As a general solution of current ethical challenges due to technological advancement, it is proposed to balance the costs of the use of new technologies against the ethical costs. However, we still require clear guidelines on how to achieve this balance. As we stated in the introduction, we are not seeking to offer solutions to the main ethical issues which emerge in response to technological development. We rather intend to raise a discussion of these matters. Researchers and practitioners need to consider these questions and discuss them with the public and policy makers.

5. Concluding Remarks About the Near Future

Advances in technology have not only brought the joy and relief of work as expected, but also posed difficult economical and ethical questions for humanity. These questions challenge policy and education makers, business people and researchers to understand economic, social

and ethical implications of technological advancement. On the one hand, most of the economic studies that applied an occupation-based approach demonstrate that many current occupations are under a high risk to be displaced by technologies. In contrast, supporters of a task-based approach provide us with less scary statistics, yet acknowledge the limitations of the applied method. Therefore, it is still unclear to whether IT will give rise to massive unemployment or not. Indeed, more research is needed to understand the phenomenon of IT-induced unemployment. On the other hand, growing unemployment is not only a matter of what IT is capable of doing or not but also what society wants to happen from technological advancement in the future. More and more academics emphasize the need to search for new solutions from the core normative ethical premises on what do we want from technological advancement for humans and take into account a human position as the basic and the most valuable unit of analysis to align technological features and new technological possibilities. Yet, these common solutions can only be reached through extensive reflections, discussions and debates as this chapter calls for. Below, we present some key thoughts about changes that current advancements in technologies bring to us in the near future.

First, we can suppose that the proponents of an occupation-based approach (Frey and Osborne, 2013; Autor and Dorn, 2013; Bowles, 2014; Frey et al., 2016) may exaggerate the level of technological displacement and as pointed out by Arntz et al. (2016) no massive technological unemployment is expected, at least in the near future. Moreover, there are still many activities that cannot be automated at this time. For example, such occupations as recreational therapists and dentists cannot be replaced by technologies, because they require foot-hand-eye coordination and dexterity. In nursing and healthcare, a considerable share of technology implementation failed due to patients' mistrust (Arkes et al., 2007). Another issue that we have to acknowledge that the implementation as well as maintenance of new and modern technologies are quite costly and labor-demanding (Carro Fernandez et al., 2012). Therefore, while we can expect structural transformation of occupations, some occupations will be difficult or not desirable to replace by technologies.

Secondly, studies in the field of information economy and labor market restructuring due to digitalization and automation demonstrate that half of the workforce in developed countries is still occupied with non-information work, and thus have not been subjected to full mechanization or substitution with mechanical technology (Wolff, 2006; Apte et al., 2012). There is also evidence that new opportunities for employing people will be provided by emerged information-service industries, including the software industry and the microelectronic industry. For example, such occupations as data scientist, cognitive computing engineer, social media architect, mobile technology expert, cloud architect, virtual reality engineer, internet of things architect are on high demand nowadays (Strohmeyer, 2011; Snyder, 2016). Therefore, advances in technologies can also create new possibilities to employ workers who specialize in networking, data analysis and programming.

Thirdly, many of the skills being taught today are no longer relevant for current jobs, which has already led to significant mismatches in demand and supply (David and Dorn, 2013). Moreover, there is also growing labour market polarization between high-income cognitive jobs and low-income manual professions (Goos and Manning, 2007). All this implies that future jobs will more and more require creative and entrepreneurial skills. Yet human nature by itself is characterized by a high level of adaptation and entrepreneurship. For example,

current studies demonstrate that the share of alternative workforce (temporary, on-call and contract workers) is growing rapidly, including the online workforce (Belsie, 2016) due to advances in technology and access to the Internet. Hence, these data and creative human nature encourage us to think positively about technological advancement.

Fourthly, some countries with advanced economies have already made attempts towards stabilizing the level of unemployment. For example, some countries make first attempts to introduce a basic secure income aiming to provide a reasonable income for everyone to satisfy basic needs (Brooks, 2017). Proponents of this initiative expect that it will give people financial freedom, eradicate poverty and enhance intrinsic motivation for creative beings. However, this initiative is partly criticized by its inability to solve the problem of technological unemployment due to reduced value of work, insufficient use of public resources and inability to solve inequality (Meyer, 2016) and was not accepted in Switzerland by public (Geiser, 2016). Will this initiative succeed to create a stable society where man and machine can coexist with each other and provide everyone with beneficial results? Undoubtedly, different scenarios can be expected and detailed knowledge on how to introduce this income and not to destroy intrinsic motivation of people is required. Yet, this attempt to reconsider and re-interpret established moral principles demonstrates that the problem of technological displacement is recognized by society as well as a need to address it by challenging existing ethical paradigm.

Given the above, the question of what recent technological advancement has brought to the labor market, humans and society as a whole is under investigation and requires detailed consideration by different research communities. What we can observe from previous studies is that it is extremely difficult to predict the precise effect of technological advancement on the structural and occupational composition of employment. Indeed, it is quite difficult, if not impossible, to predict technological development and the consequences of its use (Nye, 2006). Advances in technology force us to: "…*reconstruct our environment and to reconsider the ethical foundations of techno-economic decisions…*" (Peláez and Kyriakou, 2008, p. 1192). While it takes time to establish agreement between different stakeholders regarding the impact of technological advancements and their consequences, the first step towards this agreement might be to focus on the human position in socioeconomic relationships and challenge normative assumptions of our expectations of technological progress.

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An Ethical Perspective on Cognitive Time Distortion (CTD) in Business Systems

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1. Introduction

Can it be bad to decieve an employer about how long time you have worked for him? Is it wrong to give a customer false information about the necessary volume of working hours for completing a comission, when the single purpose is to "keep up the price level per hour"? How large error in communication about working time in a business system acceptable from an ethical point of vue?

There is little attention that has been given to questions related to the moral of human beings and the value of time. Main stream research has focused on the value of money related to tactile goods. The economic theory, based upon the fundamental assumptions that the Man is rational and selfish, has not given much attention to factors related to psychology and philosophy. Gradually, however, management and economic theory has been challenged by cognitive psychologists, and this paper shall discuss some anomalies with reference to time perception, ethics and systems management.

The paper is structured accordingly;
1. Theoretical foundation, System,
2. Factors not considered by economic theory,
3. Theoretical foundation, CTD
4. CTD in economic systems
5. Management of CTD and freerider in a service system
6. Conclusions

2. Theoretical foundations

The theoretical foundations for the formulation of the proposed model for managerial control of social organizations, steam from systems and cybernetic theories.

2.1 System and Cybernetic Notion of a Social Organization.

The notion of a '*system*', as conceived by the so-called General Systems movement (Hammond, 2003; Klir, 1991; Le Moigne, 1994), and the affiliated filed of '*cybernetics*' (Ashby, 1960; Beer, 1979, 1981), has showed useful for the conception of an organization and its governance.

Checkland (1981) summarized some central characteristics of any non-trivial system. Of these, we mention the *emergence* and *hierarchy*, where a system produces emergent

properties that none of its parts produce on its own, such as an airplane's ability to fly. This in turn gives rise to an internal complexity, which is organized in hierarchies, or levels of organization. For example, living systems may be conceived in terms of cells, organs and the organism as such, while social organizations, such as firms, organize themselves in terms of divisions, business units, functions, groups, etc. Systems manifest the capability of sending and receiving information, to *communicate*, both within the systems and between the system and its environment. This *communication* is needed to exhibit command and control of a system's behavior, instrumental for the process of adaptation to both internal and external changes. Adaptation, in turn, is crucial for system's survival or sustainability, however conceived or measured – e.g. living or death, or financial profit or loss. Following the logic of Miller, a system may be conceived principally in terms of its *operating sub-system*, which produces whatever the system does, and its *management sub-system*, which commands and controls what is produced by the operating system (Beer, 1979, 1981). Also, management of any economic system requires goals as well metrics to follow up the targets. Deviations from objectives and targets in the system will jeopardize ethic, moral as well as the economic survival of a system. This goal oriented perspective with emphasis on time and economy will be examined more in detail later in this paper.

2.2 Criticism of economic theory and the assumption of rationality

This short expose of a system and cybernetic conception of the structure of a social organization, with regard to its governance, implies that social-systems maybe conceived in terms of a teleological behavior, rather than being purely deterministic obeying passively some natural laws (Le Moigne, 1994). Teleological behavior means here that a social organization may pursue a set of goals, where some are conflicting with each other (ibid.). This understanding of a social-organization in terms of a goal-oriented behavior is central to the proposal of economic management put forward here.

Traditional economic theory is based on two basic assumptions about driving forces behind economic behavior: rationality and self-interest. Rationality assumption means in short, that man makes optimal decisions by accurately estimate the consequences and probabilities of disparate alternatives, and balance these two factors in accordance with mathematical and statistical principles in order to optimize the decision. The second assumption in Economic theory assumes - in simplified terms - that man is selfish, and behaves selfish in decision-making and actions.

These economic assumptions has been criticized by the late economics laureate Herbert A. Simon, who instead introduced the concept of bounded rationality (Simon, 1947/1997). The criticism of adoption of rationality has also been advanced by psychologists and primarily by the Israelis Amos Tversky and Daniel Kahneman, who demonstrated the irrational behavior of Man with reference to decisions under risk and uncertainty (Prospect Theory), (Kahneman & Tversky, 1979).

From a somewhat different perspective, but still critical to traditional economic theory, Richard Thaler (1992) published several articles that systematically describes paradoxes and anomalies in financial theory. A conclusion of these articles is that traditional economic theory is not always able to declare and predict economic behavior that in largely is being

controlled by psychological and social factors. In the case of intertemporal choices for instance, the decision situation is assumed to adapt to traditional economic theory of a rational decision-maker calculating the pros and cons by utilizing constant discount rate. This, however, is not the case, while instead the tendency is to give greater weight to the nearest timing, the closer it is to the decision maker. Decisive for this preference is the timing and occurrence of the option's pros and cons. In immediate disadvantages humans tend to postpone action, while at the immediate benefits she was inclined to perform the act (Thaler 1992).

This short summary on the criticism of the assumption of rationality is meant to indicate that there are several other mechanisms guiding human beings in the decision of economy in a system.

2.3 Criticism of the assumption of self-interest.

Ernst Fehr from the University of Zurich has argued for that economic models must take into account human preferences for fairness distributions and reciprocity. If these factors are not taken into account, it can not, according to Fehr, be possible to fully understand how competition affects markets, which is why cooperation and cooperatives arise and what creates general standards (see Fehr & Gächter, 2000a). The argument is based on the clear results from the well-known ultimatum game. Contrary to what economic theory predicts, the research results supports that the majority (70 percent) of the subjects (in rule, students in the West) suggested "fair" bid in a business situation. For instance, the suggested bid distribution $(0.4 < x < 0.6)$ exhibited a tendency to split the utility equal, while most rejected the rare unjust commandments $(X < 0.2)$.

While the economic scientists label this as "self-interest", this paper will approach these problems from the perspective of "ethics" and "moral". Thus, while economists criticize the concepts of rationality and self interest, it may be argued that the majority of human beings have a sense of what is "wright" to expect from a bid in a economic game.

As will be demonstrated below, the sense of "wright" and "wrong" in a system forms a common culture. Any deviation from a common norm depends on to what extent this is known by the other people in the group. There is a "free rider" effect in economic systems, when individuals avails themselves of the outcome of the group, without contributing anything at all to the common good. This is particularly relevant with respect to time, time assessment and economy.

3. Factors not considered by the economic theory

There are some important factors not considered by the economic theory, and below we only shortly mention five; Feelings, Learning, Wellbeing, Confidence and Time Perception. Little, however, is observed about how they all interact together with economy and moral and ethics. Therefore, they are only shortly presented here below.

3.1 Feelings

Purely physical emotion is not as vague, unpredictable and impossible to objective measures as previously suggested by economists. (With pure physical feelings is meant for instance anger, fear, hunger, thirst and pain.) Humans tend to systematically underestimate the impact of these feelings.

It can be noted in the context, however, that not only physical feelings are important in Economic behavior. Neurologist Damasio (1995) has shown that there is an area in the human brain (against the brow) which affects our ability to make judgments and make decisions. People with brain injuries in this area have been found have great difficulty in making decisions as well like showing feelings. Thus, feelings can be made not distinguished from rationality.

3.2 Learning

Economic models about learning should be based on research findings from the cognitive psychology – they should not be modeled by economists. Therefore, a learning model must have the four criteria mentioned below:

(i) the learning model shall be based on the information that subjects in the experiment are using,

(Ii) the learning model must be based on psychological and behavioral concepts,

(Iii) the learning model must be simple and include the valid parameters, and

(iv) the learning model must be consistent with empirically material.

Models in economic settings – and in management of systems – the criteria has not been satisfied. Therefore, it can be argued, it cannot be expected from individuals to behave and learn in accordance with objectives of a superior system.

3.3 Wellbeing

What makes people happy? The issue has been discussed by political scientist Robert Lane Yale, economists Andrew Clark University of Orléans in his book (Lane, 2000). It is supported that social relationships have a greater importance for happiness than income and living standards.

3.4 Confidence

Trust can be said to be a basic prerequisite for economic and social interaction. But how is this modeled?

A common solution to solve this from an economical and management perspective has been co-operatives in which members organize themselves and follow common rules and standards. According to Bowles & Gintis (2000) there is a social capital that is defined such as trust, concern for peers, like to live by their own co-operative standards and willingness to punish them who within their own co-operatives do not follow the standards. According Bowles can cooperatives efficient control areas where both free markets and state intervention fall short.

There are, nevertheless, some certain conditions in which cooperative governance works badly. Gneezy & Rustichini (2000), report about an unsuccessful attempt when fines failed to influence social norms. The reason for this is assumed that the fine was hampering reciprocal behaviors instead of promoting self-interest in the group.

3.5 The time perception of human beings

Economy always assume that the true value in organizations and systems follow an objective time. It is assumed that the clocktime correctly describes the customer value of a service delivery from a for instance, software programmer to a customer, and that the price the customer pays for the software is appropriate to the work done. This oversimplification of economy and service production excludes several activities and steps linked to cognitive psychology, ethics and moral that shall be discussed more in detail below.

First, there will be a formal definition of the difference between the human perception of time and the Newtonian objective time. The disparity of these two time dimensions we denote Cognitive Time Distortion – CTD – and this concept has the advantage that it serves as a practical econometric parameter influencing profit, workload as well as productivity.

However, we shall in this paper focus on the ethics of CTD, and to do this, we need to elaborate on the attitudes of the service providers. We show an example of how "free-rider" effect of time seems to stop, when time and CTD becomes *visible*.

4. Theoretical foundation CTD

All activities in an organization, such as for instance reading, writing or meetings, can be measured in terms of time. Subsequently, the system as discussed in paragraph 2.1 is here suggested to be a "time-system", in which time durations carries information about constructs such as 'wait', 'stop', 'retardation', etc. For instance; "we have *queues* in our project presently" or "there is *retardation* with 4 days in process 3" transmit important information about the system.

As previously mentioned, there are several perspectives of time that have to be considered in the system. On one hand there is the Newtonian perspective, which here is called the *physical* time. The physical time passes smoothly with an even pace and relates to the motion of the earth around the sun. The physical time usually serves as a context to which other system-related values are referred; for instance "completed cars *per week*", "Salary *per month*", etc. In economy, budgeting or project planning, the physical time constitute the singular temporal concept. The physical time relates to contracts between supplier and customer.

On the other hand, there is a time perspective referring to humans' subjective experience of time. This time, which here is called *cognitive time*, is based on the time cognition of an individual, and passes in jerks and jumps, sometimes fast and sometimes slow, and it has a pronounced stochastic development. The passage of cognitive time differs from objective time, and the divergences between the two time perspectives have been studied by psychologists the last century (Block & Eisler, 1999). The cognitive time is related to time records by staff and employees during the service delivery. Any difference between the cognitive time and the physical time is of course reflected in the economic outcome, such as

level of profit, productivity and workload. Should the disparity be large between cognitive time and physical time, the economy of the system will be endangered.

In a modern business system, the responsibility of recording and reporting time is delegated to each individual. Thus, the time perception of each employee influences contaminates the physical time and economy of the system. In Figure 1 below, we see that the mean value of a cognitive hour always tend to exceed the physical hour with 5 % - 114 %, an outcome wich naturally seriously distorts the economy of service economy and service systems.

The mean value of one psychic hour, obtained by an individual's self-assessment versus a physical hour. Source:	Mean value of one cognitive hour t_c as expressed in physical time t_p (hrs).
Mackleod & Roff (1936)	1,22
Vernon & McGill (1963)	1,08
Siffre (1964)	2,14
Webb & Ross (1975)	1,02 – 1,05
Lavie & Webb (1975)	1,12
Aschoff (1985)	1,47
Campbell (1990)	1,12

Figure 1. Research on the length of a cognitive hour. (Block; 1990:5)

Thus, the *difference* between cognitive and physical time in an arbitrary organization, and this difference, denoted Cognitive Time Distortion - CTD (von Schéele & Haftor, 2013) is defined as:

Time Distortion: $\tau_i = \left(\dfrac{t_c}{t_p}\right)_i$ (1)

Specifically, for time distortion in service economy, t_p denotes the time agreed upon in a certain contract, where "*i*" stands for contract number "*i*". The physical time t_p serves as an economical *target* for the service delivery, guiding employees about the time frame that must be met. Similarly, t_c stands for the cognitive time, corresponding to time assessments made during the delivery of contract "*i*". Time distortion τ_i is subsequently a corresponding measure of precision of delivery of time for contract "*i*". The term "precision of delivery", however, refers to metrics of *physical time*, but the term "Time Distortion" stresses metrics of *both* physical time and cognitive time with reference to the same activity.

Cognitive time varies stochastically, which means that Time Distortion as in Eq. 1 has a stochastic nature as well. Time records of employees, project plans etc. frequently exhibit haphazard deviations from targets and goals. The stochastic variations of CTD is valid on individual level as well as on contract level in a system. The problem of CTD will be apparent in Figure 2 below.

5. CTD in economic systems

In service activities, the problems of delays and error assessments of time are very noticeable. Standish Group International annually monitors approximately 6000 IT projects worldwide to investigate how effectively they are managed and implemented. In Figure 2 below, we see that there is a very small "success factor" within the projects investigated. In 2000 and 2008, there were only 16% - 28% of all projects that were categorized as "Completed on time", while about half of the projects, on the other hand, were delayed.

Precision of delivery of completed IT-projects.	Proportion of projects 2000 (%).	Proportion of projects 2008 (%).
Interrupted	23	31
Delayed	49	53
Completed on time	28	16
Total	100	100

Figure 2. Amount of projects that are classified as Interrupted, Delayed or Completed on time during 2000 and 2008 (Standish Group International, Chaos Report).

In generall, delayed projects and time reporting can be classified the delays into different subgroups:

1) **Projects delayed due to unintentional CTD.**
   These delays occurs when the employee is unaware of the CTD. It can be estimated to exceed 20% of the physical time, although it varies greatly between individuals. These error assessments tend to create a lever effect, inflicting an amplification of the delay in the economy, instead of leveling out when addition of time reports is made.

2) **Projects delayed due to intentional CTD.**
   This group includes a large group of time-reporting behaviors that can be classified as unethical and contradictory to business ethics. (The examples below derive from my own professional consultancy work about time reporting and CTD).

Some short examples of intentional CTD behaviours are listed below.

"Half-hour report"
This intentional CTD is duo to that it is common that employees, when making a time reoport, prefer to estimate "half an hour" and report this, rather than to estimate the likely working hours. This behaviour, however, exhibit an attitude of mental laziness by the employees that interferes with proper financial reporting.

"Report time on a refuse account in order to make calculation of time delivered to customer to be correct".

This intentional CTD example illustrates when employees try to correct the amount of time invoiced to the customer. As this rarely corresponds to the employee's time spent in the workplace, time is reported on the so-called "refuse account" or "slash account", to give the book-keeping an impression of that the employee worked full time. Employees has explained to me that their behavior is NOT cheating, "since it is easier to fake time reports than to cheat with money".

Time reporting at the end of the month
This intentional CTD is linked to the problem of late time reports from employees to the economic department. Even though the economic department, as well as project managers and sub division managers reminds employees about time reports, it comes out to be a low prioritized work tasks in service organizations. Unfortunaley, temporal memory of the human being is poor, which leads to time reports that are compiled more than one day after the work task contain large errors. Therefore, empoyees are dissuaded from reporting time at the end of the week.

Free rider effect
This is a rather common intentional CTD linked to that some employees prefer the colleagues to do the major part of a job. The free rider problem is a market failure that occurs when people take advantage of being able to use a common resource, or collective good, without paying for it, as is the case when citizens of a country utilize public goods without paying their fair share in taxes. The free rider effect can be seen also in service organizations, as single individuals avails themselves of a common salary level, while they do not contribute proportionally to the common output.

The last paragraph of this paper shall discuss an example of free rider effect in a service organisation (von Schéele, consultancy work, 2009, by permission of Sensus AB, Örebro, Sweden), and how this problem was solved.

6. Management of CTD and free riders in a service system

One Swedish service company planned to improve the quality of precision of deliver in order to increase profitability and customer satisfaction (von Schele, 2009). This quality management of time was named the "Qtime project". The leadership decided that the staff should report time each day in the computerized time record system of the company. The working hours of the employees were in the time report divided into three groups; Project Time, Business Development time and Other Time. The only working time that earned money to the company was Project Time, thus the staff were asked to increase this time in their daily work, while they should to decrease all other working time correspondingly. The result of Qtime project was to be accounted for once every month, as the employees were given the opportunity to follow the company's progress. Each month the result was presented so that the employees only saw the *group* results of the common Qtime project reported.
The entire Qtime project was initiated with a kick off in which one day training of employees was included. Everyone in the company confessed that they supported the Qtime project and

thought it was a good way to increase profit and precision of delivery. After 3 months, however, no significant improvement had been made of the employee's Project Time (see Figure 3 below). Instead, the they exhibited several free riders who counteracted with the objectives of the Qtime project.

It was then decided by the management that the feedback during the monthly meetings should change from showing the group's progress report of Project Time, to show the individual employee's progress report. Thus, the working time of the entire workforce became suddenly transparent, so employees could clearly follow the loyalty of each colleague.
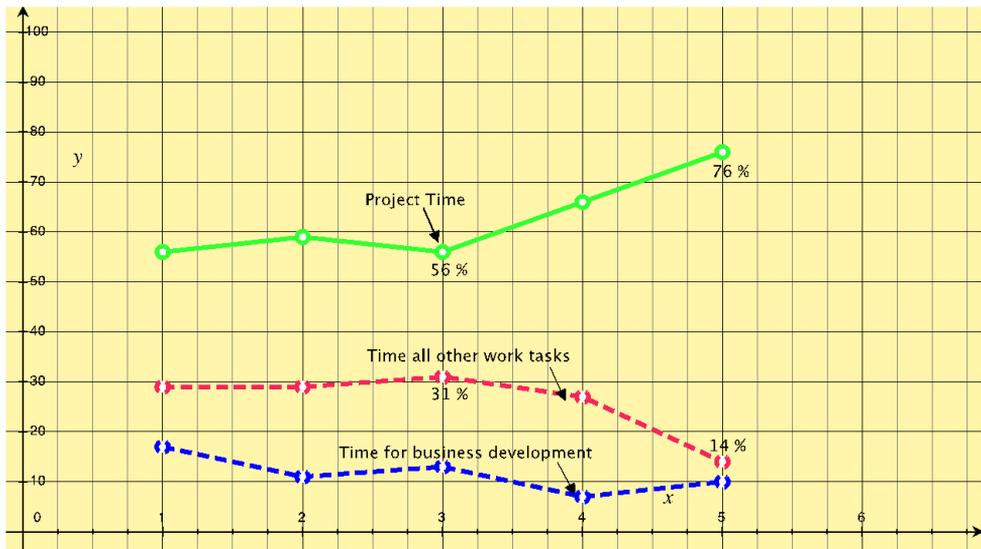

Figure 3. Example of how freerider effect is stopped and CTD decreased, as feedback mechanism to the group is changed in period 3. (von Schéele, consultancy work 2009, by permission of Sensus AB, Örebro, Sweden).

In Figure 3 above, it is very easy to track the change of company Project Time from 56% in period 3 to 76% in period 5 (green curve). Simultaneously, the activities that were linked to Business Development and Other Time decreased accordingly.

From laboratory experiments (von Schéele, 2001), we know that feedback of CTD to individuals, tend to reduce the error in their time estimates, thus improving the accuracy of the time reports, both on individual and on group level. However, and it should be stressed, this result probably only applies to *unintentional* CTD.

Intentional CTD, when business ethics and business culture are challenged by individual attitudes, the above presented example indicate that visualization of the problems may support a more proper solution. It must nevertheless be stressed that visualization of *economic key performers* did not change the precision of time assessment group. Neither did it persuade freeriders and to support management directives with reference to time reports. But if the visualization was made of the time records, exhibiting the progress reports of Project Time on *individual level*, a rapid change was initialized in the group. After just a couple months the

majority has complied to report their working time recording. Profit and precision of delivery increased as well.

7. Conclusion

In an economic system, economic key ratios are not sufficient to manage the business successfully and profitable. There are examples of areas of economic theory formation where theoretical models are vague, and measurability of abstract economic proper parameters are missing. This creates a challenge for leaders of economic systems, as business ethics and correct behavior by employees becomes difficult to follow up. In order to remedy this, the economic value must be measured - not in monetary values - but in terms that attach to the relevant value parameters - in this case time. It is not enough, however, only to measure, but one must also confront existing shortcomings in ethics at an individual level and seek feedback so that the group adheres to a common standard. This applies to the control of both monetary and time-related key performers.

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Celebration of Sytse Strijbos' Academic Achievements

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This remark is in honour of Professor Emeritus Sytse Strijbos. His work for the Centre for Philosophy, Technology and Social Systems (CPTS), which later evolved into the International Institute for Development and Ethics (IIDE) has been highly important for me as a PhD student, and later, for my professional career and guidance of own PhD students. The common denomination in our work relates to our interest in Systems Thinking and Herman Dooyeweerd's philosophy.

We met the first time more than 20 years ago, at the Free University of Amsterdam where Sytse had organized a one-day seminar. This was the beginning to our annual conferences, which included researchers and PhD students from Sweden, The Netherlands, UK, and later, South Africa. The conferences were held at Sytse's home town in Maarssden, at an old house which used to be a convent. We conveniently stayed in the same building as where the conferences were held and the nuns, who now had moved to a newer convent, provided full time lodging for us. The surroundings of this venue were beautiful and inspirational for many interesting conversations.

In preparation for each conference, the participants shared their draft papers before hand so that others could reflect on the content and prepare comments and questions. The presentations were given lengthy time to allow for comprehensive reviews. After each presentation, when Sytse's lead the discussion, he divided into: first, **Questions/Comments for clarification**; second, **Questions/Comments for critique**. This division was very helpful for me as a student. If it was a question for clarification, I needed to be more clear in my explanation; if it was a question for critique, I needed to reflect on my standpoint and provide better arguments (or abandon). What was also very helpful, a few days after each presentation and discussion, each presenter had to reflect on what was brought about and give feedback on what they intended to act on. In that way, the others got recognition of what had been influential for further development of the work and how they might have contributed to this.

In addition to the conference presentations there was also invited guests who gave presentations and lectures on topical issues of our interest. By meeting such distinguished guests in this relaxed conference setting, we got very good contact and had many informal discussions which I have brought with me in my professional career.

The conferences resulted in proceedings for which we took turns on being the editors. By that and by interacting with more seniors, I also learnt about the craft of being an editor (and got an additional merit on my CV). The proceedings included our updated versions of the conference papers, complemented with comments from the editors, and, therefore, became of high quality. At first, these proceedings were only distributed by print but, eventually, also electronically.

Besides annual conferences, a second collaboration was the book "*In Search of an Integrative Vision of Technology*", which was published 2006, ten years after our first meeting in Amsterdam. Sytse was one of the editors and main authors and several of us CPTS members contributed with chapters based on our own research focus with relevance to our 10 years of collaboration.

Finally, the inclusion of scholars from South African universities, on Sytse's initiative, has meant life long relationships with some of them as well as made me and other conference delegates from our part of the world aware of the different context in which we operate and the different problems that we face. For instance, water management means one thing in The Netherlands where you need to protect against flooding, while something totally different in South Africa where there is a scarcity of water. This inclusion also made us more responsive to ethical issues, worldwide.

Additional activities, which I also wish to highlight:

Sytse's PhD course in Luleå, in 1996, that focused on the philosophy of technology. To me, that course was an eye opener in deterministic perspectives of how we think about technology.

Sytse, being part of my PhD exam committee, in 1998, for my thesis "*A Multi-Modal Systems Extension to Soft Systems Methodology*".

Sytse, occasionally being guest lecturer at my current affiliation at Linnaeus University, both for master students and PhD students.

Now, the nuns have stopped organizing our conferences and the Maarssden house is sold. We are grateful to having learnt to know many scholars throughout the years and the relationships that have evolved. Although the conferences are not in place any longer, the collaboration continues with people we have learnt to know during these 20 years, and also with Sytse.

Anita Mirijamdotter
Nov. 22, 2016

For more, and additional information about CPTS, see
http://www.basden.salford.ac.uk/cpts/story.html

Sytse Strijbos – Man of Reason… and Action!

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As two South Africans that have closely cooperated with Sytse Strijbos over the past decade and more, it is a great honour to be given an opportunity to reflect on Sytse Strijbos and our unique impressions of the man – a man of reason...and action!

Sytse Strijbos (a man of reason): On technology and being human … always in a yes, but … way.

Lucius Botes

We need to recognise and celebrate Prof Sytse Strijbos for his contributions towards creating a multi-disciplinary space where scholars and practitioners could assemble and reflect on both the intended and unintended consequences of the nexus between culture, philosophy practice and technology (CPTS). (See also Table 1).
For many people this is a space of unfulfilled hopes and disillusioning experiences, but also a space where scholars and practitioners can meet to focus on some lessons learned, as well as how these help us to envision a post-industrial and post-modern world; spaces which Sytse and his CPTS group have deliberately put on the agenda for scholarly reflection.
In the 14 years of the CPTS colloquiums and seminars at the Emmaus Priory in Maarssen, the Netherlands, adjacent to the river Vecht *("to fight"* in the Dutch Language), it was indeed a struggle to get people to reflect systematically on this interface of culture/philosophy and technology; an initiative, which Sytse Strijbos drove with great dedication and passion. Some of the scholarly publications that appear from Sytse Strijbos are depicted in Table 1

Table 1: Seven of the most recent publications of Sytse Strijbos

An Integrative vision for Technology	2011
From Technological Transfer to cultural development	2011
The individual and the collective in health care: a problem of systems ethics	2007
A normative systems approach for managing technology and collective action	2007
A systems character for modern technology	2007
The idea of systems ethics	2006
Towards a 'Disclosive Systems Thinking'	2006

The golden threads which run through these publications all deal with the nexus of technology and technological systems (shadowed in grey) and the human interface (culture/ethics – text

underlined) (See Table 1, above). Stated differently, his work resembles a continuum of reflections on the effect and desirable outcomes of human *and* technological interface as well as human *with* technological interface. These are some very important scholarly reflections if we assume that the knowledge-based economy is now a global phenomenon. Becoming human is currently defined through the development of ITCs, from having access to the virtual web to the astonishing speed of enabling information at our fingertips with the press of the button on our IPads or the touch of the screen of our smartphones. Being human in a global age is also about a dynamic interface with cutting-edge technology in our ITC devices we use on a daily basis. Particularly with regard to the human-techno or techno-human interface, Sytse encouraged and constituted a community of scholars to reflect on the epistemology, ontology, methodology and ethics of this nexus.

Another aspect of Sytse's work is that in his scholarly reflections he always tried to bridge divides; between communities and families; between the developed North and the developing South; and between scientific theory and applied practice. I guess if we have to summarise the scholarly legacy of Sytste Strijbos it all lies in searching for partnerships in attempts to bridge divides, which brings us back to notions of bonding, bridging and building, also three central concepts in understanding development practice and social capital. In a world characterised by poverty, inequality, ethnic conflicts, climate change, forced migration, terrorist threats to human security, etc., the bonders, "bridgers" and builders are very important people. In all this, we will on the one hand appreciate that there is dignity in our difference, but also the imperative of not engaging in othering, which is often the precursor for labelling, stereotyping and legitimising social injustices and identity politics.

Much of Sytse's scholarly reflections explored and highlighted how solutions to human problems are not only technological or economic but also concern crucial themes such as culture, values and inclusion; in other words, issues of social justice. This is indeed the "disclosive" nature of reflections on the gaps between many divides. Sytse keeps on reminding us that there are limits to what our reason (science) our tools (technology) and our faith (worldview and religious orientation) could contribute towards making this world a better place. In this, his and his fellow CPTS club's contribution is in the finiteness of our understanding/reasoning and thus limitations in attempts to improve and rectify our broken world. There are therefore always unintended consequences in our social engineering attempts, which are the unforeseen and the unaccounted for and which we cannot grasp with our theorising and logic. This is largely so because God's creation is all encompassing and only comprehensible from our (human) side. The essence of development ethics lies in trying to search for these unintended consequences and possible impacts of our technological solutions to problems.

I conclude with the essence of Sytse's scholarly work: Firstly, the vast body of knowledge he developed around the human-technology-practice interface; secondly, emphasising the importance of reflection on the gaps and spaces between divides in order to improve development practice; and lastly, that we need to disclose the limitations of our human, technological, development and practical endeavours in making our world a better place.

Sytse Strijbos (a man of action): A man getting things done!

Willem Ellis

Having worked closely with Sytse Strijbos over a period of twelve years, I can attest to the academic attributes of the man as described by my colleague Lucius Botes. Scholarly, devoted, deeply spiritual and reflective…yes…but also a man of action! It has been a privilege to work alongside Sytse in the operationalisation and management of projects launched by the International Institute for Development and Ethics (IIDE) since 2004. – especially as a representative of the IIDE Africa, of which Lucius also forms part. The words which are to follow is but a brief reflection of my and our impressions of the man, but the impression left is much larger and longer-lasting!

After having worked with Sytse for a while I often boasted to colleagues that: *"You could not fool Sytse about the big things in life because he is a philosopher… and you could not do so regarding the small things in life either because he is an engineer!"* This was often to ring true in the attention given to the detail of project management and practice. Whether as the conceptual initiator of a project furthering his original idea and trying to sell the big picture; the representative of a donor safeguarding a financial investment; the eager scholar interrogating a project participant or in the role of board member overseeing the governance of the IIDE – never did he slack in his efforts to ensure that the minutiae of management and administrative tasks were of the highest quality. As a colleague for more than a decade I got to know Sytse Strijbos as a diversely competent man:

A Dutch man – forthright, honest and stubborn – sometimes undiplomatically so! I had heard of Dutch directness before but originating from a South Africa where political correctness and diplomacy had become the norm, his unashamedly outspoken approach would sometimes take me by surprise, upend conversations and lead to animated discussion. You always know where you stand with Sytse and that he will share his opinion – whether popular or not and never intimidated by the surroundings or the participants, whether they be colleagues, partners, university rectors or community members.

Pride in his country was also never far from the surface. In our many travels across The Netherlands, from Amsterdam to Delft and from Utrecht to Leiden and Maarssen, he was always proud to play host to his colleagues from Africa and share with them the culture and treasures of his nation. Many animated discussions were had about what The Netherlands could learn from South Africa and vice versa – usually about development ethics and societal justice. After having heard of the closure of the Emmaus Priory in Maarssen recently, I shed a tear, having spent many a fantastic day in House Doornburgh – all unique Dutch places that Sytse introduced me to.

A visionary man – never in the twelve years that I have worked with Sytse, have I ever seen doubt regarding the direction that the IIDE should take. Spurred on by his concern for humanity and his deep-seated wish to make a difference in lives of those that were not always able to do so themselves. It is this kind of focus and dedication that led him, sometimes accompanied by Rev. Gertjan Bruijn to travel the length and breadth of South Africa in the run-up to the consultative meeting that led to the creation of the IIDE in March of 2004. In

this process more than 80 individuals from government, civil society, the faith-based community and the academia were consulted with – both in South Africa and The Netherlands. The formative years of the IIDE was characterised by wide consultation, driven by Sytse's passion and willingness to consult with peers and sell the idea of the IIDE – visits to Tearfund (Netherlands); SAVUSA; De Verre Naaste; The Noaber and Oikonomos Foundations; Prisma and ICCO, among others, come to mind. The 1st research project launched by the IIDE in South Africa entailed a look at *"Transformation and Transformation Agents"* and the role that Christian change agents could play in helping to "transform" society – especially through the use of economic assistance. To a certain extent this was to underpin the vision of the IIDE in making a real difference in lives – thinking at the core of the vision that Sytse shared. No doubt tempered by successful and less successful interventions of the IIDE, Sytse proved himself to be resilient and adaptive – refocusing the IIDE from a narrow focus on development ethics to the growing field of social entrepreneurship. Always focusing and enquiring as to how the IIDE could make a difference.

An empathetic man - The old saying is that you should always try to walk in the shoes of another before venturing an opinion about them and I have seen Sytse Strijbos trying to step into the shoes of others to build his own understanding of, and empathy for, the situation that especially African participants in IIDE projects found themselves in. Whether trying to gauge the reasons for wanting to go into business from a young entrepreneur in Qwaqwa during the *Moahisane Development Fund (MDF)* project or building a relationship with farmers or farm workers near Bultfontein and Potchefstroom in the *Creating New Agricultural Communities: Co-existence for the Future Project,* Sytse always tried to dig deeper, to understand and to empathise. The fact that language and cultural barriers often made it very difficult did not stop him at all!

On a lighter note, I will never forget Sytse carefully guiding me through the traffic of Stockholm in 2012. We were teaching *Social Entrepreneurship in a Development Context* at the Stockholm School of Entrepreneurship (SSES) and I had never driven a car on the right-hand side of the road before! Sytse, also having had to adapt to driving on the left-hand side of the road in his visits to South Africa, understood my apprehension and led me safely home! Thanks Sytse for understanding and stepping into my shoes!

A frugal man - Being partly from Scottish descent I know all about frugality and responsible financial management! This trait of financial responsibility was one of the characteristics that Sytse insisted on in the management of the IIDE, both in Europe and in South Africa. This fitted in very well with the approach followed by the IIDE in Africa with all financial transactions of the IIDE being audited and thoroughly reported on, by the University of the Free State as the hosting institution of the IIDE in Africa as well as independent auditors. The initial seed funding for the IIDE, provided by the late Aad Strijbos, financial contributions by the UFS, as well as donations from the Paul Foundation (Rotterdam) and later the Noaber Foundation (Lunteren) were stretched to last as long as possible, enabling the IIDE to stay operational for far longer than could have been the case had responsible fiscal management not prevailed. Sytse's tenacious following up of the expenditures incurred and monies due to donors during the wrapping-up of the Moahisane Development Fund and the insistence on the

reimbursement of funds outstanding speaks volumes about the care taken for monies earmarked for assistance to the disempowered.

A faithful man – of course not only to his wife Harma, but as devout Christian. Never could there be any doubt about where Sytse Strijbos looked for guidance, both in the professional and personal environments. In our secular world he was never afraid to become involved in discourse with anybody from any faith tradition and grapple with the challenges facing our world in an open-minded fashion, but never left any doubt as to his, and the IIDE's Christian foundations and departure points. Some of my fondest memories of the last decade revolve around attending church services with Sytse in The Netherlands and South Africa or listening to theological discussions among the colleagues active in the discipline of theology…although I must admit, they often lost me in the complexity of the content thereof.

A social man – Let there be no doubt – Sytse enjoys being around, interacting with and observing people! Having spent hours in cars, trains, planes, meetings, training sessions and social occasions with Sytse has shown him having a keen sense of observation and wry humour. Sytse thoroughly enjoyed interacting with and playing mentor to the group of young(ish) authors participating in the "*From our Side – Emerging Perspectives on development and Ethics"* book project while editing the book with Steve de Gruchy and Nico Koopman. The promotional tour of the book through the United Kingdom following its launch in Utrecht in April 2008, brought many opportunities to interact and enjoy the company of peers caring about development and ethics. I fondly remember social moments shared in Utrecht, London, Oxford and Birmingham with Sytse fully participating in the serious and not-so serious interactions of the group. I remember his amazement at the South African capacity for devouring meat in restaurants and having to explain to the members of the Amos group that Dutch portions were never as big as those dished up in South African restaurants – even in an Argentinian restaurant in Maarssen!
His patience with my and Kiepie Jaftha's antics on the freeways near Amsterdam while photographing cars not common in South Africa comes to mind – especially after Sytse had to respond to a police call after a complaint from an irate motorist that he had been photographed by " Moroccans" in Sytse's vehicle. To this day, Kiepie and I proudly wear our "Moroccan" identities – showing that darker complexions in modern-day Europe is not always to your advantage! Like in so many communities all over the world, the best place for socialising is around the table and I fondly remember sharing many good meals in Sytse's company – being hosted by him, by Lucius, by Kiepie or any of a number of friends made along the way! Sytse has shown himself never to be intimidated by a good South African wine or a piece of prime steak! Or even sharing an Ethiopian meal with our friend Girma Mohammed – in a dingy establishment in Bloemfontein of all places.

A friend - I vividly recall the 1st time I met Sytse – it was at a guesthouse in Bloemfontein in early 2004. I had been communicating with him for a while but had never met him personally, so I had no idea what to expect. Seeing myself as a man of action, having spent a number of years involved in the rough and tumble of conflict resolution work in South Africa, I wondered how I would get along with this philosopher. I found him sitting in the garden of

the guesthouse, enjoying the South African sun and showing signs of just having come out of a long European winter and looking very much the quiet, introspective person that I had expected! His surprise must have been bigger, because at that stage I was sporting long hair, hanging on my shoulders or tied up in a ponytail – I am sure not what he had expected at all! Sytse, I think we have rubbed off well on each other, although I think sleeping among the myriad of philosophical books in your study occasionally has not made a thinker of me yet!

It has been a privilege and an honour to spend more than a decade working with Sytse and I speak for all my fellow IIDE colleagues when I say that it has been an enriching experience. Our doors and hearts will always be open to you and your family and we are looking forward for more sharing with you and learning from you.

Information about the IIDE Annual Working Conferences

As an essential for the execution of its research, the IIDE sustains an international North-South network of senior academic researchers and their PhD students who are affiliated with different universities and institutions in the Netherlands, UK, Sweden, and South Africa. [1]

One of its activities is the organisation of Annual Working Conferences (AWC) at the beautiful venue of the Emmaus Priorij at the river Vecht in Maarssen, near Utrecht, Netherlands. At these week-long events in April or May, participants present papers on their current research, receive comprehensive critical mentoring, and respond with ideas on how their research will be continued.

The formula of these AWC's has proved very successful in generating a flow of high quality papers, informing PhD research, and sharpening up ideas on a wide range of issues. The research of the past has resulted, amongst other things, in a series of Proceedings. The papers that are accepted have been sent out for a peer review. The title of each volume is borrowed from a Discussion paper which aims to foster the ongoing reflection at the AWC's on the mission of the IIDE and its broad research agenda.

The following Proceedings have been published since 2002:

(2002) *On the Connections Between Philosophy, Technology and Systems Sciences*, edited by Johannes D. Bijkerk, Jan van der Stoep, Sytse Strijbos. Amersfoort: CPTS. ISBN 90-807718-1-3.

(2003) *Towards a New Interdisciplinarity*, edited by Rob A. Nijhoff, Birgitta Bergvall-Kåreborn, Anita Mirijamdotter, Sytse Strijbos. Amersfoort: CPTS. ISBN 90-807718-2-1

(2004) *Interdisciplinarity and the Integration of Knowledge*, edited by Marc J. de Vries, Birgitta Bergvall-Kåreborn, Sytse Strijbos. Amersfoort: CPTS. ISBN 90-807718-3-X

(2005) *Towards Humane Leadership*, edited by Albert Helberg, Jan van der Stoep, Sytse Strijbos. Amersfoort: CPTS. ISBN-10: 90-807718-4-8 and ISBN-13: 978-90-807718-4-0

(2006) *Integrating Visions of Technology*, edited by Andrew Basden, Anita Mirijamdotter, Sytse Strijbos. Maarssen: CPTS. ISBN-10: 90-807718-5-6 and ISBN-13: 978-90-807718-5-7

(2007/2008) *The Problem of System Improvement*, edited by Andrew Basden, Darek Eriksson, Sytse Strijbos. Maarssen: CPTS. ISBN 978-90-807718-6-4

(2009) *Systems Thinking and Philosophy as Interdisciplinarity*, edited by Andrew Basden, Leenta Grobler, Darek Eriksson. Maarssen: CPTS. ISBN 978-90-807718-6-4

(2010) *Interdisciplinary Research for Practices of Social Change*, edited by Roelien Goede, Leenta Grobler, Darek Haftor. Maarssen: CPTS. ISBN 978-90-807718-8-8

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[1] This North-South network, formerly named the Centre for Philosophy, Technology and Social systems (CPTS), operates since 2010 within the organisational framework of the IIDE.

(2011) *Re-Integrating Technology and Economy in Human Life and Society, Volume 1,* edited by Lucius Botes, Roel Jongeneel, Sytse Strijbos, Maarssen: IIDE. ISBN 978-90-361-0285-8

(2011) *Re-Integrating Technology and Economy in Human Life and Society, Volume 2,* edited by Christine G. van Burken and Darek Haftor, Maarssen: IIDE. ISBN 978-90-361-0287-2

(2012) *The Role of Education in Economy and Society,* edited by Lindile L. Ndabeni, Darek M. Haftor, Sytse Strijbos, Amsterdam: Rozenberg Publishers. ISBN ISBN 978-90-361-0322-0

(2014) *Social Change in Our Technology-Based World,* edited by Mark Rathbone, Fabian von Schéele & Sytse Strijbos, Amsterdam: Rozenberg Publishers. ISBN 978-90-361-0420-3.