Slow Science:
Research and Teaching for Sustainable Praxis

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O ur purpose in this essay is to examine the nature and significance of what can be called the *slow science movement* within the contemporary discussion about higher education and scientific research. In broad strokes, slow science can be considered a humble, global and mainly virtual academic underground movement. It is clearly not mainstream. Rather, it is an alternative way of conceptualising criticisms of the changing nature of academic work, which is driven by intensification and instrumental rationality. It problematises and opposes fast policies in education,[1] characterised by academic capitalism or cognitive capitalism[2] and the corporatisation of universities,[3] questions the colonisation of academic minds and bodies[4] and formulates a sustainable alternative to the McDonaldization of the academic lifestyle.[5] Rather than representing a nostalgic longing for 'the good old days', characterised by universities as self-sufficient ivory

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[1] Peck and Theodore, 2015.
[2] Peters and Bulut, 2012; Heikkinen 2018.
[3] Berg and Seeber, 2016.
[4] Shahjahan, 2010.
[5] Salo and Heikkinen 2010; Kivistö and Pihlström, 2018.

towers, slow science promotes research practices and communities with a high degree of engagement and critical reflexivity, considering the scientific and societal prerequisites as well as the means and outcomes of research. Regardless of the field of science, this calls on researchers to engage in the public sphere in order to construct a public intelligence in collaboration with both fellow researchers and citizens.[6] At the same time, researchers committed to the slow science movement cherish and defend their autonomy and expertise. This involves formulating the aims, choosing the relevant methods as well as examining and presenting the outcomes of research in accordance with the criteria of reliability and validity within the respective fields of science. Maintaining autonomy and expertise calls for independence in relation to policymakers, funding agencies, benchmarking, performance reports, annual reviews, rankings, metrics and impact factors.[7] Slow science is conscious of, ready and able to debate further conditions and practices that enable research and teaching as a sustainable collective praxis—practices that foster a good life for all human beings and humankind.[8]

The aim of this essay is two-fold. First, it aims to contextualise the discussion around the slow science movement by employing a wider debate on contemporary higher education and university research. Thus, the slow science movement is associated with critical reflections on the practices of economic rationality, managerialism, governance, accountability, efficiency, surveillance and commodification,[9] which are adopted by universities globally, and on the undermining and colonisation of the collectively creative, truly productive pace and rhythm of the everyday academic lifestyle. The intensification of academic work through economic rationality and corporate techniques thwarts the truly productive slow zones for reading, writing, collegial reflection and well-informed critical dialogue—i.e. collegial professional

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[6] Steegers, 2018, pp. 1–14.
[7] Haigh, 2017.
[8] Kemmis, Wilkinson, Edwards Groves, Hardy, Grootenboer and Bristol, 2014.
[9] Shahjahan, 2015, pp. 488-489.

competence, which is based on collaborative and cumulative knowledge creation and scientific quality assurance maintained by devoted peers. [10] As studied by Ylijoki and Mäntylä [11] and discussed by Berg and Seeber, [12] the fragmentation of time and energy—enhanced by project management, the standardisation of learning outcomes, administrative control and surveillance systems and the multitasking made possible by information and communication technology (ICT)—affects both the productivity and work satisfaction of academics. Short-termism [13] and the 'culture of speed' [14] has effectively cut off 'timeless time' as a constituent of enthusiasm, fascination and immersion in research and teaching.

Second, the present essay aligns with the principles of slow science and practices that enable and foster research and teaching as a sustainable praxis. Collective professional praxis underlines the importance of respectful communication and collaboration, both within the community of researchers and between individual researchers and practitioners. It enhances the well-being of academics by nurturing a sense of belonging, meaningfulness, togetherness, trust and solidarity and stems from the desire of like-minded professionals to overcome their dissatisfactions and address issues that threaten their personal praxis. Emergent systems enable researchers and teachers to generate results that are greater than the sum of the elements involved. At best, in the emergence of science, different and complementary people work together. The collaborative emergence of people creates high-performance processes, which no single person has planned and no single person manages.[15]

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[10] Menzies and Newson, 2007; Steegers, 2018, pp. 48–59.
[11] Ylijoki and Mäntylä, 2003.
[12] Berg and Seeber, 2016.
[13] Haigh, 2017.
[14] Berg and Seeber, 2016.
[15] Berg and Seeber, 2016, pp. 71–90; Salo and Heikkinen, 2010.

Sustainable praxis as an ideal of academic work

The very basis for our study is encapsulated in the concept of *sustainable praxis* as an ideal form of academic work. In short, the driving force of sustainable praxis are the intellectual curiosity and autonomous agency of academics. It is based on the desire to know more than before, guided by traditional academic values such as research autonomy and rational argumentation. Sustainable praxis is driven by what MacIntyre[16] calls *internal goods*, distinct from *external goods*. By external goods, we mean goods that we achieve through actions, but which are outside of these actions, such as money, fame and power. Conversely, internal goods are valued consequences or outcomes of actions which are inherently internal to the actions themselves. In other words, internal goods are valuable experiences that one achieves by being a participant of the practice. MacIntyre uses chess as an example of the distinction between internal and external goods. If children are given a candy every time they are engaged in a chess match, they learn to play for external goods. However, the experience of playing chess and learning to become a progressively better chess player renders the most satisfying reward to the player.

At best, meeting the challenge to become a better player becomes a *flow* experience,[17] whereby a person is fully immersed in a feeling of energised focus, full involvement and enjoyment in the practice. Likewise, in the context of academic work, a sustainable praxis refers to engagement in the academic practice as a value in itself, motivated by internal goods—doing research, living the life of a researcher. In sustainable academic praxis, scientific work itself renders the most important reward and satisfaction. Conversely, unsustainable praxis refers to instrumental action whose ends are mostly external to the means. The work is motivated by achieving better positions in the university hierarchy, obtaining funding, expanding publications lists and publishing in high-ranking journals.

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[16] MacIntyre, 2011.
[17] Csikszentmihalyi, 1975.

To understand the concept of sustainable academic praxis, we need to refer to the origins of the concept of 'praxis' itself. The concept is derived from the philosophy of Aristotle and is based on the two different forms of practical knowledge and their related dispositions. Aristotle identified two kinds of practical knowledge, both situational and embedded in personal experience. One form is *techne*, the craft-like skill and knowledge needed in the material world to produce objects or outcomes separate from the person producing them ('external goods' [18]). This knowledge advises *poiesis*-type action, which is 'making action'. The other form is *phronesis*, the moral disposition to deliberate and act wisely and prudently in the social world in order to enable and promote a good and flourishing life for humans—*eudaimonia*. The human action informed by *phronesis* is called *praxis*. In praxis, the goods achieved through action are typically 'internal goods'. In other words, whereas in *poiesis* the driving force of action is instrumental rationality, in *praxis*, humans are committed to promoting a good life for themselves and for each other, which is the supreme good.[19] When it comes to the academic form of life, sustainable praxis is not manifested as efficacy in acting, performing or making decisions in the context and situation at hand. Rather, it is judged over time and, more broadly, as being worthy of decency. In what follows, we exemplify and discuss contemporary constraints and challenges undermining academic work and research as sustainable praxis.

Quick fixes and instant delivery at McUniversity

In contemporary academia, life is fast-paced, and demands are voluminous and ambiguous. Urgency and impatience, high speed, unremarked entrances and exits characterise the traffic on the academic speedway. Prerequisites and conditions of knowledge production seem to have fully embraced McDonald's service and delivery practices—from fast food to fast science! This transition

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[18] McIntyre, 2011,
[19] Aristotle, 2003; MacIntyre, 2011.

has been conceptualised by Peck and Theodore[20] as 'fast policies'. What counts are 'ideas that work'. Fast policies are based on the rapid circulation of 'new policy ideas', fads and fashions that travel around the globe at social-media speed. This also applies to educational reforms and is manifested through policy borrowing and the use of 'one size fits all' models in the new context, regardless of geographical, economic, political, demographic or other differences. The fast circulation of decontextualised policies is enabled by a smooth transnational connectivity between policy-making arenas and modes of policy development in a perpetually accelerating and increasingly interconnected world. This also applies to higher education and academic work. Menzies and Newson,[21] among others, note that universities are no longer refugees from the mundane hustle-bustle slow zones 'for reading and reflection, critical dialogue and knowledge creation'. The practices of managerialism, accountability and quality assurance that have largely been adopted in universities are seriously undermining the traditional pace and rhythm of everyday academic life. Berg and Seeber[22] discuss the loss of well-being due to the pervasive time pressures and stress among academics at the 'corporate university' and emphasise time as the common factor in the 'values' of productivity, efficiency and competition.

> Productivity is about getting a number of tasks done in a set unit of time, efficiency is about getting tasks done quickly; and competition, in part, is about marketing your achievements before someone else beats you to it. Corporatization, in short, has sped up the clock.[23]

Besides the fact that corporatisation has led to the prioritisation of hot research topics and areas, it has infiltrated the academic mindset, affecting the way in which researchers think about and relate to their research practices and how they actually conduct their research. The quest for productivity and efficiency forces researchers to rush into findings and to focus on what is easily

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[20] Peck and Theodore, 2015.
[21] Menzies and Newson, 2007, p. 83.
[22] Berg and Seeber, 2016.
[23] Berg and Seeber, 2016, p. 8.

quantifiable and marketable. The hero-entrepreneurs at the corporate university have adopted efficient practices of time management and multitasking.[24] The 'good academic citizen' at the neoliberal academy is constantly able and willing to initiate new projects, accumulate research and/or development grants in line with strategies and priorities and to deliver rapid and instant answers to external stakeholders.[25] There might even be the occasional innovation. Moreover, maintaining the status of academic citizenry presumes the capacity for extensive publishing. The fact that published results are often preliminary and partial, and 'the maturity of the findings is either ignored, presumed, feigned, or hidden beneath layers of statistical significance', is of no interest.[26] This is the era of fast science with fast delivery. Research activities are to be performed—both in the sense of accomplishing and in the sense of presenting a task or function—in an entertaining manner. This is done without formulating and asking the inconvenient questions of what, how and why; without reflecting on sustainability; without claiming autonomy and expertise; without anchoring research activities in larger communities—within and outside academia. Meanwhile, slow professors cling to their academic agency and advocate scientific realism. Their aim is to restore their emotional and intellectual integrity and resilience by acting with purpose and by preserving time for collegial and collaborative deliberation, dialogue and reflection.[27]

Fragmentation of time and energy, enhanced by the multitasking made possible by ICT and mobile devices, affects both the productivity and work satisfaction of academics.[28] The time fragmentation and intensification of academic work are rooted in the neoliberalisation of higher education in various forms and techniques for governing, monitoring and evaluating research and

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[24] Berg and Seeber, 2016, pp. 14–32.
[25] Shahjahan, 2015, p. 492.
[26] Haigh, 2017, p. 1.
[27] Berg and Seeber, 2016, p. 11; Haigh, 2017, p.1.
[28] Ylijoki & Mäntylä, 2003.

teaching.[29] However, these techniques seem to contradict the very nature of academic work and forms of life. One prominent example of the McDonaldization of academic work are the so-called quality assurance procedures. Researchers appear to be deeply frustrated by the consequences of the techniques of new public management (NPM). Efforts aimed at managing the allocation of working time through an online database have led to bizarre outcomes. For example, in Finland, the software used for time allocation (e.g. Sole TM, Reportronic) recognises 7.35 hours of work every working day, no more, no less. However, academic work, including thinking and reflecting, is not something that can be atomised in this instrumental and fragmentary manner. One cannot stop thinking or discussing after one leaves the office. A counterweight is that, sometimes, you are not at your best in your office at a given time; you might be elsewhere doing something else. As a result of this fluidity in academic work, researchers put imaginary decimal numbers in the database, while in reality, they work almost regardless of the clock. This takes place at the same time as academics widely discuss the ethics of doing science and when the McDonaldization of the university, ICT and global networks result in new possibilities and forms of misconduct in research.[30]

It is essential to ask what kinds of impacts these kinds of systems and techniques have on the ethical foundations of academic work. The time allocation system represents a kind of double bookkeeping, whereby academics are forced to knowingly enter fictitious figures into the database. This has definite and profoundly demoralising effects on academic work. The parallels with the former Soviet Union's dual economy are obvious. It is paradoxical that the reforms underlying neoliberalism parade as human freedom and the abundance of options. When applied to academic work, however, the opposite seems true. Neoliberalism is based on the view that competition enhances and restructures human practices. In this line of thought, the market is expected to constitute a self-regulating system in which individual actors find

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[29] Shahjahan, 2015, pp. 488-489.
[30] Varantola, 2012.

their place in the economy according to the laws of natural choice; individuals compete with each other in the same way as the evolution of stronger species take precedence over weaker ones.[31] There is obviously a cold logic in neoliberalism. The indicators used (e.g. the number of degrees, publications) show that the scientific "production" is increasing . According to existing statistics, scientific work is made more effective along with NPM. Yet, what else is on this track? It seems that it makes people cynical, and they begin to treat others in an instrumental way. At the same time, neoliberalism seems to bring about alienation, anxiety and depression.[32]

Slow research

> Science needs time. It needs time for thought, time for reflection, time for making mistakes and more time for correcting those mistakes. It develops slowly. Years of churning at the same material maybe punctuated by rare and unpredictable leaps of insight like those described by Kuhn (2012). However such insights emerge as the consequence of hard won field trial and long experience.[33]

Haigh's statement relates to applied environmental sciences. He presents two case studies, a 15-year study on landslide magnitude and frequency in Himalaya and a 10-year study on the effects of the use of land fertilisers in South Wales. Both studies underline the importance of slow and patient long-term research. In the case of land fertiliser use, data collected 10 years after adding fertilisers during tree planting suggested opposite conclusions compared with 'a snapshot' after two years. In the long term, adding fertilisers proved to be worthwhile.

Haigh contextualises his case studies within slow science, advocating patience, carefulness, receptiveness, reflection and mindfulness—a sustainable research praxis. He updates the

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[31] Hayek, 1945; Hilpelä, 2004.
[32] Hilpelä, 2004; Julkunen, Nätti and Anttila, 2004.
[33] Haigh, 2017, p. 1.

branches of slow movement [34] to include slow *living*, slow *marketing*, slow *technology*, slow *geography*, slow *journalism* and slow *television*. Slow *science*, as initially formulated in appeals and manifestos on the internet, relies on the idea of a slow, calm, quiet and curiosity-driven research based on independent and critical inquiry at the service of society and human kind as a whole.[35] Slow science relies on the inherent values of research, researchers and the academic form of life as sustainable praxis. The novelty and creativity of research findings might be by-products of the researcher being absorbed in an enjoyable and satisfactory manner in research practices. Slow science relies on a collective praxis, dependent on wondering, thinking, discussing and sharing in recurring cycles. Time and space are the essential resources for exercising professional judgement, for imagining (radical) alternatives, for critical playfulness and for 'exposure to diversity and difference regarding ways of seeing and being in the world'— the attributes of solid creative scientific work.[36]

We are well aware that slow science might, at first glance, depict itself as a resurrected grandmother in a rocking chair, the lost romantic stranger in 'the publish or perish culture' of contemporary academia. Still, at a time when the number of publications are to be maximised (by presenting preliminary and partial results), peer reviews written in haste, research projects and grants tightly scheduled and performance strictly targeted, slow science founds itself on a view that true creativity and new insights are nurtured in peace at a slow pace. Science worthy of its history, institutions, methodologies and contributions to the development of humanity is based on loose schedules that allow, at times guide, us to pursue the side paths of the stray. There is always plenty of time for long reflective walks and enjoyment of the fragrance of roses. Substantial and sustainable research findings might be a combination of fumbling, making serious mistakes, in-depth reflection, collegial dialogue and recurrent interpretations and

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[34] E.g. Honoré, 2004.
[35] E.g. Slow Science Academy, 2010,
https://www.petities24.com/slow_science_manifesto.
[36] Mahon, Heikkinen and Huttunen, 2018, p. 9.

analysis. Scientific work performed in this manner reminds us of both the English and Swedish etymology of the word research. In English or French (*recherché*), it actually refers to the 'act of searching closely'. In the Swedish concept, 'undersökning' gives the impression of finding something valuable beneath the surface, underneath what we are able to see with our eyes (under = under; söka = search).

The outcome of the abovementioned logic of reasoning might intimate that slow science is favoured by pre-modern, romantic and soft humanists. Paradoxically, however, the concept was invented within 'the hard sciences', medicine and information science. The concept of slow was, arguably, first used by an information scientist Ernst A. Garfield.[37] The irony is that he is also the 'father' of the bibliometric and is, therefore, liable for the 'impact factor'.[38] In Garfield's view, slow science relates to quiet, persistent and invisible everyday work. It does not result in a number of publications or exhaustingly long curriculum vitaes. It is rooted in quality, matured through slow research processes. Garfield used the discovery of DNA (deoxyribonucleic acid) in the late 1940s as an example of slow science. The breakthrough relied on protracted, intermittent and exhausting scientific work, from which the number of publications was initially very low. When the results were finally completed, DNA became a scientific breakthrough. Similar examples can be drawn from the recent history of science, for example, the development of analytical techniques or bootstrapping in statistics.[39] Nobel Prize winners are rarely young academic career missiles; rather, they are generally true academics who have done persistent work, and in most cases, they have retired from their academic posts. An example is Peter Higgs, a Nobel Prize laureate from 2013, who presented, together with his colleagues, the first paper on the topic of Higgs boson in the early 1960s. Biochemist Lisa Alleva [40] is another early proponent of slow science. She rediscovered 'the traditional ideal',

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[37] Garfield, 1990.
[38] Gosselain, 2011.
[39] Anon, 2015, p. 5.
[40] Alleva, 2006.

the very basic principle of making science, in a small laboratory. Alleva and her colleagues had the possibility and freedom to formulate the starting points and research questions by reviewing the literature and exploring earlier studies within the field in a slow, thoughtful and thorough manner. Thereafter, they planned their experiments with great care and executed research strategies with prudence. They did not plough through genomes with a desire for discovery. Instead, they formulated a theory, executed experiments and, finally, tested the theory—performing a sustainable research praxis.

Slow teaching

For the hero-entrepreneur scientists at the corporate university who are teaching and giving classes as a must-do duty, a task distinctive from and interfering with 'truly productive' research activities, this means application and publication activities. Within the neoliberal discourse of higher education, learning is conceptualised in terms of learning outcomes, as a product or process leading to behavioural changes or accumulation of human capital, which ought to be accomplished, evaluated and measured as interchangeable units of performance.[41] Slow researchers relate to teaching—that is, the reciprocal and collaborative construction of research-like learning environments based on enthusiasm, inspiration, pleasure, playfulness, authenticity and a sense of belonging—as a site for testing ideas and plans for research and/or contemplating existing bodies of knowledge in intellectual collaboration with students. In our view, slow teaching is not about 'giving' students more time to read, think, explore and learn. It goes beyond a linear concept of time, time being understood and handled as a resource. Slow teaching focuses on being present, on the quality of attention enhanced by collective self-awareness and self-reflection. Further, slow teaching embraces listening, pondering, pacing and narrating.[42]

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[41] Shahjahan, 2015, pp. 497-498.
[42] Berg and Seeber, 2016, pp. 40–49; Hart, 2004, pp. 5–9.

Berg and Seeber, [43] alongside Shahjahan, [44] question the contemporary discourse of teaching and learning within higher education, firmly anchored in the duality of mind and body. Within a mind-centred framework, learning is understood merely as a cognitive activity taking place in a transcendent brain. Classes are inhabited by quiet, individual, immobile, silenced bodies, invisibilized for the sake of focusing on producing, perceiving and interpreting the 'word'. [45] Slow teaching recognizes the embodiment of knowing as well as the contextual, situational and physical enablers and constraints of being present, involved and engaged in the human interaction labelled as 'teaching' in higher education. Slow teaching acknowledges the importance of sensations, emotions and sensory ways of knowing. It nurtures presence, attention and focus by ritualising learning through exercises in relaxation, deep breathing, silence and listening. Bodies can be reconnected into the classroom by the use of music, drama, humour and other sensory experiences. The process of dislodging the personhood that is characteristic of the neoliberal corporate university, grounded in thinking on scarcity, has to begin with a new vision of researchers, teachers and students.

> Slowing down disrupts a subjectivity that ties time with rationality or productivity, or, more importantly, with being civilized or modern. It is about inviting abundance thinking in the present and the focus on our bodies now for its own intrinsic value as knowledge producer, rather than later, or for some extrinsic value. [46]

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[43] Berg and Seeber, 2016, pp. 33–40.
[44] Shahjahan, 2015, pp. 497-498.
[45] Shahjahan, 2015, p. 495.
[46] Shahjahan, 2015, p. 498.

Slow science as an open, collective and public praxis

A slow scientific process includes surprising and unpredictable findings. Although careful planning is essential, the research process may reveal a whole new range of perspectives. As a result, the research direction might be changed in part or even completely. Such unpredictable factors are well-recognised in the tradition of action research within the field of education. Corey,[47] the pioneer of action research, emphasised that there should be an opportunity to change the original issues addressed in the original plan so that the research can reflect the complex, transformed reality. Whyte[48] uses the term 'creative surprises' for these unexpected emerging findings and ideas. McNiff, Lomax and Whitehead,[49] in turn, describe the natural by-paths as 'side-spirals'. Discovery of something unexpected refers to 'serendipity'. [50] However, Liedman[51] emphasises that serendipity is not only a matter of good luck; discoveries are dependent on wisdom, curiosity and concentration. Otherwise, the explorer would not know that the findings are rare.

Besides openness to surprising and unpredictable findings, the tradition and practices of action research underline the importance of respectful communication and collaboration, both within the community of researchers and between individual researchers and practitioners. Collective praxis in academia, as experienced and described by Smith, Salo and Grootenboer,[52] nurtures a sense of belonging, meaningfulness, togetherness, trust and solidarity. It is a 'capacity building model of intellectual engagement that builds communication and partnership'. It stems from 'the desire of like-minded professionals to overcome the dissatisfactions and addresses issues that threaten their personal praxis'.[53] The pressure

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[47] Corey, 1949.
[48] Whyte, 1991.
[49] McNiff, Lomax and Whitehead, 1996.
[50] De Sousa, 2011.
[51] Liedman, 2001.
[52] Smith, Salo and Grootenboer, 2010.
[53] Ibid., 63.

of effective production, combined with the fragmentation of academic work processes, results in temporal alienation and superficiality, both in terms of academic handicraft and the social interactions included in it.[54] Personal praxis becomes disconnected from collective praxis. The very basis and means of making science as a collective endeavour is lost, without the possibility of processing ideas and training argumentation and without making deeper meaning by listening and participating, criticising and interrogating each other.[55] It is important to note that original and innovative deliberative communication and action require, in addition to horizontal relations, recognition and the inclusion of diverse interests, perspectives, interpretations and identities. Multiple voices, as in the case of the ideal of study circles,[56] such as Keijo Räsänen [57] and his colleagues, use the concept of 'academic praxis in emergence' as an outcome whereby researchers perpetually articulate and negotiate somewhat coherent answers to three questions, each representing one of three stances: tactical (*how to do this?*), political (*what to accomplish and achieve by doing this?*) and moral (*why aim at these goals in this manner?*).

Openness and transparency in research, not just within academia, but also in the public sphere, is related to the three questions above. In an era of social media, researchers have opportunities to present, discuss and, at times, refine their work in progress openly and in communication with the public. Information scientist Erik Proper[58] argues for replacing the practice of *publish-fast* with that of *observe-think-debate-experience-debate-think-debate-publish*, in which some of the deliberations take place outside academia, for example, in the blogosphere. In this field of research, fundamental questions and problems need to be articulated in collaboration with practitioners and users over an extended period. Winfield[59] argues that slowing down and publicly debating

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[54] Menzies and Newson, 2007.
[55] Smith, Salo and Grootenboer, 2010, pp. 63–65; Gosselain, 2011.
[56] Larsson, 2001.
[57] Räsänen, 2008.
[58] Proper, 2009.
[59] Winfield, 2011.

ongoing research has benefits. First, it enables a collective acknowledging and understanding of the ethical and societal impacts of the research in progress. Second, it likely enhances the awareness of the unintended consequences of the research at hand. Open science conducted in a peaceful manner can also result in increased trust between academia and the public. Ongoing communication can make the popularisation of science redundant and complement the teaching of science in schools and universities. Still, the conditions for presenting scientific work in progress and refining it in public spheres, such as social media, have become a true challenge. In times of fake news and trolling, when emotionally charged, delimited and strongly exaggerated personal, political and nationalistic claims and viewpoints form the agenda of public interest and discussion. Communication and learning in a sustainable collective praxis requires listening skills. Welton[60] identifies learning to listen as one of the main challenges of the pedagogies of civic education. The capability of listening to others is actually not self-evident. Contemporary Western knowledge culture and mass media society are not equipped with a sensitive ear for dialogue. The erosion of solidarity in the lifeworld weakens our ability and willingness to listen and, thus, communicates at a pace that enables meaning-making and sustainable human development.

According to Denzin and Lincoln,[61] creative scientific work is at best a 'bricolage': it is a creative and free combination of various things. 'Bricolage' presupposes divergent thinking, allowing participants to combine and play with things in an unprejudiced way. Bricolage is about crossing conventions and boundaries. The word 'bricolage' comes from the French language and means a kind of work in which materials of different types are put together. Scientific breakthroughs often involve this kind of emergence, which is based on a creative playfulness. Emergent systems generate results that are greater than the sum of the elements involved. At best, in a scientific emergence, different and complementary expertise come together and challenge and

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[60] Welton, 2002.
[61] Denzin and Lincoln, 2005.

complement each other in a ground-breaking manner. Collaborative emergence creates a high-performance process that is beyond planning and management. How, therefore, does the NPM of universities enable emergence? We are very sceptical of whether this question can be answered. One of the best facilitators of emergency is freedom. Researchers must therefore be encouraged to partake in informal interaction and free-form play with new ideas. Freedom allows new associations and perspectives in which alternative interpretations and inventions may arise. New openings often take place in informal situations, not necessarily meant to be included in research projects.

Slow Time

Even if technology makes life comfortable and fast-paced, the human brain has its own pace, not to be rushed beyond its capacities. An urgent question is how fast can a human being think? O´Carroll[62] argues for a dual temporal existence. Beyond the rationalist discourse characteristic of industrial work, in which time is represented as quantitative, organised and manageable, there is another temporal reality. In this reality, time constructs itself as a qualitative, lived variable, encompassing thought, imagination and sociability. In organisations such as universities, socially shared perceptions of time function both as external constraints and as cultural resources. Academics organise their experiences, make sense of their lives and themselves and relate to their work through a multitude of temporal aspects and dimensions. In the study of Ylijoki and Mäntylä [63] on time perspectives in academic work, the authors identify four complementary and contradictory time perspectives. 'Scheduled' and 'contracted time' relate to rationalist, organised and manageable time. 'Personal time' relates to human existence and life as a whole, the life cycle from birth to death and the question of what is a good life. The meaning of work and life for a person

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[62] O´Carroll, 2008.
[63] Ylijoki and Mäntylä, 2003.

is reflected in his or her closest social relations among family members and relatives as well as in the physical and mental coping of academics. It is a question of whether they can have time to rest and whether they can live some life moments without research. The fourth time dimension, [64] 'timeless time', relates to the capability of academics to throw themselves into the natural flow of time:

> Timeless time is not subjected to any kinds of external pressures and demands. […] it refers to internally motivated use of time in which clock time loses its significance. In this sense timeless time involves transcending time and one's self and becoming entirely immersed in the task at hand. […] long working hours […] stem from academics own enthusiasm, fascination and immersion in their work. […] this time perspective is devoted to academic research, especially to reading, writing, thinking, and having intellectual discussions in peace and quiet. Based on autonomy and freedom, academic research is characterized as being carried out beyond all mundane concerns and temporal limitations.

In her study on time in the knowledge industry, O´Carroll [65] identifies 'intangible time', which is simultaneously connected and disconnected to timeless time. It refers to the unconscious processing of information and ideas taking place while doing something other than working. Intangible time is peripheral to core activities identified as work. It can be brought about during physical exercise or when relaxing while taking care of one's duties beyond work. Intangible time also reminds us of the importance of hobbies. The concept of 'hobby' is etymologically related to children's toyhorse (*hobyn*) and connected to a notion of an 'activity that doesn't go anywhere'.[66]

Slow science – for a life worth living

The principles and practices of slow science are slowly expanding within research. Yet, they are meaningful and relevant to human togetherness and sustainable living in general. The ultimate

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[64] Ibid., p. 62.
[65] O´Carroll, 02008, pp. 185–187.
[66] Online etymology dictionary.

purposes of the slow movement are the promotion of sustainable local lifestyles, balance between humans and nature and a defence of the life world. Paradoxically, slow science might actually produce quick scientific breakthroughs. However, there has to be both time and space to be able to wonder beyond quality systems, action plans and work packages. Slow science is deliberative, open and public. It offers new opportunities for outreach work and sustainability. It is non-profit and co-operative, nurtured by activities and discussions, beyond traditional institutions, on open platforms of various kinds. Slow science is genuinely critical and is based on sustaining trust. It is about learning to understand oneself and one's own pace and living in accordance with one's limitations and possibilities. It is also a question of leadership and understanding that human beings differ and that the demands on them, therefore, have to be different.

The slow scientific ideal is reminiscent of Aristotle's idea of a good life—*eudaimonia*—which he presents in *Nichomacean Ethics*. For Aristotle, the three most favoured lives are the life of gratification, the life of political activity and the life of study. The work of a researcher is a lifelong inquiry into the world and human being, with the aim of reaching the good life, one that is worth living. According to Aristotle,[67] human *happiness* or whether one has lived a *good life* (*eudaimonia*) can best be evaluated posthumously. Many of us seem to achieve and perform a great deal during our lives, but only time will tell which acts and ideas were good, durable and worthy of adoption. Only time will prove whether a person contributed to a good life for mankind and humanity during her or his lifetime or whether his or her lifetime was taken up with trivial pursuits. Time is the most objective assessment of sustainable praxis, including in science. Nature has its limits, and so does the human capacity, since human is nature.

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[67] Aristotle, 1999.

Endnote

This essay develops, extends and updates arguments and perspectives on slow science, published earlier by the authors. In Finnish Salo, P. & Heikkinen, H.LT. (2010). Slow Science: vaihtoehto yliopiston macdonaldisoitumiselle. Tieteessä tapahtuu, nr. 6/2010, 28-31. In english Salo, P. & Heikkinen, L.T. 820119. Slow Science: an alternative to macdonaldization of the academic lifestyle. Available on-line:
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