Volume 5

The Hermeneutic Side of Responsible Research and Innovation

Armin Grunwald
The Hermeneutic Side of Responsible Research and Innovation
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The author of this book has three precious skills to offer in the understanding and implementation of responsible research and innovation (RRI). He has been trained in physics, he is a philosopher and an important practitioner in the field of technological assessment (TA) and its inclusive form of participatory technological assessment (PTA). For this last reason, this book is very welcome to extend the content of the previous volume (Volume 4) in this set of books, *Precautionary Principle, Moral Pluralism and Deliberation. Sciences and Ethics*. Some of the problems addressed in both texts, practically and theoretically, are common to both the PTA and RRI fields. Armin Grunwald thinks that there is quite nothing new with RRI compared to PTA. In this way he replaces the novelty of RRI in a 30-year tradition, mainly developed in Europe, at least with public institutions, when these experiments are operated mainly by the private sector or universities out of this area.

As a physicist in charge of one of the biggest TA and PTA institutions, he could have insisted on the different ways to *calculate* the different risks of emerging technologies. Instead of calculation he appeals to forms of *discourse*. Indeed, before emerging in research programs, new technologies are produced in different narratives. What is a new trend in political discourses, “tell us a story for this project”, from a small program up to a European building, is true in innovation and research as well. As he writes, this book is to decipher the meaning assigned to new and emerging science and technology (NEST). When the so-called post-modern philosophies have preached their end, the big stories come back just like a boomerang. This need of a story is perhaps because of the fragmentation of knowledge necessary for developing the new technologies and in a second step their socio-political impacts on societies. The place of technologies in the globalization process is central. There would be no globalization without technologies, they are in transportation, information or communication and human biology. The RRI pillar pleading for open science is only a partial solution to the problem of the fragmentation of knowledge. As a medicine – the *pharmakon*, remedy, poison and scapegoat in *Phaedrus* exploited by the French philosopher Jacques Derrida – it can heal, but at the same time it can make the problem worse.
The action of assigning meaning, central to this book, is very close to the core of responsibility. One of the meanings of responsibility is imputation as presented in Volume 3 of this set by Sophie Pellé and Bernard Reber (*From Ethical Review to Responsible Research and Innovation*). Indeed, the meaning thus stands – just as, for example, that of responsibility (Chapter 2) – in a social and communicative context in which arguments for attributions are expected but can also be controversial.

Armin Grunwald conveys here another philosophical tradition: the hermeneutic one. From the theological field dealing with the study of texts, to Heidegger, Gadamer, Ricoeur, this prolific sub-field of philosophy is specialized on the problem of interpretation. While the previous volume (Volume 4) was mainly focused on argumentation, this volume largely opens the space to interpretation. The problem of narrative is an “uncharted territory” in RRI debates. The field of new and emerging science and technology does not focus on those technologies as such. A breakthrough technical or scientific success does not have any societal meaning per se. Therefore, it is important to see how these meanings are created and disseminated. Attribution of responsibilities to new technology takes place at a very early stage of development. The assignment of meaning may even be decisive for social acceptance or rejection of technology.

Where Ricoeur was more interested in the identity problem, with five determinations of the human capacities – language, action, narration, ethics (responsibility) and memory – Armin Grunwald in his three forms of hermeneutics has introduced actions mediated by technologies, when some are sophisticated, and turned into the future.

This text echoes further volumes in three different ways.

Firstly, it deals with uncertain futures as in Volumes 1–4. The major origins of the production and assignment of meaning is based on techno-visionary futures and approaches to define and characterize new fields of science and technology, as Armin Grunwald has presented in detail, especially in Chapters 3 and 4. Indeed, these narratives play a decisive role in determining the nature of what is new. This is also true as an element in the ethical theories (see Volume 4). It follows here more a pragmatic line, meaning something (objects) for someone (addressee).

Secondly, these techno-visionary futures play an important role in what some present as anticipatory governance. Volume 4 of the set insisted more on the famous precautionary principle. We have here a contribution in the debate between anticipation and precaution. But traditional approaches based on consequentialist reasoning no longer work. We are facing problems of reliability. If the precautionary principle is used in cases where we have no means to build on reliable probabilities, these visions of the futures could have a role in the assessment.
In the debate regarding anticipatory governance, Grunwald puts more emphasis on the meaning of the projections as expressions of today’s diagnoses, perceptions, expectations, attitudes, hopes and fears instead of interpreting them as anticipation. We have another way to speak about the communicational expectations of Habermas, less normative and more focused on the objects than the people taking part in the interactions.

Thirdly, Armin Grunwald recognizes that he is mainly focused of the beginnings of a hermeneutic circle of reaching an understanding on the meaning of NEST developments. However, this initial station of the attribution of meaning is very crucial since it limits the diversity of alternatives. We find here a defence of the diversity of possibles and the recognition of the contested future, already tackled as an important issue between ethics and efficacy (Volume 1).

Fourthly, Armin Grunwald returns back to deliberation. We find in another way the theories of deliberative democracy, exposed and criticized in Volumes 3 and 4 of the set. Grunwald wants to clarify the roots of RRI and contribute to a more transparent democratic debate over the direction and the utilization of scientific and technological progress. A task that requires public involvement.

The hermeneutic approach sketched out in this book will hopefully contribute to the development and application of a new type of reasoning and policy advice in debates on future technology beyond traditional consequentialism. Different emerging technologies are studied through this interdisciplinary hermeneutic approach: nanotechnology, synthetic biology, human and animal enhancement, autonomous technologies, robots, technologies to fight against global warming. Very creative, clear as well as based on improved methods, this book unfolds an ambitious research project and a worthy contribution to philosophy.

Bernard Reber
October 2016
Preface

Responsible research and innovation (RRI) has become an intensively debated concept for shaping future science, technology and innovation. This book is dedicated to the hermeneutic dimension of this concept by focusing on the first steps of emerging RRI debates. The main message is that the object of responsibility must be extended: beyond scrutinizing the responsibility for possible consequences of new science and technology in a more distant future, it is highly relevant to carefully observe the assignment of meaning to new science and technology in early stages of their development. Meaning is attributed by relating new science and technology to social and usually techno-visionary futures as well as by definitions and characterizations of these new fields. The aims of this book are to uncover these processes of assigning meaning, to put them in the context of responsibility, and to sketch a hermeneutic approach as an interdisciplinary research program for achieving a better understanding.

This book builds on research done by the author in the recent years and develops it further. An explanation of the origins of the various chapters and their relation to preceding work at the end of this book makes the novel approach transparent and shows clearly where I refer to existing work. The notion of hermeneutics with which I experimented over the last years serves as a conceptual umbrella.

Thanks have to be expressed in different respects. First, I would like to warmly thank Bernard Reber for inviting me to publish this book in the Responsible Research and Innovation set of books. Second, I highly benefited from many debates on RRI with my colleagues from the Institute for Technology Assessment and
Systems Analysis (ITAS) and with many colleagues from all over the world. Third, the fantastic work of Sylke Wintzer, Miriam Miklitz, and Michael Wilson on translation and proofreading made it possible to publish this book in excellent quality. Last but not least, I would like to thank Nina Katharina Hauer for carefully organizing the references and the bibliography.

Armin GRUNWALD
September 2016
What Makes New Science and Technology Meaningful to Society?

Intensive and sometimes controversial debates about new forms of technology, especially those embodying a visionary perspective, have become a dominant field of communication between science, technology and society in the past decades. They make up the largest portion of the debates in the field of responsible research and innovation (RRI). In this introductory chapter, I ask how the social and ethical interest in new technology arises – in other words, how scientific and technical developments in the laboratory or in modeling are given real social meaning. The directions I examine in this book exist in a practical context. The objective is to clarify RRI studies and discussions about their roots and thus to contribute to a more transparent democratic debate over the direction and utilization of scientific and technological progress. The generation of sociotechnical meaning, which – according to my thesis – is essential for making new technology interesting for RRI debates, is not a task for scientists and engineers alone but requires public involvement.

1.1. Motivation and objectives

The debate on responsible research and innovation (RRI) [OWE 13a, VAN 14a] has so far been focusing on a comprehensive understanding of innovation [BES 13], on participatory processes to involve stakeholders, citizens and affected persons in design processes and decision making [SYK 13], on understanding responsibility in industry [IAT 16], and on ethical conceptions of responsibility [GRI 13, GRU 14a, GIA 16]. Furthermore, it is concerned to a large extent with identifying specific characteristics of RRI in order to distinguish it from established approaches to reflection on science and technology, such as technology assessment [GRU 09a], value sensitive design [VAN 13a], science, technology and society (STS) studies.
WOO 14] and applied ethics [CHA 97]. Considerable effort is spent on profiling RRI among these approaches [OWE 13b, GRU 11a, VON 12].

These topics are without a doubt central to the further development of RRI. However, other aspects might also be crucial and must not be neglected. A question that has so far attracted hardly any attention is how the issues and challenges that are analyzed, discussed and reflected from different perspectives in the context of RRI come into being. My supposition is that this question is uncharted territory for RRI that is untapped in both an analytical and a practical sense. The goal of the book is to undertake some first steps toward exploring this uncharted territory. To provide a brief outline at the outset, I would like to make five observations at the beginning that should motivate the analyses presented in this book:

1) A first observation motivating this book is that RRI debates in the field of NEST\(^1\) (new and emerging science and technology) do not focus on those technologies as such. For RRI debates to arise at all, the respective NEST developments such as synthetic biology, human enhancement or autonomous robotics must rather show relevant meanings [VAN 14b] in ethical, cultural, economic, social or political respects. A purely scientific breakthrough or a huge experimental success in laboratory research does not have any societal meaning per se. They may be scientifically or technologically fascinating but will not find resonance beyond unless a further step is done: it is only the sociotechnical combination of scientific and technological advance or projections, on the one hand, and their possible societal consequences and impacts, on the other, which triggers RRI debates. There would not be any RRI interest in NEST developments without the technological advance stories being related to expected, promised or feared societal consequences and implications. Only this second step makes new science and technology meaningful to society and a fascinating and often contested issue in society and its RRI debates. Then, questions will arise as to what might be in store for us or for future society, what might be at stake in ethical, political or social respects and what the NEST developments under consideration could mean in different respects for the future of humans and society. It is precisely these questions on the sociotechnical meaning of NEST that constitute the paramount object of the often controversial RRI debates. Thus, it appears obvious that we must deal explicitly with the issue of how these meanings are created and attributed, what their contents are, how they are communicated and disseminated and what consequences these attributions of meanings have in the RRI debates and beyond, e.g. for public opinion forming and political decision making.

\(^1\) RRI is obviously not restricted to NEST fields and also covers innovation in more mature fields of technology, such as technologies for transforming the energy infrastructure. However, in this book, I will focus on NEST fields and consider case studies in this area only (see Chapters 5–8).
2) The second observation guiding the analyses in this book concerns the role of futures for the creation and assignment of meaning, in particular the role of techno-visionary futures in NEST fields. A large body of research literature of the recent years legitimates stating that a major mechanism of assigning meaning to NEST developments is telling stories about the future impact and consequences, the expected benefits and risks of new technology under consideration for the future development of society, humankind or individual life. Techno-futures, in particular techno-visionary futures, play a key role in the attribution of meaning to NEST developments. In these futures, projections of new technology are associated with future images of humans and society, often in a purely hypothetical and thus also speculative manner:

“Those anticipations are meaning-giving activities, and their function is to prevent choices being taken blindly, or on the basis of too narrow fantasies of future actions which focus only on a sub-selection of possible follow-up actions and ignore significant groups of stakeholders” [VAN 14b, p. 102].

This observation (see Chapter 3) makes it possible to productively use the knowledge acquired in the previous decade about the role of techno-futures and visions [SEL 07, ROA 08, GRU 12a, COE 13, NOR 14] in order to investigate how meaning is assigned to new technologies by relating them to narratives of the future. These narratives involve perceptions, issues being considered as problems, expectations and hopes, worries and anxieties that give rise to questions and controversies. This field of “contested futures” [BRO 00] provides plenty of substance for RRI debates.

3) While the observation of the meaning-giving role of futures has already been discussed sporadically over the last years, the issue of how new sciences and technologies are defined and characterized and what the corresponding scoping processes and debates on an adequate characterization add to the meaning of those sciences and technologies has not been explicitly considered yet. Despite the fact that we have witnessed extensive and complex debates on the definition of nanotechnology [SCH 03, DEC 06], on the understanding of synthetic biology compared to other fields of biology and biotechnology [PAD 14], and on the understanding of human enhancement [GRU 12b], there is no conceptual debate on the meaning-giving function of these debates and processes. This seems surprising because obviously answers to questions such as what is substantially different between the NEST developments under consideration and existing lines of research and development are of high importance to attach societal meaning to them (see Chapter 4). Thus, the third observation to be substantiated in this book is that processes and controversies around the definition and characterization of new sciences and technologies are of major relevance for assigning meaning to them.
4) At this point, a *fourth observation* motivating this book becomes apparent. The attribution of meaning to a new technology by relating future stories to it or by proposing specific definitions usually takes place at a very early stage of development. In most cases, it will precede the respective RRI debate or accompany it in its nascent stage, but can then strongly mold the debate’s further development. Whether, for example, enhancement technology is attributed the meaning of offsetting inequalities in the physical and mental attributes of different humans and thus of leading to more fairness, or whether it is supposed to be used to fuel the competition for influential positions in the sense of promoting super-humans illustrates the great difference. Depending on which prevails, the respective NEST field will be assigned to one of these completely different discussions and put in a different context. The example shows that the assignment of meaning can heavily influence public debates and can possibly be crucial to public perception and attitudes by highlighting either chances or risks. At the end of the day, the assignment of meaning may even be decisive for social acceptance or rejection of that technology as well as for policy and decision making on the promotion or regulation of research and development. Thus, the possibly high impact of assigning meaning to NEST developments leads to the postulate of an early critical reconstruction, analysis and assessment of those meaning assignment processes, their results and their communication in order to enlighten the debate and to shed light on blind spots of those processes and debates (see section 1.2).

5) The *final basic observation* guiding the analyses to be provided in this book is that uncovering processes of assigning meaning to NEST developments involves considerable conceptual and methodological challenges. The assignments of meaning via techno-visionary futures, on the one hand, and by processes of definition and characterization, on the other hand, are interpretations, associations and, in the case of futures, partially speculations showing an epistemologically precarious nature and lacking strategies of proving them objectively. Mostly, it is extremely difficult or even impossible to say anything about the validity and reliability of those meaning-giving propositions – which, however, might have a major impact following the fourth observation above. This observation raises the questions of how to provide a well-reflected orientation for society and decision makers involved in NEST debates and policies. Provision of orientation knowledge is at the core of RRI – however, in the situation of lack of valid knowledge, traditional approaches based on consequentialist reasoning do no longer work (see Chapter 3) [GRU 14b]. If RRI and technology assessment nevertheless is to substantially contribute “to achieve better technology in a better society” [RIP 95] by analyzing meaning-giving processes, new approaches have to be developed. The *hermeneutic approach* sketched in this book will contribute to the development and application of a new type of reasoning and policy advice in debates on future technology beyond traditional consequentialism. Its objective is to
allow deciphering the meanings assigned to NEST developments as early as possible in order to allow and support more transparent and enlightened debate.

These five observations are illustrated in Figure 1.1, which presents two elements:

– first, the creation and development of meaning and its attribution, whether by means of technology futures or characterizations, are regarded a hermeneutic circle: the available meanings on offer are communicated and discussed and, in the process, supplemented or modified. The history of the definition of nanotechnology [SCH 03] is an excellent example of this (see Chapter 5);

– second, this hermeneutic circle itself must have been created at some point. There must have been acts in which meaning is attributed, representing the first steps, and the hermeneutic circle mentioned above can then develop out of them. For nanotechnology, Richard Feynman’s famous lecture [FEY 59] or the book Engines of Creation [DRE 86] might have been such first steps or at least early steps in the process of creation.

The illustration makes it clear how great an influence such initial steps can have by decisively molding the ensuing debate and that in the hermeneutic circle these steps can only be gradually modified by alternative suggested meanings. On the other side of the image, so to speak as the output of the hermeneutic circle at a
certain point in time, are the real consequences (section 1.2), for example with regard to funding for research or shaping the social debate. Clarification of the workings of the hermeneutic circle, in particular of its beginnings, is therefore a central task for us to be able to discuss the real output in as transparent a manner as possible, for instance, in the framework of public debates.

It is interesting to observe that the concept of hermeneutics – the study of understanding and meaning themselves – has been mentioned from time to time, although not frequently, in the RRI debate in the last few years. Probably, this is neither a coincidence nor simply a passing fashion. On the contrary, the use of the word “hermeneutics” signifies a growing accumulation of knowledge and diagnoses that have been obtained from technology assessment (TA), science, technology and society studies (STS studies), sociology of expectations [VAN 93], applied ethics and the philosophy of technology in working with the new and emerging sciences and technologies. This result is especially the consequence of studies of technovisionary projections of the future [NOR 07a, SEL 08, FER 12] putting more emphasis on the meaning of these projections as expressions of today’s diagnoses, perceptions, expectations, attitudes, hopes and fears instead of interpreting them as anticipations of what the future will or might bring. In particular, the word “hermeneutic” has been used in the following contexts:

– reinterpreting the nature of futuristic visions: the idea that visions could anticipate future worlds that we would have to prepare ourselves for was reinterpreted to be the question as to what these visions say about us today [GRU 14b]. This reinterpretation, which was the result of a discussion about vision assessment [GRU 09b, FER 12], has turned attention to understanding technovisionary futures as a means of preparing a diagnosis of the present;

– understanding instead of predicting: the expectation that technology assessment is supposed to predict future developments more or less precisely, as is mentioned over and over again, frequently cannot be realized, especially in the field of NEST. Qualitative understanding must come first. Helge Tøgersen [TOR 13] sees a hermeneutic task of technology assessment in analyzing NEST;

– attributing meaning to new areas of technology: Simone van der Burg [VAN 14b] sees visionary futures as a means of giving sense and meaning to NEST, such as via the visionary embedding of technical developments in future social constellations. This production of meaning, not the anticipation of future developments, is the primary function of uncertain and speculative futures according to van der Burg.

While these references seem to be more or less isolated, they will be used as points of departure to expand them in this book in order to enable a more systematic study of hermeneutic questions in the NEST debates. The hermeneutic approach to
better understand processes and contents of assigning meaning to new technology will add meta-information to the RRI debates about the techno-visionary futures dealt with there and about the processes of definition and characterization of NEST developments. This meta-information includes information about the respective current world in which the techno-visionary futures are created and communicated, but not statements about the future as a coming reality. The hermeneutic turn [GRU 14b] changes the perspective: understanding the meanings of techno-visionary futures leads us back to the present. It is this meta-information that heightens a debate’s reflection and transparency and thus helps make the debate open and unbiased in the sense of a deliberative democracy. Similarly, a hermeneutic analysis of processes of defining and characterizing NEST should help uncover the background of present diagnoses and perceptions motivating these proposals.

This perspective, based on the normative ideal of a deliberative democracy in the field of designing and governing the development and use of new technology, claims to add new accents to the RRI debate so far. It is based on the five above-mentioned observations that serve as questions or hypotheses guiding the analyses and argumentation presented in this book. Briefly, they may be summarized here as the major starting points:

1) **The attribution of meaning** to new technology plays a large role in the NEST debates and in the respective deliberation processes and controversies [VAN 14b]; subjects of RRI debates are not new technologies as such but are rather sociotechnical meanings assigned to them.

2) **Techno-visionary futures** and other types of narratives of the future constitute a major medium of assigning meaning to new technology; they usually cannot anticipate future developments but fuel current and ongoing debates and controversies to form opinions and make decisions today.

3) Debates on the definition and characterization of NEST are highly relevant to assigning not only scientific and technological but also ethical and social meaning to them and should thus be included in a hermeneutic enlightenment of the emergence of meaning.

4) **Orientation** for society and decision makers is needed because the assignment of meaning may have major consequences despite the lack of knowledge about expectable future consequences.

5) The **hermeneutic perspective** will investigate and uncover these meanings in order to increase transparency, expecting that democratic deliberation and argument-based reasoning will benefit.
This means that we are required, not merely entitled, to reflect conceptually and methodologically on the creation and attribution of meaning in the RRI debates on NEST fields. The identification of two major origins of the production and assignment of meaning – techno-visionary futures, on the one hand, and approaches to define and characterize new fields of science and technology, on the other hand – has structural consequences for this book. Both roots of meaning will be described conceptually in more detail their dedicated chapters (Chapters 3 and 4), while the case studies on various NEST fields (Chapters 5–8) will address both tracks by applying a hermeneutic perspective.

The book extends the state-of-the-art concerning the hermeneutic perspective on futures and definitions of NEST, and their use by different actors in conceptual and methodological terms adds several new aspects to the RRI debate, and will motivate further lines of exploration and reasoning in this direction. As the first monograph on the hermeneutic side of RRI and its accompanying NEST-related debates, it will bundle and focus research done so far, provide insights by applying a more comprehensive and comparative perspective and give orientation for further research on NEST-related techno-visionary communication.

1.2. The need for orientation in NEST fields

This book – which is by all means theoretically oriented, as shown by the issues it pursues – ultimately owes its origin to practical interest. The backdrop for this is the practical claim of technology assessment, for which I stand [GRU 09a], as well as that of RRI to provide orientations that are based on knowledge and research in order that research and innovation can be conducted in a responsible manner and lead to ethically and socially good results [VON 13, VAN 13a]. With this goal and obligation in mind, the observations made above show that their realization requires a deeper look at the processes of creating and attributing meaning to developments in NEST. Both the philosophically motivated questions as to meanings and their provenance, on the one hand, and the theory-driven and empirically underpinned answers, on the other hand, remain fundamentally tied to a practical interest in pursuing knowledge: the objective is to improve the prospects for RRI to meet the expectations placed in practical orientation. In order to underpin this primacy of practice, I will initially specify the central arguments as to why orientation is at all necessary in the field of NEST.

NEST developments are by definition at an early stage of development (section 1.3) and still strongly rooted in basic research. Does it make any sense at all to demand public debate on such topics and to expect political and social orientation? Should we not instead let scientists doing basic research continue their research? Are the positive and negative visions linked to them anything more than simple