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The Role of Universities in a Sustainable Society. Why Value-Free Research is Neither Possible nor Desirable

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Abstract: The current climate crisis confronts us with a deep discrepancy between knowledge and action. Therefore, this article is looking for a readjustment of the relationship between science and society. The positivist self-understanding of science and its fragmented organizational form lead to a marginalization of ethical questions. Instead, sustainability calls for a re-examination of the preconditions and embedding contexts of supposedly value-free research. Faced with the increasing complexity of the modern world, ethics must spell out a new "grammar of responsibility" that addresses the prevalent "declamatory overload of responsibility". Ethicists can fulfil this role by uncovering and regulating conflicting goals and dilemmas. Instead of playing the role of "marginal echo chambers", universities ought to assume their social responsibility as structural policy actors. This article suggests a methodology of responsible research as a specific ethical contribution to the model of "transformative" and "catalytic" science for a "post-normal age". True to their founding mission, academia should herald a "New Enlightenment" that is more self-reflexive regarding its own practical and ethical preconditions, foundations, and consequences. This article presents a possible practical method for fostering the dialogue between the natural sciences and the humanities and to link research, education, practice, and social communication in new ways. It is concluded that a foundation of a whole-rationality approach with a multidimensional understanding of wisdom and, respectively, rationality and sagacity is necessary for sustainable universities.

Keywords: sustainability in science; transformative science; grammar of responsibility; ethics of knowledge; universities as echo chambers of society; catalytic science; whole-institution approach

1. Introduction—Humanity is Running out of Time

The current situation of global society in the upheaval of modernity is marked by a discrepancy between knowledge of probable future disasters and a lack of adequate reaction of today's society. Theoretically, available technology could ensure proactive protection for the environment and climate that respects the "planetary boundaries" [1] (p. 1) of a safe and fair space for the development of human civilization. However, there is a lack of social will and of binding political framework conditions to shift from an irresponsible logic of competitive pressure to ecological and social foresight.

The development of solutions to scientific–technical problems requires great trust in an open future and in the complex interaction between self-dependent actors, with such interaction being conducted freely and reasonably. By contrast, deep mistrust is spreading regarding democracy, reason, and the concepts of progress with which science is closely interwoven. Ethically and politically, particularly precarious is the increasing distrust of international cooperation and of the ethical universalism of human-rights-based political liberalism [2–4]. Against this background, the role, communication conditions, and tasks of science in political discourse are changing.

This article focuses on a definition of the relationship between science and society, based on the "whole-institution approach" [5] (p. 19). Instead of entrusting the issue of sustainability just to a single academic department, the "whole-institution approach" encompasses the university as a whole. On all levels and all fields, sustainability needs to be established as a core value and common goal that all stakeholders actively seek to put into practice. For instance, sustainability "involves rethinking the curriculum, campus operations, organizational culture, student participation, leadership and management, community relationships, and research" [6] (p. 46). This process can be fostered by offering financial and administrative support, training schemes, guidelines, and best practice models. The central task is to establish viable inter-institutional, interdisciplinary, and transdisciplinary networks. Thus, the university itself becomes a beacon of sustainability by linking research and practice on its own campus [6,7] (pp. 39–59, pp. 113f.).

The main thesis of this paper is that ineffective ethical knowledge relates to a deeper deficit of the current self-understanding and of the organizational form of science, namely a shortened understanding of rationality, which subsequently leads to the marginalization of ethical questions. Therefore, this article stimulates a debate with an understanding of ethics as "philosophy of science" and a norm–theoretical analysis of different ways by using the terms "responsibility" and "freedom". It explores, in a theoretical and practical way, whether and how universities can contribute to a sustainable society under changed conditions of communication.

On the one hand, the "social grammar" of responsibility in the field of tension between actor, object, and controlling authority, and the handling of highly complex risks, is examined. On the other hand, the understanding of rationality and the associated current debate about the relationship between science and society in times of climate change as well as the "post-factual" weakness of trust in reason and democracy are analysed. The aim of this paper is to outline an ethics of knowledge that understands research, freedom, and responsibility as a unit and plumbs the academic discourse space anew.

Owing to the above-mentioned reason, the considerations are divided into five parts (a–e): (a) The current situation of science between the role of observer and actor is presented at first in Section 2. (b) Section 3 will describe the need to change the cultural patterns and guiding values of society, so that universities can become driving forces for a cultural revolution. (c) The methodology of how this change can take place follows in Section 4, and (d) the vision of a "New Enlightenment" ends the line of argument in Section 5. (e) In the final section, Section 6, all arguments are summarized together with discussion from a different point of view from that of the authors, as well as other issues not considered in this article.

2. Science between the Role of Observer and Actor

Numerous scientists around the world have raised their voices because they do not want to witness society fall into the climate trap. Inspired by the vigor of striking students with "Fridays for Future", the "Scientists for Future" initiative has developed into a strong international network in 2019. At the level of higher education policy, there are various initiatives to institutionalize climate responsibility. Examples include the Germany-wide joint project "HOCH^{N}" (www.hoch-n.org), the "Network University and Sustainability in Bavaria" (www.nachhaltigehochschule.de/), and the German "Science Platform Sustainability 2030" (www.wpn2030.de).

2.1. Re-Examination of the Relationships Between Science and Society

Thus, the relationships between science and society, knowledge and responsibility, and freedom and autonomy must be re-examined. The debate is conducted under various headings, but none of these approaches have received proper attention so far. They include the terms "socially responsible research" [8] (p. 38), "transdisciplinary" [9] (p. 68), "catalytic science" [10] (p. 44), "knowledge hierarchy (expert vs. lay)" [11] (pp. 86f.; 89f.), "citizen science" [12] (pp. 13f.), "dialogical" and "integral higher education system" [13] (pp. 166f.), "transformative science" [14] (p. 17), "oppositional and

emancipatory science" [15] (pp. 101f.), or "science for a post-normal age" [16] (p. 739). All of these approaches urge the scientific community to play an active role in orientation and conflict resolution in the multi-layered field of tension of the current processes of change. They establish a robust knowledge base for a just and sustainable design in a transdisciplinary, dialogical, and context-sensitive way.

In our view, Ortwin Renn's concept of "catalytic science" most succinctly summarizes the various aspects of the relationship between science and society. Renn specifies the role of science in social transformation processes by describing science as a catalyst. Scientists should not see themselves as moderators, but should contribute their knowledge as an indispensable energy to dissolve blockages in thought and processes, and to activate desirable transformations. Among the scientific public, however, the term "transformative science" has become established as a guiding concept in debate, perhaps because the term is controversial and has stimulated conceptual discussions [10].

Ultimately, the pragmatic challenges of climate change call into question the current fundamentals of science. For example, the French sociologist Geoffroy de Lagasnerie argued that scientists are already involved in social change—as soon as they begin to produce ideas and discourses [15] (p. 14):

"If the concept of science (and especially the intellectual field) is to have relevance as a sphere of discussion, then the questioning of certain structures in which knowledge is produced (and also the question of what knowledge production actually means) is not an 'attack on science', but, on the contrary, a form of the use of scientific reason, which, in this case, chooses itself as its object, a kind of academic practice which remains loyal to its concept and definition" (translation from German) [15] (pp. 81f.).

Truth is not a neutral descriptive perspective, but an "oppositional concept" that shows how and why a practice or an institution is incorrect [15] (p. 55). If one locates usefulness in this original linkage of theory and practice, then it is not an externally applied measure to evaluate utilitarian consequence. Instead, usefulness represents an inherent moment of the practice of knowledge. It is a counterpart to the self-referential nature of science. Especially in the humanities, such self-referencing increasingly refers to itself through a flood of footnotes and thus forms a closed system that seems to decouple itself from the outside world [17].

2.2. Three Dimensions of Sustainability Research

The best politically established term in the search of responsible, transformative, catalytic, or public science is "sustainable research". However, there are three quite different ways of understanding the concept:

(1) Sustainability research in a broad sense focuses on particular questions of sustainability, such as climate change, renewable energy, and biodiversity.
(2) Research procedures respect guidelines about sustainability, for example, with regard to the use of natural resources, animal welfare, and social compatibility
(3) Sustainability research in a narrow sense examines the coherence of the concept and its normative logic. This is essentially a logic of integration, inclusion, and balance, which seeks to harmonize heterogeneous and conflicting goals and to establish strategic networks between different fields and levels of action. Ethical reflection should not stop at asserting synergies. It is also necessary to analyze conflicts and trade-offs, to reflect on priorities, to define criteria for appropriate decisions in different contexts, and to establish procedures for dealing with dissent. Of central importance here is to mediate between the different logics of the social subsystems.

The concept "research in a socially responsible way" (translation from German) [8] (p. 38) focuses on the second area: It primarily develops standards for the process of research. However, the other two dimensions are by no means excluded. Academic responsibility cannot be limited to a few formal criteria of research, but must rather deal with the grand challenges.

2.3. The Conflict between the Normative Claim of Transformative Science and the Positivist Theory of Science

The normative claim of sustainable and transformative science is an attack on the positivist theory of science. In terms of moral theory, this is associated with a profound dilemma. By reducing the understanding of "reason" in a positivist manner to its knowledge function, it necessarily surrenders itself to a morality of subjective decisions and purposes released to arbitrariness: It declines to the means for goals about which it itself ultimately does not decide [18] (p. 33). In positivism, morality is understood as a question of subjective preferences that cannot be further justified and is therefore excluded from the concept of science [15] (pp. 17–27).

Much of what Max Weber wrote 100 years ago in his two lectures "Science as a Vocation" [19] and "Politics as a Vocation" [20] is still valid and ground-breaking. This is relevant not only in ethics, but also for the self-understanding of science and politics. Nevertheless, there are several methodological problems in his model of ethics of responsibility. Weber proposed a method of weighing consequences and strict separation between a science that ascertains and analyzes facts versus a policy that negotiates compromises between diverse interests, preferences, and value convictions [21] (pp. 97–121). The model needs critical further development, because reflecting on the rationality of the goals and ideas of a good and meaningful life are excluded from the thinking space of science. The concept of the unity of analytical and normative reason becomes fragile. This is especially true with regard to its perception by ancient and medieval traditions, especially the concept of wisdom (phronesis or prudentia) [22,23]. Weber's theory of responsibility as consequentialism is subjected to a calculation of purposeful rationality, in which essential dimensions of practical reason are ignored [24].

With regard to methods of ethical decision making, the concept of responsibility needs to be supplemented [18] (pp. 17–128). For Horkheimer and Adorno, Weber's separation of ethics from research and action from knowledge in conventional social-scientific thinking neglects the practical use of the conceptual systems and one's own public role. This tendency hides the structural preconditions and consequences as well as the perspective of scientific positions behind the appearance of neutrality instead of making them transparent [25]. It also undermines the necessary distance from the system of rules of society that has coagulated in science [26].

The positivist understanding of science needs to be critically revised [15] (pp. 17–27) and relativized regarding the preconditions and embedding contexts of supposedly value-free research [27] (pp. 201–240). A multidimensional understanding of wisdom, prudence, intelligence, knowledgeability, judiciousness, and sagacity has to be established as the foundation for a "whole-rationality approach" of understanding sustainability sciences and sustainability education. In addition, spirituality might be a crucial part of "sustainable wisdom" [28] (pp. 279–290). It is a kind of rationality which is open to the ambiguity of the world [29]. At the same time, it is a form of "practical wisdom" [22].

Thus, with new urgency, the old question arises as to whether science can be content with analyzing the world, or whether it should also immediately strive to change it. Is the role of science mainly that of an observer or an actor? What role do universities play in the society?

Universities are not only observers. They can also be seen as "change agents" by having an ethical scientific theoretical basis in the concept of sustainability. This core has established itself above all in the sphere of politics and was initially a socio-political and not a scientific concept. It is a discourse of responsibility whose strong normative charge in its deep structure does not fit with current ideas of freedom, autonomy, and scientific excellence at universities [30]. Some scientists fear that the freedom of science will be used for ethical and political purposes and thus sacrificed.

Against the background of this unresolvable tension between different models of scientific theory, the claim of responsible and transformative science should not be interpreted primarily as a moral appeal. Such a claim should first be reflected in theories of science and norms. Science in the era of climate change should not lose itself in activism under the pressure of supposedly urgent political goals. It will only succeed if it methodically and structurally reflects the search process in the field of tension between empirical research, normative demands, and social transformation in relation to the

self-conception and organization of science. The reflections of de Lagasnerie [15], Schneidewind [31], Grunwald [14], Müller-Christ [13], and others support this idea, but require greater ethical depth.

The following part combines a reflection about the role of universities in society with some considerations about the underlining concept of rationality and its normative implications. The thesis is that we need a new discovering of the traditional idea of wisdom. The aim of the argumentation is a contribution to overcoming the dualism between science and society by connecting theoretical and practical competences as well as empirical and normative approaches. Universities are understood as "structural policy actors" that actively reflect upon and shape their own working conditions. This leads to a shift in understanding progress which underlines the need to change the cultural patterns and guiding values of society.

3. Universities as Driving Forces for a Cultural Revolution

3.1. The Crisis of the Wise—Universities as Marginal Echo Chambers?

The science journalist Manuel Hartung became known for his "College Novel", published in 2007, about the everyday life of modern students. He diagnosed a "crisis of the wise" that is ignited by the question of whether universities want to remain in their "marginal echo chamber" or become "centers of social certainty" (translation from German) [32].

This harsh criticism can be read as a call for transformative science. The current highly differentiated scientific world produces heaps of detailed data-fed studies and reflections; these mostly generate neither existential knowledge nor the will to act. Not least due to the vast increase in scientific publications that are produced with great effort but seldom read, many sectors of science are threatened with becoming self-referentially closed systems. This would mean that "scientific impact" is insufficient as a criterion for excellence, and should be accompanied by "societal impact" to ensure quality [33] (p. 27). This complaint is not new (cf., e.g., the educational theoretical analyses of Alfred North Whitehead dating back to a lecture cycle held at Oxford University in 1912 [34]). In the context of the challenges of climate change and digitization, however, such a sentiment is topical and urgent [35] (pp. 150–163). In brief, people do not know what to believe, and do not believe what they know. We are displacing ecological knowledge because we do not want to admit it. The announced catastrophe reaches our consciousness superficially because we are trapped in the comforts of everyday life and cannot imagine its loss. We compensate with a bad conscience and moral appeals to third parties. There is a lack of a sense of reality, because the uncomfortable facts of climate change and global poverty remain abstract for most people. They are of little immediate sensual significance.

Science is faced with a communicative dilemma. If it points out its unavoidable fuzziness, "then it develops no appellative force and fails to make the point that the world could very soon become very similar to the fictional scenarios of doom" (translation from German) [36] (p. 4). An apocalypse of global warming and extreme events seems to be perceived as a myth, and "any resembling prognosis seems to be untrustworthy precisely because of this resemblance. That is where the effect we are experiencing right now comes from. If the present actually bears (pre-)apocalyptic traits, this is not perceptible, or can easily be repressed or rationalized on a small scale" (translation from German) [36] (p. 4).

Against this background, the crisis of the wise is not simply a failure of individual intellectuals, but is deeply rooted in the modern concept of rationality and science. This diagnosis calls for the transformation of science. Climate and environmental change, which are increasingly harsh real experiences, challenge scientists to question the current patterns of thought and action. Under great time pressure, they need to make the knowledge base available for comprehensive transformation of the economy and modern ways of life. This undertaking will not succeed without a revision of our human self-understanding. The Anthropocene takes philosophical anthropology to new horizons of reflection. This period can be described as a new phase of enlightenment with a changed thrust [37] (pp. 92f.), focusing on the integration of fragmented knowledge.

Sustainability science as an educational method can be measured by whether it enables an ethically founded reorientation in the Anthropocene and links diverse segments of dissociated knowledge landscapes. It aims to enable students to acquire the knowledge to generate judgement and the will to act. This can also be described as "emancipatory science" (translation from German) [15] (pp. 101f.).

3.2. Transforming the Concept of Rationality into a Reliable Normative Compass

The controversial debate about the role of universities in society in times of climate change challenges the self-understanding of science, which also has to answer to the contempt of rationality in parts of the public debates. The "crisis of the wise" can also be interpreted as the consequence of a limited understanding of rationality through loss of the classical concept of wisdom [22]. This includes analytical as well as normative and everyday practical skills. It combines a precise perception of the situation with qualitative standards of value resulting from wishes, interests, and convictions in order to compare different alternatives for action and to make goal-oriented decisions. Wisdom enables individuals and collectives not simply to blindly follow their own preferences, but to judge, weigh, coordinate, and implement those preferences according to the situation. Wisdom establishes a concept of rationality that integrates the discourse about a successful lifestyle and enables decisive action as the central moment of all virtues. It constitutes "our personal grammar of importance, preference, and desirability" [22] (p. 10) and self-esteem as an "evaluative gravitational field of personal identity" [22] (p. 11).

In modern times, wisdom is "moved from its ethical center. Wisdom is losing its ethical impregnation and has no longer the character of a life-management authority" [22] (p. 7). Wisdom becomes a "contingency management technique" that serves interests. It is focused on an "ethically neutral optimization of consequences of action" and "loses the dimension of supervision over one's own quality of life" (all translations from German) [22] (p. 7). The common good can thus only be understood as the intersection of private interests. However, this remains a highly fragile construct, which—given the complex challenges of the Anthropocene—cannot generate sufficient stability for long-term global cooperation.

Science has become the catalyst for such profound change in society that ethical reflections are scarcely able to follow. The German Advisory Council on Global Change (Wissenschaftlicher Beirat der Bundesregierung Globale Umweltveränderungen) therefore proposes a "normative compass"; at its center is the concept of dignity [38] (pp. 2f.). This is flanked by the maxims of participation, the protection of individual character and diversity, and the conservation of natural resources. However, these concepts remain abstract and powerless unless they prompt science to shape the digital future and promote ethical–political development. If humanity, as "Homo Deus" [39], with our increased use of technology, is seen godlike, the inversion of all values in favor of a transhumanism can hardly be stopped. Then, the humanistic foundation of the universities would be a leftover of the past [40].

3.3. Redesigning Discourse Spaces by Overcoming the Dualism between Science and Society

Transformative science relativizes the significance of the disciplinary professional community as a delimitation of discursive spaces and affiliations. According to de Lagasnerie, the supposed autonomy and neutrality through subject-related membership generates a dualistic two-world constellation. The first constellation is that of academic discourses and the second is the public in media, politics, and society [15] (p. 94). Emancipatory science overcomes this dualism by creating situational spaces for discussion in the common struggle for justice. It establishes an inclusive relationship between intellectuals, politics, and the public sphere [15] (p. 102).

This adjustment in the relationship between science and society can be described as overcoming a dual chronology. The old model initially envisaged an "internal" discussion and knowledge generation reserved for specific disciplines, which were then confronted—in a second step—in their encounter with the "outside world" through some kind of dialogue [15] (p. 102). Models of "citizen science" [12] (pp. 13f.) and "dialogical science" [13] (pp. 166f.) understand the public as well as every day and

practical knowledge of supposed laymen as always present in the process of knowledge acquisition. This results in a "heterogeneous intellectual space, [...] to which activists, artists, writers, and authors with the most diverse horizons belong" (translation from German) [15] (p. 103). In this space, thinking occurs; it represents a public exterior space to which science refers before the practice of knowledge emerges.

The structural change of the public through digital media is also changing the way science is conducted and communicated. This raises fundamental questions, both practical and philosophical. The practical aspect concerns data protection, transparency, and the suggestive power of digital algorithms. The philosophical aspect concerns human self-understanding in view of the increasingly superior functional performance of artificial intelligence in certain areas [35]. Fair, inclusive, and humane coping with the complex radical processes of change associated with digitization requires new discourse spaces in the dialogue between scientific, social, entrepreneurial, and political practice. This is the only way to involve complex expert knowledge without installing the exclusive rule of experts that Strohschneider rightly rejects [41] (p. 190). Digitization offers many opportunities for innovation, without which adaptation to the challenges of climate change would be slow or impossible [42].

Citizen Science does not mean that the difference between spontaneous, civic, and scientific knowledge is leveled. Scientists always seek what others cannot see, even in practical social contexts. Through their scientific perspective, they discover new and uncomfortable questions [15] (pp. 104–106). If the people abandon the idea of academic discipline as a community and commit themselves to ethical spaces of discussion, society does not abandon research and science at all, but affirms both, because, in this way, the citizens address both of them [15] (p. 106). Since the judgement of everyday experience plays an important role in ethical questions, and questions of sustainability have an ethical dimension, the various models of civic science are of particular importance here.

The most methodologically differentiated and long-established guiding concept for redesigning scientific discourse spaces is transdisciplinarity [9]. Three aspects are guiding here [10] (p. 46): Research practices that adapt their objects of investigation, methods, and questions to social problems; cross-disciplinary development of analyses and options for action, considering empirical knowledge of contextual conditions and areas of application in practice; integration of knowledge carriers outside of science, throughout all phases of the knowledge and research process, to develop practical and socially accepted solutions.

Transdisciplinarity is a hybrid of three concepts of science. These are 1) the classical, which offers orientation aid with the help of systematic analyses of complex contexts, 2) the instrumental, which formulates problem-solving options for action with the help of scenarios, and 3) the catalytic, which contributes co-creatively to controlling decision-making and communication processes on the basis of a procedural design [10] (pp. 49f.). The success of scientific social and policy advice regarding the current transformation processes and governance problems in the context of climate change, digitization, and sustainability depends to a large extent on whether a synthesis of these three strategies succeeds at the level of "high-quality knowledge" [43] and whether science establishes itself as an "honest broker" [44,45] (p. 113, pp. 2f.) of mediation in complex conflict situations. The prerequisite is that science should cultivate and promote communicative intelligence in heterogeneous discourse spaces as an integral part of its self-image and working method.

To adequately fulfil this demanding role, transformative science needs places and arenas in which its socially productive impact can be experienced and tested [33] (pp. 27f.). Institutional innovations and resources are also important to overcome the strong inertia in the science system and to open up transdisciplinary discourse spaces more than just selectively—or with a loss of quality [46] (p. 64).

What the concepts of transdisciplinary research and transformative science have in common is the goal of "reviving the relationship between science and society and supporting it with proposals for political innovations to promote sustainability research" (translation from German) [33] (p. 26). It deals with the self-image of the scientists as well as with institutional questions of change and the distribution of resources. The concept is about the "scientific impact" in connection with the "societal

impact" [33] (p. 27), regarding the role of science in deliberative democracies based on reason [44]. The various concepts can also be summarized as science in the service of society.

3.4. Universities As "Structural Policy Actors"

Against the background of the complex debates briefly outlined here, what has been said is applied in this final section on the role of universities and a new concept of transformative science. That is, how can sustainability—in the sense of a "whole-institution approach"—be anchored in the depth structure of the university so that it becomes an influential structural policy actor?

Universities face heterogeneous role expectations: Education of a growing number of students with a simultaneous integration of all learners; producers of innovative knowledge for the economy; a place of critical thinking. The multitude of expectations creates considerable pressure. Autonomy helps to mobilize productivity and efficiency potentials. Often, however, this is a sham autonomy, since it merely addresses the resource constraints with a range of management instruments, which usually follow a business rationality model [13,15,47] (p. 171, pp. 24–27, 33–36, p. 84). The increase in university autonomy through liberation from state and political influence often leads to appropriation by other subsystems (e.g., by industry as a third-party donor).

Securing autonomy requires a critical examination of one's own institutional conditions for action. Universities are structural policy actors; they are institutions whose actions do not simply react to social framework conditions, but actively influence those social conditions with their strategies [15,47] (p. 82, p. 102). To this end, universities must perceive the multiple demands placed on them as an opportunity for further development, to become social bridge-builders between the various social subsystems. In the sense of a "whole-institution approach", holistic approaches to the design of higher education institutions should aim to shape the curriculum and the management of the organization. Cooperation with other local institutions, initiatives, and actors in the sense of sustainable development are also crucial. Autonomy means moving freely between systems in the field of plural demands. This can succeed only if the areas of tension in the sense of an intelligent dilemma management, a high tolerance of ambiguity, and transparency and credibility are mastered and placed into a productive relationship [6,47] (pp. 46–48; pp. 86f.).

Sustainability is not an externally defined goal, but an open search process with heterogeneous target components, which are thus plural and culturally variable [28] (pp. 134–179, 369–372). It does not replace normative debates, but challenges them. A precondition for this challenge is that the adjective "sustainable" is not used synonymously with "good". Instead, the relevant ethical and cultural guiding values—such as freedom, human dignity, justice, or prosperity—must be reflected. The conflicting goals must clearly be named. Transformative science addresses the conditions and goals of research. It does not aim at softening quality standards in favor of practical purposes, but at a self-reflexive and pluralistic value debate about good education and excellent research. It understands the ability of science not only to collect data, but also to evaluate them and to recommend actions as a criterion for excellence. In such an understanding of science, "ethics" is not a single criterion among many, but provides a framework for reflection and a structure for argumentation of the whole. It aims at "excellence of responsibility". This has proven its worth in the ability to identify the epistemic and structural causes of conflicts of values and justice and to identify dilemmas, while representing clear options and priorities.

3.5. A Paradigm Shift in the Understanding of Progress

The scientific system reflects information highly selectively, using specific codes that reduce complexity and guarantee efficiency, effectiveness, and verifiability. These features enable specialization and dynamism, but at the same time create limited perception [47] (p. 88). Non-system subordinate sequences are produced, but are usually not recognized and therefore not adequately processed. In a reflexive modernity [11,48], however, it will be important to think systemically about the social side effects of technical and socio-economic innovations from the outset. To achieve this, rapidly

changing knowledge societies depend on a prospective responsibility among scientific institutions. Ultimately, it is about a "cultural revolution" [49] (p. 3), a "World in Transition—A Social Contract for Sustainability" [50]. This is not only the postulate of some scientists, but is already a political decision: With the Sustainable Development Goals (SDGs) and the Climate Treaty of Paris, the international community has committed itself to such a revolution. By addressing old and new industrialized countries as well as countries of the Global South, these documents bid farewell to the development concept that the United Nations previously promoted [51]. However, this farewell has not been consistent, and many contradictions arise in the tension between ecological and socio-economic goals [52] (pp. 13–20, 55–67). Awareness of the consequences of the SDGs for everyday politics, economy, and society seems limited. Thus, the potential for conflict associated with the SDGs is considerably underestimated.

The implementation of the SDGs cannot be achieved without a change in the cultural patterns and guiding values of society. These cannot be changed by decisions from above, but must change gradually in a complex interplay between value change, institutional design of framework conditions, and pioneers of transformative practice. So-called Leaderships are indispensable at all levels. One of their core tasks is to illustrate new ways of understanding progress. In this way, universities can change their role from marginal echo chambers to driving forces for a revolution of the society in favor of sustainability. In order to grow up in this role, they have to provide a better understanding of transformation and the challenges of responsibility not as a moralistic proclamation, but as a scientifically reflected concept. Some considerations about this are the content of the next paragraph.

4. Transformation and the "Social Grammar of Responsibility" as Methodology

The claim of a "World in Transition" [50] derived from the moral principle of sustainability aims for a global, intergenerational, and ecologically unbounded responsibility. Responsibility can be defined as a relationship that contains three elements. It is a competence that (1) lies with someone, (2) for something, (3) towards someone.

All questions of accountability and liability occur in such a three-dimensional field of tension [53] (p. 23). The relationship between subject, object, and addressee constitutes the "social grammar of responsibility" [21] (p. 11). The thesis is that all three dimensions are today specifically unsettled. Our legal system, international institutions, and sense of morality are insufficiently prepared to identify and attribute responsibility in dealing with ecological collective goods or diverse socio-cultural values. In addition, the universities are overstrained with that kind of unbounded claim of responsibility. The future of democracy depends on whether it is possible to spell out the "social grammar of responsibility" in such a way that subjects for action, accountability, and control become tangible in the complex processes of delimited development. The goal cannot be absolute control, but it can be counteraction in the most conspicuous fields of irresponsibility. The task of universities is also to enable interdisciplinary and methodological reflected research about ethical questions, especially about moral dilemmas and not trivial ethical conflicts.

Beyond the orientation for such a system of rules, an ethical–systematic reflection on the concept of responsibility can provide access to an existential understanding of ethics. Ethics is neither mere optimization of consequences, nor simply the deductive application of norms and principles. It is more than a benevolent attitude or an altruistic willingness to renounce advantages in favor of others. Ethics must address the challenge of people living together in a given situation. This responsive character is directly expressed in the concept of responsibility. Ethics refers to attentive care in dealing with people as well as complex technical and social challenges. Responsibility as a virtue requires active planning and the willingness to learn more about life's creative possibilities. It is a basic attitude that can be enforced or calculated only to a limited extent from the outside. Responsibility manifests itself in the willingness to account for one's actions, to both oneself and others. When applied to universities, that means that the claim of responsibility cannot be handled adequately just by delegating it to a

special discipline, but it has to be implemented in the habitus of responsible scientists and a sustainable reorganization of universities regarding their social and ecological impact.

4.1. The Declamatory Overload of Responsibility

Instead of harmonizing and thus resolving conflicting goals, the more convenient path is often chosen: Many different goals are set up without taking into account that some of them contradict each other and thus cannot be easily fulfilled at the same time. The result is an excessive demand [54] and "declamatory overload of responsibility" [55] (p. 298). For example, the SDGs seem to initiate a renaissance of utopian thinking [56] (pp. 13–109). This results from the unresolved tension between their developmental policy and ecological goals. However, they simply lack conceptual coherence. Unfortunately, the Paris Agreement in its present state that wants the countries to pursue efforts to limit the increase of climate warming to 1.5 °C must now also be regarded as a largely utopian target [57].

The commitment of all governments to implementing the "2030 Development Agenda" is accompanied by a blatant contradiction in the form of measures not taken [51] (pp. 247f.) This could be called a mode of "Symbolic Politics and the Politics of Simulation" [58], or perhaps a dilemma of politics in the field of tension between national and international challenges. Preserving the claim to rationality of deliberative democracy, however, especially in post-factual times, depends on an active role of science in the complex and conflictual transformation processes of the present. These overtax the traditional arenas and forms of communication of politics [44].

From an ethical perspective, the arenas, limits, and conditions of responsibility need to be reassessed. Without dealing with the structural political prerequisites of their active perception and implementation, the full-bodied rhetoric of responsibility is just an "uncovered check" [53] (p. 187). The limits of attributing responsibility, planning sustainability, and controlling political processes must be remeasured [59] (pp. 1–6). The ethical critique of utopian thinking thus does not primarily aim at reducing the goals to an extent that is supposedly achievable in realpolitik. Rather, it aims at reflecting on the conditions for action, resistance, and coherence problems in which the serious will must prove itself. Such a critique aims at dilemma management regarding the difficulty of acting correctly under wrong systems or conditions. It is also concerned with transformation and governance knowledge regarding the change of regulatory structures.

The SDGs have established themselves as a ground-breaking document in the struggle for sustainable development. There are now quite demanding reflections on ways and conditions of implementation. However, the dilemma of the great promises of responsibility associated with the global, intergenerational, and ecological expansion of responsibility threatens to lead to excessive demands. This would result in a permanent crisis of legitimacy.

The problem, however, goes even deeper. The promises of humanity that have been promoted in modern times [53] (pp. 49–72) are being tested in new ways. The great success of the development idea is bought by "wear and tear of the biosphere" (translation from German) [51] (p. 251). Wolfgang Haber also saw a fundamental contradiction between humanitarian development goals and the "uncomfortable truths of ecology" (translation from German) [60] (pp. 45f.). This contradiction is not solved by SDGs, but is hidden, and it renders the full-bodied speech of responsibility in the anthropoid debate a short-sighted suppression of planetary boundaries [61]. Promises of prosperity and responsibility are unsustainable in the age of the Anthropocene. That dilemma situation is also a crucial problem of universities because they are driving forces of the traditional promise of progress. The challenge is to define a new version of a humanism which is aware of ecological interconnectedness and the dialectic tension between progress and risk. To establish this new understanding of progress and humanism, there is a need for deep inter- and transdisciplinary discourses. They have to be pluralistic and intercultural, but not without engagement and obligation. Universities have to become "transformation labs" in search of a culture of sustainability and responsibility.

One of the crucial challenges for a sustainable society is that responsibility is eroded by the anonymous system logic of the modern age. In the confusion of late modern societies, it is often

impossible to determine with certainty the subjects of action, the objects, and the addressees of responsibility [55] (p. 299). Familiar models of addressing, delimiting, and monitoring responsibility are often no longer applicable to the anonymous, widely ramified, and confusing networks of actors of late modern societies [21]. The dynamics of functionally differentiated system logics with partially incalculable effects, such as the highly complex financial system, do not seem to be effectively managed within the framework of the traditional concept of responsibility. In view of the side effects of action that no one wants or can calculate, virtue ethics runs into nowhere. Consequentialist concepts of responsibility—that is, concepts related to weighing consequences—fail because of the unpredictability of the non-linear results of action in complex chains of effects [21] (pp. 23–66).

4.2. Promoting a Culture of Risk-Taking and Innovation

In assessing technological innovation, "the heuristics of fear" [62] (p. 27) emphasizes the prognosis of calamities. However, this may paralyze the capacity for action and innovation in many areas, thus possibly generating more dangers than limiting them [63]. The contribution of research to a sustainable society consists essentially in innovation. The evaluation of innovation cannot be sufficiently performed within the framework of classical concepts of technology assessment.

Often, the effects of technological innovation cannot be predicted in advance, but become visible in an open research process. The concept of responsible innovation thus needs philosophical–ethical as well as socio-theoretical and legal basic research on how to deal with ignorance and uncertainty [64]. In recent years, a process-accompanying resilience concept has established itself as a normatively rich and open category, neither purely defensive nor risk-blind [65,66]. The systematic core of an ethic of innovation is the theoretical reflection of action and institutions on how to deal with systemic risks and the different types of ignorance with which the search for responsible decisions is confronted [67]. It needs "risk maturity" [28] (pp. 347–372) in the sense of a culture-conscious and self-reflexive handling of systemic risks. It also requires an ethical foundation that goes beyond a consistent weighing of consequences. Innovations are always risky and difficult to control. Without openness to innovation, however, the specific problem-solving potential of science can hardly unfold. Up to now, universities missed the development and practice of a differentiated model of freedom and autonomy in the context of climate change. This has to include an adequate degree of ecological responsibility and services for the public in order to be clearly different from arbitrariness.

A theory of responsibility in and through science must distinguish between the necessary freedom for desirable innovations and the equally necessary restrictions to avoid the escalation of systemic risks. Humanity knows too little about social transformation processes in many areas, and often fails because of path dependencies of technological developments. Responsible science needs an intelligent combination of scientific–technical, entrepreneurial, political–institutional, cultural, and social innovation. The EU concept of "Responsible Research and Innovation" could be a pioneer in this respect. Due to the complexity of cause–effect relationships, it is insufficient from an ethical–systematic viewpoint to interpret "responsibility" primarily in the space of a utilitarian–consequentialist-oriented technology assessment and linear intervention models. Rather, these models must be fundamentally extended by participatory, democratic–theoretical, systemic, and cultural aspects [42,63,68]. To date, "Responsible Research and Innovation" has been mainly a buzzword that points to a field of research that is still underdeveloped in ethical–systematic terms. It is not yet a normative, clearly structured concept for the political governance of responsible research [69] (pp. 753; 757).

A crucial strategy to counter uncomfortable environmental–ethical claims in the context of climate change is to try to get rid of those claims by questioning the truth or precision of the scientific analysis of reality. In the worldwide movements of the "Science March" and "Scientists for Future", scientists have protested against the fact that scientific findings are not taken seriously enough in many areas of shaping society's future.

Julian Nida-Rümelin diagnosed a connection between the refusal to take note of scientific facts relevant to action and the "ideology of anti-realism" [70] (p. 33). Political powers may insinuate that

there is no reality, but rather only opinions conveyed by the media. Digital media are being cleverly used to reinforce this impression. Many people nowadays seem to form their opinions in "digital bubbles" that immunize against criticism because they select and reinforce predetermined opinions. This dynamic is politically dangerous and explains the deep uncertainty behind the superficial political excitement about the rhetorical phenomena of the post-factual. The uncertainty of communication in the age of digital manipulation of opinions demands active effort from the sciences to provide solid information to the public and to maintain standards of rationality.

As the binary logic of the digitally comprehensible and operationalizable forms of rationality becomes dominant, the fiction of measurability and quantitative comparability within linear logics leads to a unification of the world [29]. This allows the old development model to be revived in the operationalization of SDGs because it corresponds to the logic of comparability and optimization [51]. There is no room in the model of digital algorithms for the perception of cultural peculiarities and identity conflicts. In relation to ethics, the question arises whether normative reason is mere convention and a question of subjective preferences; or is content that is scientifically accessible and true suitable for such reason? [70] (p. 82). If it is assumed that ethics has a scientifically founded truth content, then it can and must be uncomfortable and must not depend on public opinion. The contempt for expert knowledge and reason undermines the foundations of our culture, as do self-generated systemic constraints that prevent politics, business, and society from doing what is reasonable [21] (p. 10). These questions are not just abstract problems of the philosophy of science, but affect the heart of self-understanding of universities and their role in the society.

4.3. The Grammar of Responsibility—Uncovering and Overcoming Conflicting Goals and Dilemmas

The decisive task is therefore to spell out the "grammar of responsibility" in such a way that subjects for action, accountability, and control become tangible again in the complex processes of delimited development. The art of responsibility is the distinction between primary and secondary issues as well as between different levels of responsibility and degrees of commitment. It aims at empowerment justice in the sense of a subsidiary strengthening of autonomy, personal potential, and participation. In this context, freedom is understood not merely as freedom of choice or arbitrariness, but refers to the propensity for self-determination that creates identity as a moral subject in conflict situations.

Such conflicts should not simply be ignored in the sustainability discourse. Although the discourse is ethically and systematically geared towards integration, it is necessary to distinguish between objectively appropriate, productive compromises versus lazy and short-sighted compromises. Such questions are not only, as Weber suggests, the tasks of politics, but also of ethics as method-guided scientific reflection of normative reason [18]. The transformation of SDGs into a scientific concept depends on whether the complex problems of their conceptual coherence and the associated attributions of responsibility are reflected in an interdisciplinary manner.

Global society is losing sight of the moral and cultural foundations of social cohesion, because there is no consensus on the changed conditions of the interplay of freedom and responsibility in the processes of disruptive change in an increasingly polycentric world. Climate change poses enormous challenges to the idea of freedom that Ghosh classifies as the most important political concept of modern times [71]. In a society that has banned the idea of collectives from politics, business, and literature in equal measure, it is difficult even to think about the collective structure of climate responsibility. An individualistic narrow concept of freedom and responsibility, devoid of its cultural and institutional embedding contexts, fails because of the complex chains of action and causality in climate change. The purely formal understanding of freedom as the maximization of options is empty because it leads to an ultimately uncontrollable indeterminacy.

Ethics should not surrender to the apparent autonomy of system imperatives, but must analyze actor constellations in complex networks in a new way. In doing so, it can negotiate moral and legal attributions of accountability on the basis of social–anthropological, institutional, and action– and property–theoretical approaches [72]. This will in turn require a critique of the "neoliberal

revolution" that has "elevated the market to the center of society" and "weakened public institutions" (translation from German) [73] (p. 16).

According to Patrick Deneen's diagnosis, the transnational universalism of ethics has ended because the elites in politics, business, and science are unilaterally exploiting their opportunities for freedom for private gain [2] (pp. 15–27). The normative basis of an open democratic society, namely the interplay of responsibility and freedom, had been abused and systemically eroded. Thus, the social embedding and legitimation of modern science seems fragile. Universities in some countries are already experiencing this fragility on a large scale. Deep distrust against the academic elite is breaking ground worldwide in populism and is becoming a political force [4].

This accusation hits science hard, which can only develop its potential under the condition of fundamental trust in the reason of freedom. Science is challenged to defend the trust in reason and freedom as the basis of democracy by proactively assuming responsibility for overcoming the central social challenges. Instead of hiding behind the non-binding nature of a systemic, ultimately questionable concept of freedom and idly watching its structural incapacitation in many countries, it must become more political and transformative. The necessary knowledge for a sustainable model of global development requires a transdisciplinary approach that can be generated and communicated to key actors in a broadly effective and comprehensible manner. Such methodological, practical, and scientific–political reflection is the necessary first step to a science of sustainability that is both aware of its responsibility and respects the freedom of research. It is a prerequisite for science not simply to adopt declamatory large goals from the outside, from the political realm, but to adopt goals from the inside. The competencies of science in analyzing problems, opportunities, and strategies for action should be methodically reflected upon. Strengthening the voice of science in the context of political decision-making processes improves the chances of responsibility. This would not, as the critique of transformative science proposes, imply an "atrophy" of the political [41] (p. 190). Exactly this is an indispensable task of ethics. If ethics is to be more than a trivializing Sunday rhetoric, it must not stop at conjuring up desirable things, but must uncover and overcome conflicting goals and dilemmas. Responsible science's task is to be the voice of those who have no voice in the arena of power.

After this norm–theoretical approach, the following reflections will focus on the relation of scientific research to society and the societal impact of research and education in the context of the actual discussion about climate change and the challenges of sustainability.

4.4. Research and Its Social Responsibility

Transformative science should help students to reflect on key problems in depth and to develop action knowledge suitable for their era [13] (p. 162). How this can be achieved is a topic of its own, to which reference can only be made in the context of the reflection focused here on research ethics. Such a reference, however, is necessary and integral if one adheres to Humboldt's idea of the university as a unity of research and teaching. Clever and responsible graduates are an indispensable "resource" of modern knowledge societies. Since students are the first addressees of the knowledge generated at universities, models of transformative and emancipatory science must always prove themselves. This can only succeed if students are not seen as passive recipients of knowledge, but are increasingly involved in the generation and communication of knowledge. Transformative science and transformative education belong together [6,7,74] (pp. 46f.; pp. 113f.; pp. 51f., 69). With regard to the "whole-institution approach", even "the institution itself functions as a role model for the learners. Sustainable learning environments, such as eco-schools or green campuses, allow educators and learners to integrate sustainability principles into their daily practices and facilitate capacity-building and competence development, and value education in a comprehensive manner" [6] (p. 4).

If thinking is interpreted as the capacity for critical reflection, then thinking will always be questioning and uncomfortable. The debate on sustainability has often been oriented towards compromises. Now, the mood seems to be turning to radical criticism of culture and the system. In

this situation, the voice of a science that weighs complex arguments and remains objective without trivializing conflicts is essential.

5. Towards a New Enlightenment

5.1. A Methodically Controlled Reflection on the Epistemic and Normatively Rich Premises of Every Science

The discourse on sustainability leads to a philosophical–scientific reflection on the epistemic and ethical–political foundations of the project of modernity, which have become fragile and need further development. It is important not to give up on human rights universalism, but at the same time to become more sensitive to cultural contexts and ecological preconditions, which are often decisive for its concrete perception. Equally important is a critical revision of notions of rationality, space, and time, as well as the freedom and political control that underlie the project of modernity.

Ernst Ulrich von Weizsäcker and Anders Wijkman postulated a "New Enlightenment" [37] (p. 92), which they characterized as Enlightenment "that is fitting for the 'full world' and for *sustainable* development" [37] (pp. vii). Its core, according to the authors, is a methodically controlled reflection on the epistemic and normatively rich premises of every science, even supposedly value-free fields. Fundamental to the success of a New Enlightenment is a new quality of dialogue between the natural sciences and the humanities, which for decades have been divided into "two cultures" [75]. An explanation of the prerequisites and limits of the different models of rationality in the sciences is the decisive impulse for interdisciplinary discourse. The predominant model of enlightenment and rationalization as linearly increasing secularization and "disenchantment" is questioned [27]. The New Enlightenment strives to regain the unity of reason and faith that was a central guiding idea in the founding of European universities; however, it does so in a changed context, as an impulse for a comprehensive understanding of rationality [37] (pp. 92–98).

The current challenges of global development are concerned with fundamental questions as well as human and world views. Hence, theological and religious aspects play a constitutive role—for example, regarding the ideas of progress, prosperity, quality of life, and social cohesion. Notions about nature, the meaning of history, and the sources of responsibility and morality are also addressed. The significance of enlightened theology in a pluralistic public sphere and scientific culture is not limited to updating and revising religiously orientated knowledge. In the interest of enlightened reason, theology must also counter the false public use of religion, above all religious self-exaltation of the political, ecological, or economic. Often, the religious factor expresses itself in "post-secular societies" [76] (p. 328) by granting a quasi-religious status to the ecology and linking "green religion" with sense-making [77]. Here, the task of interdisciplinary dialogue among theology, philosophy, and the humanities or social sciences is to distinguish between "neomythic" ways of thinking and a critical awareness of the mutual referentiality of faith and knowledge [76] (pp. 328–338). The often-subliminal equation of freedom with market freedom, of the model "homo economicus" with an image of man, or of profit maximization with claims to the creation of meaning also challenges the sciences to a New Enlightenment. Such demarcations are as much a scientific–theoretical task as a cultural one. They require new forms and forums for transdisciplinary dialogue.

A New Enlightenment uncovers ambivalences of modernity. For example, human identity cannot be construed as an isolated point-shaped self. It is rather formed in relationships with others and the other, with self-understanding depending on the absolute other [78] (pp. 6f.; 321–324). Critical examination of the "anthropic principle" of modern idealism [79] is an indispensable deep dimension of spiritual and moral reorientation in the upheaval of late modernity.

The classification of empirical, normative, and transformative aspects of knowledge must be reflected in a new way if science is to promote not only factual knowledge, but also judgement and action competence [21] (pp. 436–456). What is needed is an ethics of knowledge that fosters conversation among the various forms of rationality. This is the only way in which universities can guarantee comprehensive education in the claim to genuine, cosmopolitan "universitas" and to develop

problem-oriented interdisciplinary approaches to solve the increasingly complex questions of the future concerning society, the environment, and technology. A self-reflexive enlightened science focuses on the institutional embedding of knowledge generation and reception. In turn, this focus is associated with contingent perspectives, interests, and prerequisites. It is up to such a science to give more space to the old concept of phronesis (wisdom) as a value-led and context-sensitive judgement [80] (p. 65). In addition, a rediscovery of the spiritual dimension of ethics and of sustainability could be part of such a new phase of upgrading Enlightenment [28] (pp. 279–282, 482–494).

One possibility of implementing a New Enlightenment—including critical awareness of values and history—would be a philosophical and theoretical examination of the fundamental models of the respective subject at the beginning of all courses of study. Each course could begin with conceptual training, learning to think about and understand the normative premises of the subject-specific guiding models. A general philosophical–ecological study program could also be implemented for first-year students at universities to introduce sustainability knowledge in the fields of general education, environmental sciences, and social sciences.

5.2. A New Understanding of the Relationship between Sustainability and Freedom

A crucial part of that enlightenment in the age of climate change is a new understanding of the relationship between sustainability and freedom. Sustainability has to be understood as empowerment to freedom. People are not only entitled to have freedom and human rights, but should also be empowered to exercise them by securing the necessary ecological, socio-cultural, and economic conditions for all. This includes future generations and people in the Global South. By referring to the basic capabilities, freedom becomes concrete. This understanding of sustainability can be inspired by the capability approach of Amartya Sen and Martha Nussbaum. Following Amartya Sen, one could spell out "sustainability as freedom": Sustainability promotes freedom by securing the increasingly decisive preconditions. This also applies to universities; that is, commitment to sustainability requires enforcing the freedom of research and teaching through securing their essential prerequisites [74] (pp. 84f.).

Freedom arises by assuming responsibility [81] and through the practice of independent and resistant thinking. Hannah Arendt did not define "The Freedom to Be Free" [82] as the absence of fear and limitations. In the sense of the Aristotelian understanding of man as "zoon politikon", she defined freedom as participation in the political process. This is also a task of higher education, not only individually, but institutionally. Universities can only secure freedom and autonomy if they actively shape their own conditions for action as structural policy actors. The striking discrepancy between knowledge and action in times of climate change challenges educational institutions to link research, education, practice, and social communication in new ways. These are aimed at enabling independent analysis and catalytic participation in shaping social change. Knowledge that takes itself seriously seeks to reduce the discrepancy between critical thinking and everyday action; therefore, it has an ethical dimension. Creating such a transdisciplinary ethics of knowledge is a crucial task for universities during this time of climate change [74] (pp. 87f.). Shifting from the abstract idea of freedom to an awareness of socioecological preconditions of freedom to be free lies at the core of the new enlightenment.

5.3. Overcoming the Fragmentation of Knowledge

The central thesis of this article is that value-free research is neither possible nor desirable. Therefore, the following steps of argumentation are crucial: Science in a knowledge-driven society is one of the challenges we face in the context of sustainability, just as it is part of the solution. Because of this ambivalence, science has to be self-reflexive regarding its own practical and ethical preconditions, foundations, and consequences. This could be the starting point of a new phase of enlightenment. Therefore, this article proposed a philosophy of science as a methodological frame for such a "New Enlightenment" through inter- and transdisciplinary research and a transformative

role of science under the demands of sustainability. This role can be described as catalytic because it is not the main force for transformation, but just a specific element of it. Philosophy of science can help to overcome the fragmentation of knowledge and be an enabler for the dialogue between the natural sciences, humanities, ethics, and society. Finally, philosophy of science resists the positivist self-understanding of science which leads to a marginalization of ethical questions [15,21]. Instead, sustainability calls for a new emancipation of science as a structural policy actor.

Thus, this essay proposed a multidimensional understanding of wisdom, rationality, and sagacity as a foundation of a "whole-rationality approach" for a sustainable university. The challenges of sustainable, transformative, or responsible science are grounded in the current self-understanding of the organizational form of science, namely a shortened understanding of rationality. Therefore, it needs a philosophy of science and a norm–theoretical analysis of the different models of understanding science. Only on this basis can universities contribute to a sustainable and responsible society under the conditions of the age of Anthropocene.

Faced with the increasing complexity of the modern world, ethics must spell out a new "grammar of responsibility" which organizes accountability in a complex world [74] (pp. 29–47). Ethicists can fulfil this role by methodologically reflecting, uncovering, and regulating conflicting goals and dilemmas. The morally overloaded avowal to sustainability needs to be transformed into a rational discourse about common but differentiated duties in a pluralistic world. The model of transformative and catalytic "science for a post-normal age" [16] (p. 739) requires a foundation in ethical reflection.

The acceptance of sustainability depends on whether it is thought of as a limitation of what humanity is not allowed to do, or understood as an authorization to act through long-term reason, cooperation, and fairness. The problem facing the global sustainability debate does not seem to be different definitions of objectives, but rather the question of how moral claims can be enforced given the dominance of particular interests. Focused on content, the sustainability and transformation discourse lacks reflection about what norms are and how they work [21] (pp. 9–20). The function of norms is not to indicate moral reasons when there are no obvious material reasons and interests for certain actions. Norms rather serve to open up an area of freedom by creating a certain distance from the world of the factual. In the modern knowledge society, solutions to the challenges of climate change and sustainable development can only be found on a scientific basis. Science can be only productive under conditions of self-dependence. It needs anticipation of trust. To justify and vindicate this, the scientists have to develop methods of self-control regarding criteria of responsibility. Sustainability could be a frame for the search for new models of ethical universalism in a broken world. The scientific frame of this is an understanding of responsibility as accountability in the field of tension between actor, object, and controlling authority, and the handling of highly complex risks. It has to be seen as an integral element of understanding rationality and the associated concept of science and society in times of climate change. The aim is to outline an ethics of knowledge that understands research, freedom, and responsibility as a unit, and plumbs the academic discourse space anew. Only the reunification of freedom and responsibility can build up a strong resistance against the "post-factual" weakness of trust in reason and democracy.

6. Conclusions

The argumentation of this article was developed in five steps:

(1) In the present situation of climate change and the great acceleration in the epoch of the Anthropocene, humanity is running out of time. Therefore, the role, the conditions of communication, the perceptions, and the tasks of universities in the present public discourses are changing. Universities are no longer only observers, but also become "change agents" and have to deal with the request of a proactive relationship between science and society.

(2) There is a wide call for a new role of science in society which is discussed under different headlines, e.g., transformative, responsible, public, sustainable, or catalytic science. All of these models are in a deep conflict with the positivistic theory of science, which is still dominant. Scientists

are involved from the beginning in social change—as soon as they begin to produce ideas and discourses. It is their task to reflect upon this situation.

(3) Against this background, universities are part of the problem and part of the solution as well. If they shall become driving forces for a sustainable society, they have to undergo a cultural revolution regarding the concepts of rationality, freedom, wealth, and progress. Therefore, the universities have to overcome a shortened understanding of rationality that leads to the marginalization of ethical questions. There is often a lack of scientific research about moral dilemmas on the way to a sustainable society. To deal with this adequately, sustainability science in the Anthropocene that recognizes the claim of the SDGs needs a comprehensive ethically founded reorientation as well as a transdisciplinary approach that establishes an inclusive relationship between intellectuals, politics, and the public sphere. Sustainable science includes wisdom, which constitutes our personal grammar of importance, preference, desirability, and identity. By beginning to act as "transformation labs", the universities become self-reflective "structural policy actors" that see sustainability not as an externally defined goal, but as an open search process with heterogeneous target components that have to be clearly specified. Hence, the normative claim of sustainable science is an attack on the positivist theory of science.

(4) A responsible shaping of the accelerated change in society needs a "normative compass" with the concept of dignity at its heart. The centerpiece of this cultural and scientific revolution is a differentiated understanding of the concept of responsibility. The art of responsibility is the distinction between primary and secondary issues as well as between different levels and degrees of commitment. Needed is an analytical approach to the "grammar of responsibility" in its three dimensions. The relationship between subject, object, and addressee that constitutes the "social grammar of responsibility" helps to overcome the idleness of declamatory overloaded concepts of responsibility in favor of a better understanding of conflicts between ecological and social demands and a down-to-the-earth distance to utopian thinking. The challenge is to define a new version of a humanism which is aware of ecological interconnectedness and the dialectical tension between progress and risk. Responsible science's task in this context is to strengthen risk maturity that opts for innovations and avoids system risks. Scientists always have to be the voice of those who have no voice in the arena of power.

(5) These considerations lead to the program for a "New Enlightenment" with three dimensions: (a) The autonomy of research requires a critical examination of one's own institutional conditions for action. So, science needs a methodically controlled reflection on the epistemic and normatively rich premises of every science. (b) The lack of consensus regarding the interplay of freedom and responsibility imperils the social cohesion. There is a need for a new understanding of the relationship between sustainability and freedom. (c) Regarding a whole-institution approach, transformative science and transformative education belong together. In order to promote a sustainable society in the age of Anthropocene, science needs to overcome the fragmentation of knowledge, the dualism between natural and social sciences. Thus, universities need a "whole-rationality approach" that is aware that value-free research is neither possible nor desirable. In this manner, sustainability enables the "freedom to be free".

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