The understanding and meaning of knowledge transfer for research and education

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Leibniz Association

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THE UNDERSTANDING AND MEANING OF KNOWLEDGE TRANSFER FOR RESEARCH AND EDUCATION IN THE CONTEXT OF A GREAT TRANSFORMATION

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Abstract
Knowledge transfer between universities and society, as well as the social commitment of universities ('third mission'), are coming increasingly into the focus of public attention and of science policy (section 2). The central role of universities in supporting search and learning processes in society, as well as the need for a change in mindset towards (more) sustainable development, are also emphasised in the context of the Great Transformation towards greater sustainability (section 3). At present, the two strands of discussion are largely unconnected. This article outlines the basic aspects of both fields of knowledge. This demonstrates that the basic understanding is the same in both areas: they share an understanding of knowledge transfer based on recursive exchange processes between science and society, which ideally entail the joint generation (co-production) of knowledge which can be linked both to science and to practice. However, there are 'blind spots' which will be illuminated by focusing on transformative education, an area still marginalised in the debate about transformation. Philosophical and educational reflections (section 4) demonstrate that deeper cultural and individual values, as well as holistic worldviews – i.e. based on the unity of humans, nature and culture – appear to be suitable key orientations for radical transformations towards sustainability. From the authors' perspective, the communication of normative target/orientation knowledge and its scrutiny in scientifically-grounded debates in line with a transdisciplinary understanding of science – in combination with a reflection on the values and mindsets embedded in a holistic education in relation to the environment or values – represents a central 'hinge' for knowledge transfer and for the path from knowledge to action. These aspects are currently underrepresented and deserve more attention in research and development.

Keywords
Third mission – transfer as recursive exchange – transformative research/education – shift in consciousness/shift of mindsets – transformative literacy – transformative learning – change agents – values education – worldviews

1 Introduction

Together with the increased value placed on knowledge and innovation in the economy and society, the transfer of knowledge by universities to the social, cultural, economic and political spheres, as well as social engagement, are coming increasingly into the public focus. Yet the discussion about the transfer of knowledge from universities is not new: the social mission of the university played a role in the founding of the world's oldest university, the University of Bologna, in 1088 (Conway/Humphrey/ Benneworth et al. 2009). There has been intense discussion since the 1980s, particularly in the fields of regional economic research and, in connection with this, in science policy, to the effect that universities should fulfil social tasks that go beyond their core tasks of teaching and research. Thus, the 'promotion of knowledge and technology transfer' is now an explicit task of universities according to section 2(7) of the German Higher Education Framework Act *(Deutsches Hochschulrahmengesetz, HRG*). This 'third mission' is regarded as a core task alongside research and teaching (*WR* [German Council of Science and Humanities] 2016: 5 with reference to *WR* 2013: 25).

In parallel to the regional economic and science policy developments, the expert report by the German Advisory Council on Global Change (*Wissenschaftlicher Beirat der Bundesregierung Globale Umweltveränderungen, WBGU*) on the 'Great Transformation' (*WBGU* 2011) also injected a significant impulse into the debate. In this report, the German Advisory Council on Global Change explicitly referred to the central role and responsibility of universities and the scientific field in supporting the knowledge-based social search processes to support the targeted shaping of sustainable, future-proof societies, and proposes extensive further developments. It recommends 'four transformative pillars of the knowledge society' (ibid.: 21), which establishes both targeted research and education about transformation processes (transformation research and education) and active participation in shaping them (transformative research, education) and interlinks them. To achieve this, a new form of interaction between politics, society, science and the economy is required (ibid.: 24-25). In *The Great Mindshift* (2016), Göpel additionally points out the necessity of a fundamental, radical shift in consciousness.

The two lines of discussion about knowledge transfer and the third mission on the one hand and the contribution of universities to shaping sustainable development within a Great Transformation on the other are still conceptually largely unconnected. The present article aims to outline fundamental viewpoints on the understanding and meaning of knowledge transfer from both fields of discussion, i.e. from regional economic research and science policy (section 2) and from transformation and transformative research and education. For the latter, we will focus on transformative education, which is still underrepresented in the scientific discourse (section 3). This is connected with holistic education approaches, which fundamentally also re-

quire a critical reflection on worldviews, values and mindsets in relation to a radical or 'great' social transformation towards sustainability. This will be substantiated and illustrated through a philosophical and educational lens (section 4). In conclusion, we will summarise the current desiderata regarding further research and development (section 5).

2 Knowledge transfer in science policy

The understanding of knowledge transfer in science policy is characterised by an understanding of the notion of transfer that has been discussed in regional economic research from as early as the 1980s. Whereas the concept of transfer initially predominantly referred to the transfer of technology and, in this connection, the relationships between universities and the economy, it is now interpreted more broadly as the transfer of knowledge between universities, the economy and society. A more precise definition is provided by a position paper published by the German Council of Science and Humanities (*Wissenschaftsrat, WR*) on knowledge and technology transfer (*WR* 2016, with reference to *WR* 2007, 2013). According to the etymological origin of the word *transfer* (Latin *transferre*, to put across or convey), as well as the everyday understanding of the term, in the scientific context it generally means the transfer of knowledge from its formation or generation to its application/use. This can 'be an application of knowledge in a new context, but also the use of explanatory knowledge for the development of technologies or the transfer of knowledge from the institutions of the scientific system into other areas of society. These different connotations are also reflected in linguistic usage when scientists or those interested in scientific knowledge speak of "transfer"' (translation of the original German quote; *WR* 2016: 9).

Also closely connected to the current debate about knowledge transfer is what is known as the *third mission* of universities. The third mission refers to the role of universities in relation to society and goes beyond the core performance areas of teaching and research (the 'first' and 'second' mission). In the assessment by the German Council of Science and Humanities, the discourses about transfer and the third mission significantly overlap but also require clarification (*WR* 2016: 8 et seq. [FN 9]). Generally, there has been no clear differentiation to date between the terms and concepts of transfer and of the third mission (e.g. Nölting/Dembski/Kräusche et al. 2018); accordingly, they will be used synonymously in the following text.

In particular, two projects funded by the Federal Ministry for Education and Research (*BMBF*) for performance evaluation and operationalisation currently provide an orientation for the science policy discourse about the third mission at a national level: the 'FIFTH – Facets and Indicators of Research and the Third Mission at Universities of Applied Sciences' project by the Centre for Higher Education (*Centrum für Hochschulentwicklung, CHE*), which focuses on universities of applied sciences[1], and the 'Be-Mission' project by the Institute for Research on Higher Education (*Institut für Hochschulforschung, HoF*) at Martin Luther University Halle-Wittenberg, which relates to

1 http://fifth-projekt.de/english.html (6 May 2021).

all types of universities[2]. Both of these also offer definitions and overviews of the developmental history of the concepts (Roessler/Duong/Hachmeister 2015; Henke/Pasternack/Schmid 2016, 2017).

Henke/Pasternack/Schmid (2016, 2017) systematise and illuminate the various origins of the third mission debate with regard to new and expanded tasks in addition to the traditional university tasks of teaching and research. Approaches such as transformative science and the sustainable university are also mentioned here for the first time (Henke/Pasternack/Schmid 2016: 36 et seq.), but do not reappear in the subsequent operationalisation. In this respect, the discussions are still in the early stages (for more on this, see Kanning/Richter-Harm 2018).

When seeking a general definition of the third mission/transfer among all the different approaches and expectations, this refers – in relation to the pioneering European project 'European Indicators and Ranking Methodology for University Third Mission' (E3M) – to services 'which lead to a beneficial interconnection between the university and its extramural environment by means of reciprocal interactions in relation to transfer and human capital. The third mission comprises [...] services [...] by universities which have a direct impact on society and the economy, as well as currents and movements emanating from the economy and society which, in turn, have an impact on universities' (translation of the original German quote; Roessler/Duong/Hachmeister 2015: 39).

This broad understanding of the term is linked to two central insights: firstly, *transfer is understood as a recursive exchange* of knowledge (cf. also *WR* 2016; Froese/Mevissen/Böttcher et al. 2014). This goes hand in hand with the understanding of *recursive innovation processes* which has developed in (regional) economic transfer and innovation research since the 1980s. Accordingly, innovation processes are usually characterised by a high degree of collaborative interactions involving the participation of numerous people and institutions. More recent innovation research particularly emphasises the importance of diverse recursive interaction processes between the economy, science and policy (e.g. Kline/Rosenberg 1986; Schmoch 2000; *WR* 2007: 16).

Secondly, *society is mentioned as an important target group and stakeholder in addition to the business community.* This corresponds to the recommendations by the German Council of Science and Humanities, which states in its position paper on knowledge and technology transfer that it will be necessary in future 'to apply scientific knowledge as broadly as possible in cooperation with all stakeholders in society, including economic partners' (translation of the original German quote; *WR* 2016: 35 et seq.).

In this context, the German Council of Science and Humanities refers to a heuristic model developed by Froese/Mevissen/Böttcher et al. (2014) for non-university institutions in social sciences research for the analysis of knowledge transfer; in the

2 https://www.hof.uni-halle.de/projekte/bemission/ (06 August 2018).

authors' opinion, this relativises and expands the existing notion of linear transfer and innovation processes in which researchers pass on their knowledge unidirectionally to practical stakeholders (ibid.: 5; see Fig. 1).

In the process model, knowledge transfer processes are considered analytically in the context of knowledge generation, knowledge use and types of research. However, the authors wish to point out that these are interconnected in research practice. The basis for the model is the assumption that knowledge transfer processes are already influenced by knowledge generation and that this influence has an effect right up to the use of knowledge by different user groups. For the production of knowledge, it is crucial to look into how research questions are developed and to what extent problems that occur in practice are addressed (Froese/Mevissen/Böttcher et al. 2014: 4 et seq.). Froese/Mevissen/Böttcher et al. base this understanding on pioneering contributions to transdisciplinary research (Bergmann 2010; Bergmann/Schramm 2008) (ibid.: 4), with the result that this recursive understanding of transfer contains the first references to the field of transformative research (see section 3).

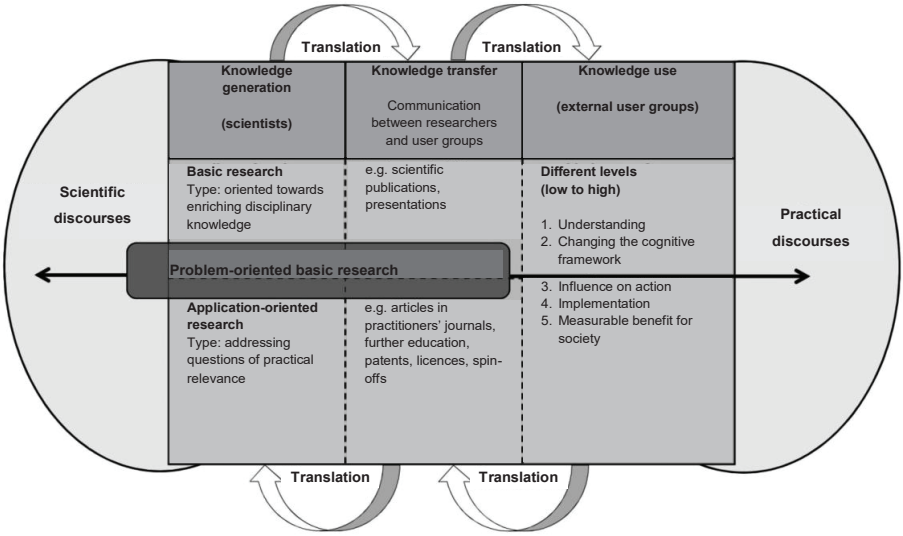

Fig. 1: Process model for knowledge transfer / Source: Froese/Mevissen/Böttcher et al. (translation of the original German figure) 2014: 5

In many cases, a corresponding bidirectional or multidirectional and recursive exchange between stakeholders from science and from different areas of society also encompasses recursive processes relating to the translation of scientifically generated findings into an understandable, accessible and practicable form for partners outside of science, and in return, the translation of non-scientifically generated questions and problems into research questions. This enables practical questions and problems to be transformed into scientific questions and thus become linked to the specialist knowledge, methods and the approaches of various disciplines (*WR* 2016: 11).

According to this understanding, knowledge transfer is therefore characterised by diverse reciprocal/recursive exchange processes between science and society. Ideally, it includes the joint production of new knowledge (*co-production*), which can be linked to both science and practice. This is particularly significant for the transformation of society towards sustainability (see section 3). However, the knowledge policy discussion still reveals differences of understanding in this respect. An example is the 2017–2020 project known as BePerfekt, sponsored by the Federal Ministry for Education and Research and implemented by the Potsdam Institute for Climatic Impact Research (*Potsdamer Institut für Klimafolgenforschung*) in cooperation with the Karlsruhe Institute of Technology and the Helmholtz Centre Dresden-Rossendorf (HZDR). Its aim is to develop educational tools and to empower people and teams in transfer structures in universities, non-university research institutions and, if applicable, also in businesses (not in society).[3] Although it refers to the previously outlined process model, the project modifies it at a crucial point: the analytical separation put forward by Froese/Mevissen/Böttcher et al. 2014 into knowledge producers (science) and knowledge users (society, politics and the economy) is retained for the concept of transfer services. Knowledge transfer is simply interpreted as the translation of scientific findings and thus remains within a unidirectional understanding of transfer, which is precisely what needs to be overcome.

3 Knowledge transfer in transformation and transformative research and education

The contributions to recursive knowledge transfer processes outlined above correspond to the conceptual proposals for the further development of the scientific system that has become established in transdisciplinary science (*ProClim* [Forum for Climate and Global Change] 1997; Brand 2000; Becker/Jahn 2006; Bergmann 2010; Jahn/Bergmann/Keil 2012 – for an overview see Pohl/Hirsch Hadorn 2008). This is linked to a new understanding of science which is no longer based on freedom from value judgements but is geared towards the specific problems of society. This requires disciplinary boundaries to be transcended and a paradigm change towards a 'post-normal science' (Funtowicz/Ravetz 1991); as distinct from 'normal science' ('Mode 1'); this is also described as 'Mode 2' (Nowotny/Scott/Gibbons 2001; Mittelstraß 2003). Cooperation between scientific and non-scientific stakeholders is intended to generate 'socially robust' knowledge (Scholz 2011). Conceptually, this transdisciplinary understanding of science largely corresponds to the approaches of analytical-descriptive *transformation research* and actively structuring *transformative research* (*WBGU* 2011; Geels 2002; Scholz 2011; Schneidewind/Ernst/Lang 2011; Schneidewind/Singer-Brodowski 2013; for an overview see Wittmayer/Hölscher 2017), which are needed to shape sustainable development processes.

Although the normative orientation of the guiding principle of sustainability in the scientific landscape has sparked a heated debate about whether science is not obliged

3 https://www.beperfekt.de/about/was-ist-wtt/ (18 January 2019).

to be 'pure' science in the sense of Humboldt,[4] transformation research and transformative research on the basis of a transdisciplinary understanding of knowledge are relatively highly developed. Despite the different positions with regard to the normative orientation, underlying value judgements and normative settings should always be disclosed and reflected on critically (cf. Mittelstraß 2018; Grunwald 2018; Strunz/Gawel 2018).[5] A systematic foundation for the integration of knowledge from science and civil society on the basis of analytical findings and normative value judgements is offered by the three dimensions of knowledge developed within transdisciplinary science: system knowledge, target/orientation knowledge and transformation knowledge (see Fig. 2).

In comparison with research, the field of *transformation and transformative education* is still in its infancy. Although there are current, basic theoretical foundations from different disciplines (e.g. pedagogy, sociology), educational goals in connection with social transformation remain marginalised in practice, which means that the path to concrete implementation in educational institutions is still a long one (Singer-Brodowski/Beecroft/Parodi 2018). The first approaches for universities and schools were formulated in the context of the UN Decade of Education for Sustainable Development 2004–2015 (DESD).[6] These were initially aimed predominantly at the transfer of competences which enable people to participate actively in planning sustainable development processes (above all, *Gestaltungskompetenz* according to de Haan 2007). The UNESCO Global Action Programme on ESD (2015–2019) which followed on from the UN decade expanded this objective even further, particularly to school education, and in addition to societal transformation as a dimension of ESD (UNESCO 2014: 12), it firmly characterised teachers and facilitators as 'powerful agents of change' (ibid.: 20) for ESD. This led to the discussion of an orientation towards 'transformative literacy', which can be generally described as the ability 'to understand transformation processes adequately in their multidimensionality and to contribute to them through one's own actions' (translation of the original German quote; Schneidewind 2013: 120). It can be viewed as a 'way to increase social reflexivity when observing and contributing to transformation processes' (translation of the original German quote; ibid.: 139). With reference to the transition cycle (see Fig. 2), the three knowledge

4 On the two opposite poles, see Schneidewind (2010), the President and Scientific Director of the Wuppertal Institute, and Strohschneider (2014), as well as the German Council of Science and Humanities in a mediating capacity (2015).

5 In this context, one might also refer to the 'reflective framework for socially responsible research' (*Reflexionsrahmen für Forschen in gesellschaftlicher Verantwortung*) (Ferretti/Daedlow/Kopfmüller et al. 2016), which was developed jointly by three large non-university research institutions: the Fraunhofer Society (*Fraunhofer-Gesellschaft*), Helmholtz Association (*Helmholtz-Gemeinschaft*) and Leibniz Association (*Leibniz-Gemeinschaft*), as part of the joint research project LeNa sponsored by the Federal Ministry for Education and Research. This aims to provide orientation as to how responsible research should look, and not to prescribe dogmatically what should be researched (ibid.: 5).

6 Further information on education for sustainable development can be found, for example, in Barth/Michelsen/Rieckmann et al. (2015), Stoltenberg/Burandt (2014), Buckler/Creech (2014), https://www.hochn.uni-hamburg.de/en/2-handlungsfelder/03-lehre.html; examples of good practice include the German Commission for UNESCO e.V. (*DUK*) (2011, 2013), Weisser/Geibel (2016), ISCN (2017). General information on education for SDGs can also be found in the publication on 'Education for Sustainable Development Goals', published by UNESCO (UNESCO 2017).

dimensions mentioned above should be taken into account in knowledge transfer processes (Singer-Brodowski/Schneidewind 2014: 131).

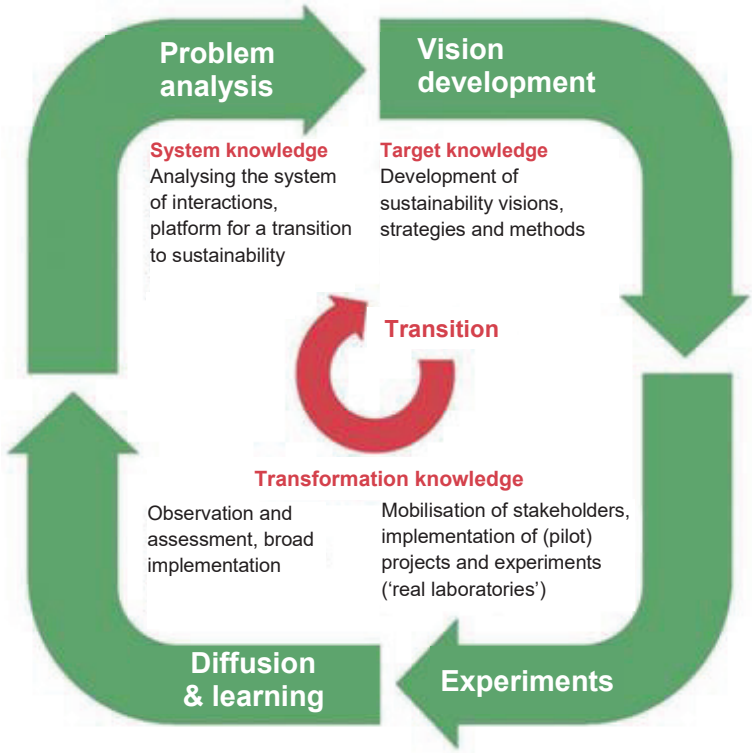

Fig. 2: Transition cycle / Source: Meyer 2018b: 27 after Brüggemeier/Scheck/Schepelmann et al. 2012: 31; Loorbach 2010: 173; Singer-Brodowski/Schneidewind 2014: 135 (translation of the original German figure)

For academic teaching/education, Wiek, Withycombe and Redman (2011) emphasise five key competences: competences in systemic thought, strategic thought and action, interpersonal cooperation, and anticipatory and normative competence. From a methodological point of view, learning by trial and error and reflexive learning are considered particularly significant (Michelsen/Adomßent 2014: 44 with reference to Martens 2006, Kemp/Martens 2007). With regard to transformative science Schneidewind and Singer-Brodowski (2013) also point out that in addition to transferring system knowledge, universities, too, should place a greater focus on acquiring target and transformation knowledge (with regard to the significance of real laboratories, e.g. Singer-Brodowski/Beecroft/Parodi 2018). In connection with target knowledge, particularly worth discussing is the paradigm of economic growth (SDG 8), which critical economists have already been referring to since the late 1960s and early 1970s (Boulding 1966; Daly 1996) and are currently expanding in relation to the sustainability guiding principle to include post-growth (Paech 2005; Seidl/Zahrnt

2010) and degrowth[7] approaches. Even today, more than 40 years after 'The Limits to Growth' (Meadows/Meadows/Randers et al. 1972), the replacement of the neo-classical growth paradigms is still deemed the (most) important key to societal transformation: '[...] the most critical aspect for turning the wheel toward fulfilling the SDGs is changing the economic paradigm' (Göpel 2016: 3). Thus, the economist Maja Göpel, Secretary-General of the German Advisory Council on Global Change since 2017, entitled her book analysing the Great Transformation (*WBGU* 2011) *The Great Mindshift – How a New Economic Paradigm and Sustainability Transformations go Hand in Hand* (see also section 4).

In view of the current criticism of education in relation to ESD, which is uncritically based on the economic growth paradigm and on an instrumental and uncritical view of nature and ecosystems (cf. Getzin/Singer-Brodowski 2016: 38; Singer-Brodowski 2016: 13 et seq.), in order to achieve 'a comprehensive change for reasons of understanding, prudence and providence' (*WBGU* 2011: 5), new content and participatory, inclusive and multi-perspective methods are demanded of ESD and global learning (Singer-Brodowski 2016: 14). On the basis of this criticism, the objective of an instrumental ESD or 'education *for* sustainable development' is shifted to a critical-emancipatory ESD or 'education *as* sustainable development', which is also placed in the context of degrowth (translations of the original German quotes; Getzin/Singer-Brodowski 2016: 39). Meanwhile, the theory of transformative learning is discussed in this context as a way to convey transformative education, and refers back to approaches from critical theory, as well as to socio-constructivist learning theories (ibid.: 14 et seq.). On this foundation, the focus is firstly on the change in individual perspectives on meaning and secondly on collective awareness and emancipation processes, which can be promoted in learning arrangements by 'a constant interaction between specific action and reflection on the experiences thus engendered' (translation of the original German quote; ibid. 16): for example, by questioning mental infrastructures (Welzer 2012). Ultimately, such shifts of mindsets can or should contribute to a 'great mindshift' (Göpel 2016) for a Great Transformation (see also section 4).

Therefore, the following should fundamentally be taken into account: 'Socio-ecological transformations never mean [...] only the formation of the external conditions of human existence, but also that of the psychological structure of people – i.e. their patterns of perception and interpretation, their self-image, their emotions and their habits' (translation of the original German quote; Sommer/Welzer 2014: 106). In order to reduce the gap between knowledge and action or perception (mind-behaviour or mind-perception gap), it is therefore pointed out that we should observe our own perception and behaviour more intensively and question them in order to become aware of unconscious patterns of perception and behaviour (cf. Entzian 2015: 208). The cultural theorist Annett Entzian also emphasises that 'perception is not only influenced by cognitive aspects but also seems to be particularly linked to emotional factors. Thus, some cases revealed clear changes in environmental behaviour over the course of their lives which were

7 More information about this can be found at https://www.degrowth.info/en/ (26 May 2021).

primarily caused by emotions' (translation of the original German quote; ibid.: 210). It is therefore also important to integrate affective approaches and value systems (Joas 2006) into transformative education and transformative learning, as emphasised, for example, within a holistic values education (Meyer 2018b: 23 et seq.). A holistic approach in environmental education is currently being discussed and tested in the context of ESD and transformative education with reference to the three forms of knowledge (e.g. Jung 2009; Vogelsang 2017).

4 Philosophical and educational reflections on the Great Transformation

The challenges of a Great Transformation towards sustainable development must be addressed as quickly as possible in view of the 'planetary boundaries' in combination with the 'great acceleration' (Rockström/Steffen/Noone et al. 2009; Steffen/Richardson/Rockström et al. 2015), but also because of the global and regional social disparities in the sense of socio-economic limits or 'critical human deprivation' (Raworth 2017: 9). Raworth uses the metaphor of the doughnut here, which she characterises in her well-known image as 'both an ecologically safe and socially just space for humanity' (ibid.: 39). She emphasises that the task of bringing humanity in the 21st century into this ecologically stable and socially just space is 'unprecedented' (Raworth 2017: 39). She particularly highlights the authority of economics: 'Economics is the mother tongue of public policy, the language of public life and the mindset that shapes society. [...] (E)conomic beliefs, values and assumptions are shaping how we think, feel and act' (ibid.: 5 with reference to F. S. Michaels and her book *Monoculture: How One Story Is Changing Everything*, published in 2011). This future task therefore – following the major didactic questions and decisions – involves changing *what* is produced and consumed, *what for*, *how* and *with what*. The UNESCO Global Action Programme also argues along these lines: 'It will require a wholesale change in the way we think and the way we act – a rethink of how we relate to one another and how we interact with the ecosystems that support our lives' (UNESCO 2014: 8). The current discussions, e.g. about transformative learning in a degrowth society (Getzin/Singer-Brodowski 2016), follow this line of thinking (see section 3).

This shows that spatial transformations go hand in hand with social transformations – particularly a shift in consciousness – or perhaps even necessitate them. According to the findings of research on transitions and transformations (e.g. Schot/Geels 2008; Loorbach/Frantzeskaki/Avelino 2017), decisive impulses for this are set by *pioneers of change* or *change agents*, who initiate and disseminate the change as transformative forces (e.g. Kristof 2010: 106 et seq.; *WBGU* 2011). In this context, reference may even be made to Gottfried Wilhelm Leibniz (1646–1716) during the early Enlightenment period. As the founder and first president of the Berlin Academy (Society) of Sciences, he represented 'a philosophically substantiated concept of scientific research which (predominantly) sees its aim and purpose in union with practice ("theoria cum praxi"), in the satisfaction of people's needs, in the promotion of the common good (and) in the solving of socially relevant problems' (translation of the original German quote; Li 2012: 21). It is in fact self-evident that research should have practical relevance and provide a service to humanity by solving socially relevant problems, but this is also controversially debated (see section 2). With regard to the promotion of

the common good and in connection with the usual market-oriented concepts of the satisfaction of needs by means of increased consumption, Maja Göpel analyses the findings of the Chilean developmental economist Manfred Max-Neef and his demand 'that we need an entirely new language in order to understand better what people really need' (Göpel 2016: 63). His 1992 matrix of fundamental human needs 'opens up a plethora of possible solutions for good lives which do not have to cost the Earth' (ibid.: 66). With regard to aims and purposes, it should be noted that contrary paths towards sustainable development are considered equally expedient and purposeful. These include, for example, the discussion about genetically modified seeds in connection with the use of pesticides – and the associated power positions of global corporations. Vandana Shiva, an Indian pioneer of change and winner of the Alternative Nobel Prize in 1993, has not only called attention to these problems in numerous publications (e.g. ibid. 2000) but also actively advocates alternative paths as best-practice examples (Meyer 2017a).

Following Leibniz's understanding of science, Wenchao Li, who held the Leibniz Foundation professorship at the Leibniz University Hannover from 2010 to 2017, criticises current science for becoming simply a productive force and argues that it is urgently necessary to 'provide a key orientation for modern secular civilisation' (translation of the original German quote; 2017: 25). Key orientations which point in the direction of sustainable development are highlighted by different pioneers of change and/or scientists. Three such key orientations are taken as examples in the following.

Vandana Shiva has developed an *Earth Democracy* (ibid. 2015), which is both an ancient philosophy and a current political movement for peace, justice and sustainability (ibid.: 1). It is based on ten principles, and its aims are *Living Economies*, *Living Democracies* and *Living Cultures*. In particular, political involvement and power in the sense of self-empowerment are of crucial importance.

Satish Kumar, the founder of Schumacher College in Dartington Hall (a leading centre for environmentally-friendly, economic and social sustainability) and publisher of the journal *Resurgence & Ecologist*, argues for a new trinity of our time, in the form of *Soil – Soul – Society* (ibid. 2013). To this end, he interprets the Bhagavad Gita for today's era with reference to ecology, spirituality and humanity (ibid.: 16). For *soil*, he emphasises that 'the challenge for humankind, in the twenty-first century, is to find humility and reconnect with nature' (ibid.: 18). For *soul*, he states: 'the inner landscape of spirituality and the outer landscape of sustainability are intricately linked' (ibid.: 26). He views *society* on this basis and demands a social movement that will stand up for justice, equality, freedom and wellbeing for all (ibid.: 29).

A further *key orientation* is educational purposes. Victor Nolet, Professor of Secondary Education at Western Washington University, calls this a *sustainability worldview*. He defines it as follows: '[A] sustainability worldview is a holistic phenomenon that involves a combination of values, knowledge, dispositions and agency' (2016: 64). Such a worldview also emphasises certain thinking capabilities (cf. ibid.: 108): adaptive expertise, systems thinking, critical thinking, decision-making, character strengths.

Sustainability, spirituality and transformation
A worldview for sustainability – as made particularly clear in the statements by Satish Kumar with reference to 'Care of the Soul' (ibid.: 24 et seq.) – predominantly requires a certain (self-)awareness which can be seen as fundamental for the required transformation (see also the holistic approach in Jung 2009 and the references to deep ecology and integral theory in Meyer 2018b). The spiritual traditions of Asia (such as Hinduism, Buddhism and Taoism) distinguish between a 'normal, limited "ego self" and an unlimited "original self". The ego self is characterised by what Einstein called the "optical illusion of separation"' (translation of the original German quote; Stanley/Loy 2015: 46). For personal (and ultimately also societal) transformation, it is stated that: 'We must recognise that our original self encompasses the entire living world. This type of empathy based on a holistic worldview is essential for life' (translation of the original German quote; ibid.: 47).

Individual transformation is therefore described as follows: 'The individual is released from his or her narrow identity or ego and is transformed into divine consciousness. The way to such an enlightened state is [...] the understanding that "I am part of the whole". I am an organ of the Earth body; I am a member of the Earth community. [...] Through universal love we are able to break out of this ego and become part of the eco – making a quantum leap by changing from "g" to "c". The Greek word "eco" is very beautiful. From it we get "ecology" and "economy". Eco [...] means home' (Kumar 2013: 24 et seq.).

Pioneers of change, who have implemented their key orientation and vision of sustainable development with great efficacy, can serve as role models (Meyer 2018a, 2017b). Maja Göpel comments with regard to 'pioneer practice': 'We see how essential the role of worldviews or mindsets are in the formation of individual identity, collective vision and strategies for systemic change that have a mobilizing effect' (2016: 149). Some of these change agents have been awarded the Alternative Nobel Prize, e.g. the Kenyan environmental activist Wangari Maathai in 1984 (see below) and the Chilean economist Manfred Max-Neef in 1983 (see above). 'Through the "Right Livelihood Award", as the Alternative Nobel Prize is literally called, the founder [Jakob von Uexküll, born in 1944 in Uppsala, Sweden] [...] also brought values and the question of meaning back into the discussion, since the change demanded by the prizewinners [...] attempts to address the roots of the problems – and these often extend deeply into worldviews and views of humanity, fundamental religious convictions and myths of modern civilisation. There is thus scarcely a prizewinner who does not call for a fundamentally new spiritual and ethical orientation' (translation of the original German quote; von Lüpke 2010: 21). The common denominator of all the approaches advocated by these change agents for the 'right livelihood' is 'overcoming the separation between humans and nature. Homo sapiens is no longer viewed as the master, but as a thread in the web of life' (translations of the original German quotes; ibid.: 20; for the environmental sciences, fundamentally cf. Immler/Hofmeister 1998). This connection is also demanded in the context of a holistic science, e.g. by Stephan Harding, lecturer in holistic science at Schumacher College (see above): 'Holistic science is thus about

reuniting fact and value in ways that enable our culture to explore new possibilities of living harmoniously with the Earth' (ibid.: 43). He refers back to indigenous knowledge and the relationship of indigenous ethnic groups to earth or nature (as do all the change agents mentioned here as examples) and to James Lovelock's Gaia theory (ibid.: 68 et seq.).

With regard to the consciousness of a unity between humans, nature and culture, the legacy of Wangari Maathai (1940–2011), Nobel Peace Prize winner in 2004 (Meyer 2016) could also be mentioned. In her last book, *Replenishing the Earth – Spiritual Values for Healing Ourselves and the World*, she emphasises spiritual values for the Green Belt Movement that she founded, which served as a key orientation for her and all the participants – and thus contributed to a social and spatial transformation in some regions of Kenya: 1. 'Love for the environment', 2. 'Gratitude and respect for Earth's resources', 3. 'Self-empowerment and self-betterment' and 4. 'The spirit of service and volunteerism' (Maathai 2010: 14 et seq.). She states: 'Such values are not unique to the Green Belt Movement. They are universal. [...] They define our humanity' (ibid.: 16). With the Green Belt Movement, Maathai exemplified the significance of knowledge transfer for sustainable development and thus initiated transformative learning (Meyer 2016, 2017b) – entirely in the spirit of the knowledge transfer discussed in this article.

5 Conclusions

The above discussion has shown that knowledge transfer between universities and society belongs to the 'third mission' of universities (section 2). At the same time, knowledge transfer is a constitutive feature of sustainable universities as well as of transformation research and education, as well as of transformative research and education (section 3). In both fields, the basic 'modern' understanding of knowledge transfer is the same: it does not mean a unidirectional knowledge transfer *from* science as the knowledge producer *to* society as the user of knowledge; rather, it refers to diverse recursive exchanges *between* science and society, in which, ideally and according to a transdisciplinary understanding of science, new 'socially robust' knowledge is generated together (*co-production of knowledge*), and is linked both to science and to practice. However, the two debates – the science policy debate about transfer and the third mission on the one hand, and the transformation debate about sustainability on the other – have very seldom referred to each other. There is still a considerable need for research and development here, in which both fields could learn from each other.

In the authors' assessment, the 'path from knowledge to action' in the direction of radical transformation to sustainability hinges on the communication and scientifically-grounded discussion of *normative target/orientation knowledge*. Too little attention has been paid to this to date. For spatial transformation, the focus here is particularly on the spatial and planning sciences. The task of spatial planning is to coordinate discussions on objectives and/or social claims to spaces, while directing them towards sustainable development (section 1 of the Federal Spatial Planning Act [*ROG*]). However, 'blind spots' remain in research, as do underlying 'preanalytical visions' and

worldviews in practice (Kanning 2005: 120 et seq.; Kanning 2013), which connect ecology with the economy, i.e. assume a unity between humans, nature and culture, and can thus promote sustainable development – as also shown by visionaries or change agents (Meyer 2018b) (section 4). In other words: 'Worldviews or paradigms serve as central reference frameworks for epistemic communities in research but also for the pioneers or situated groups that transition researchers observe taking action on strategic change' (Göpel 2016: 150).

Critical reflections on culturally transferred 'mental infrastructures' and the initiation of reflection processes, including the strengthening of self-awareness, and in particular of a conscious examination of value commitments and value orientations, therefore seem to have a key function for both transformation research and education and for transformative research and education (see section 4).

Whereas underlying value judgements and normative settings in research should always be disclosed and discussed critically, for education/teaching, which is ultimately also shaped by researchers and affects them in return, a holistic environmental education or values education in combination with transformative learning and 'transformative literacy' could be pioneering, on the basis of a critical/emancipatory ESD in the context of degrowth (see section 3). Change agents play a central role in this as transformative forces of change (see section 4) in the transfer of knowledge between universities and society.

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