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Unconventional ideas conventionally arranged: A study of grant proposals for exceptional research

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Abstract

Exceptional research involves exceptional, rather than established, approaches, theories, methods and technologies. Nevertheless, to gain funding for such research, scientists are forced to outline unconventional ideas in ways that still relate to recognized concepts and findings, as well as adhering to the conventional requirements of relevant fields of research. Surprisingly, we know very little about the approaches scientists take to overcome these obstacles. In this article, we investigate how applicants use rhetorical moves and argumentative patterns to rationalize their unorthodox ideas and how they rhetorically combine their hypotheses or ideas with those of previous research that used specific methods and recognized technologies. The study concentrates on neuroscience grant proposals in Germany for a funding programme intended to support exceptional research. In addition, we look for the argumentative patterns favoured by members of and reviewers for the organization's funding programme in order to understand if the successful applications share rhetorical characteristics. An analysis of 52 applications disclosed four different argumentative patterns: (1) solving practical problems, (2) exploring specific phenomena, (3) expanding confirmed knowledge and (4) offering an alternative theory. Only one persuasive strategy explicitly challenges established theories by proposing alternatives. Despite this, the funding programme continued to ask for radical and extraordinary ideas and many scientists continued to present potentially ground-breaking ideas that did not invalidate earlier work.

Keywords

argumentative patterns, exceptional research, grant proposals, neuroscience, rhetorical moves

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Introduction

Scientific researchers seldom have the opportunities and the resources to substantially probe new and controversial approaches. Nevertheless, within the great variety of funding programmes, there are some dedicated to offering financial support to exceptional and potentially transformative research (see e.g. Heinze, 2008). It is common practice, even among these funding programmes, to ask for formally arranged proposals. This means that applicants with unconventional ideas must present them in accordance with accepted knowledge, which binds them to the formal and functional aspects of writing up scientific content.

Grant proposals, in particular, are usually written in an unpretentious manner (Myers, 1990) and adhere to conventional structures (Connor, 2000; Connor and Mauranen, 1999) such as referring to previous research, identifying research gaps, indicating specific goals and describing the planned approach. Such rhetorical moves and conventions are also evident in other scientific forms, such as research reports and articles (see e.g. Gilbert and Mulkay, 1984; Gross et al., 2000, 2002; Myers, 1989; Swales, 1981, 1990). In addition, grant applicants are forced to frame their proposals concurring with normative subtexts that vary from discipline to discipline (Serrano-Velarde, 2018). Taking these circumstances into account, how do applicants deal with the difficulty of probing a heterodoxic scientific idea while they are tied to established (orthodox) scientific expectations and conventions? Most studies of exceptional research examine and assess institutional conditions and policies (e.g. Bourke and Butler, 1999; Heinze, 2008; Laudel, 2006; Laudel and Gläser, 2014). In addition, there are investigations of the formal and functional aspects of grant proposals (Connor, 2000; Connor and Mauranen, 1999; Serrano-Velarde, 2018).

Interestingly, we know little about the rhetorical practices used in grant proposals that would finance exceptional research. How can applicants simultaneously demonstrate a mastery of scientific theories, methods and technologies and persuade reviewers and evaluators to support something unconventional. In two recent studies, Barlösius (2018a, 2018b) offered some insights into the concepts of originality and risks in grant proposals for exceptional research. She describes in what respect ‘promised newness’ reveals some distance from what Kuhn (1970) describes as ‘normal science’ with its acknowledged scientific models, principles and methods. Barlösius (2018a) distinguishes between temporal (i.e. for the first time), partially different (i.e. non-traditional) and revolutionary (i.e. complete turnover) accounts of originality in different scientific disciplines. According to her findings, temporal and partially different accounts of newness only assume slight changes within normal scientific fields, whereas revolutionary accounts contemplate a break with acknowledged traditions. In another paper, Barlösius (2018b) examines the same grant proposals to see how applicants cope with risk. Taking her interpretations, researchers deliberately play down riskiness in their plans for research; detailed descriptions of deliberate procedures to handle likely bottlenecks seem to be a common practice in this regard. Thus, different wordings regarding newness, originality and risk might be potential methods of persuasion to deal with the obstacle of leaving approved tracks in science without being unscientific. Nonetheless, these studies still paid less attention to how applicants rationalize such outlooks. As in Dirk’s (1999)

investigation of portraying originality in research articles, one may ask how applicants refer to previous research but embed and operationalize their ideas scientifically? Are there different argumentative patterns beyond different concepts of originality?

This paper presents findings of an explorative analysis of the argumentative patterns employed by researchers in their grant proposals when applying to the funding programme 'Experiment! – in Search of Bold Research Ideas', run by the German Volkswagen Foundation in 2013. The programme asks for 'unconventional', 'radical' and 'counter-intuitive' approaches and thus seems to provide applicants with opportunities to leave the approved tracks of science without being unscientific (VolkswagenStiftung, 2017). However, at the same time as presenting unconventional ideas, applicants have to demonstrate a mastery of widely accepted and established theories and recognize previous research methods. Concentrating on grant proposals from the research field of neuroscience, we investigated how these applicants used rhetorical moves and different argumentative patterns to rationalize their ideas. Our analytical focus was on how they rhetorically combined their hypotheses or ideas with previous research, specific methods and technologies and how they typically connected research gaps with goals and means. Based on these findings, we further asked whether members of the funding programme and reviewers favoured certain argumentative patterns and whether chosen grant proposals share distinct rhetorical characteristics. We found that applicants employed various forms of argumentative patterns. Interestingly, there is only one persuasive strategy that explicitly challenges established theories by offering alternatives; other argumentative patterns may promise ground-breaking results but remain less provocative. The review board, however, did not give priority to provoking styles and they were open to other argumentative patterns.

Data

The initiative behind the 'Experiment! – in Search of Bold Research Ideas' was to create a flexible funding programme to enable scientists to search for and explore novel ideas and produce exceptional research. According to the Volkswagen Foundation's guidelines (as described on its website and in its flyer for the programme), the organization supports counter-intuitive, radical and unconventional hypotheses, methodologies or technologies. This funding programme specializes in financing exploratory endeavours in natural sciences, life sciences and engineering. It is seen as readdressing the balance in mainstream funding which usually encourages studies within established theoretical and methodological frameworks.

We had access to anonymous grant applications to the 'Experiment!' funding programme in 2013. The Volkswagen Foundation received 704 proposals to finance an exploratory endeavour for a maximum duration of eighteen months and to a maximum cost of €100,000. These proposals went through a two-step review process. At first, members of the organization sorted out applications that were seen as fitting 'the spirit of the initiative' (Bischler and Soetbeer, 2017). According to those responsible for the funding programme, they looked for unconventional but argumentatively precise and clear proposals and used in-house expertise to assess their scientific soundness for certain fields of research. With this procedure, they reduced the number of all applications

down to 93. These made up the shortlist given to a jury for further professionally qualified assessment. The jury board consisted of experts from different disciplines and research fields and they finally singled out thirteen applications for funding (a success rate of 1.8 per cent) – confirming a highly competitive funding programme.

In order to handle an investigation of rhetorical practices, this study concentrates on all grant proposals from neurosciences and in particular those that were eventually funded. The number of applicants in the submitting process whose proposals related to neuroscience was 52. Limiting the sample to neuroscientific topics assures that findings can be related to this field of research. As it happens, the review process elected six neuroscience proposals for the shortlist, two of which were funded (a success rate of 3.8 per cent within neuroscience).

Formally, all these proposals were more or less structured in accord with the predefined schedule. Applicants were asked to provide a three-page description of the proposed project, divided into sub-units that included: the research idea; the implementation concept and why it is unique; and the reasoning for an exploratory phase. Most applicants used this formula; those who deviated from it still reproduced a genre-specific structure, for example, one grant proposal was arranged using the headings 'Motivation', 'State of the art', 'Solution concept' with the subheadings 'Technical objectives and objections' and 'Relevance and perspective'. We concentrated our analysis on these parts of the proposals and did not consider additional pages for more formal aspects; applicants, for example, could use an extra page for illustrations or images. We also left out the separate self-assessment sheet in which applicants were prompted to justify why their research idea was particularly fitting to the programme, why it should be considered for funding and what objections were expected and how they would respond.

Method

Without any predefined assumptions about specific argumentative patterns, our examination was guided by the principle of theoretical sampling (Glaser and Strauss, 1967). After gaining a preliminary impression of the material, we began a closer reading, comparing and contrasting the proposals. Using maximal and minimal contrast cases, we searched for specific structural and rhetorical patterns in the rationales of the grant proposals. The close reading of research proposals continued until typical patterns could be identified and separated. After scrutinizing more than twenty proposals and skimming through further applications, we came up with a typology of distinct argumentative patterns that were repeatedly employed in the examined grant proposals.

The comparative close reading of the proposals comprised of several analytical steps. In a first round, using the concept of rhetorical moves (Connor and Mauranen, 1999), we examined the functional components of the grant proposals. Based on detailed descriptions of specific research grant strategies (Connor, 2000; Connor and Mauranen, 1999), we identified the rhetorical purposes of different text segments in each closely examined grant proposal. To differentiate meaningful units, we also made allowance for linguistic clues (e.g. changing tenses or the use of adverbs) or typographical indicators (e.g. a section headed 'Open question'). The next analytical step assumed a logical connection between the gap, the goal and the means (see Connor, 2000) and we further

Table 1. Identified argumentative patterns in examined research grant proposals.

Typical genre-specific structure							
Territory		Gap		Goals		Means	
Argumentative patterns for 'unconventional ideas'							
Solving practical problems							
Present previous research	→	Indicate practical problems	→	Provide a solution	→	Describe parameters for a proof of concept	
Exploring specific phenomena							
Present previous research	→	Indicate unknown	→	Identify characteristics or patterns	→	Describe parameters for observations	
Expanding confirmed knowledge							
Present previous research	→	Indicate theoretical/ methodological shortcomings	→	Present a corresponding idea	→	Describe parameters for testing idea	
Offering an alternative theory							
Present previous research	→	Indicate new findings	→	Introduce an alternative explanation	→	Describe parameters for testing hypothesis	

studied how applicants linked these moves. Our examination concentrated on the different arguments employed: How did they construct an argument for the gap? What followed as goals? What plan of action was described to achieve the anticipated goals? In a final step, we searched for terms and phrases that typically appeared in the construction of certain arguments; for example, in discussing the research gap, applicants who searched for new scientific knowledge indicated gaps as 'unknown' or 'elusive' whereas those who intended to solve a practical problem discussed the 'advantages' and 'disadvantages' of earlier solutions.

It appeared that, even though we examined only three key pages, proposals were typically organized along the genre-specific routes of enquiry: territory (an introduction to the research topic and previous research), gap, goals and means. In some cases applicants also employed segments to highlight achievements (anticipated results), benefits (intended usefulness and value to people in general) or competence claims. Despite this, we found distinct argumentative patterns connecting gaps, goals and means with typical terms and phrases.

In a final step, the typology of identified argumentative patterns were separated into segments and described in order to provide a schematic overview (see Table 1) and establish a codebook. A group of interpreters (another researcher joined the authors) applied segment descriptions to a randomly selected sample of ten proposals and discussed disagreements and questions. The discussions resulted in amended codes which were used by two coders to categorize all 52 neuroscience grant proposals plus all funded applications. They identified agreements and resolved disagreements by discussion with the assistance of MaxQDA (Kuckartz, 2010). With the software package it became possible to work

with a standardized set of codes to annotate the whole sample. This analysis shows that the typology seemed to be robust and that the characteristic segments and relations could be comprehensively employed to categorize all of the applications under investigation.

Four distinct argumentative patterns

The following quotations are taken from the examined grant proposals to illustrate the distinct argumentative patterns that were identified. To preserve anonymity and to protect scientist's ideas, the quotes are short. For that reason, the cited passages include relevant wordings and phrases but contain abstract paraphrases in rectangular brackets when quoting sensitive information. Otherwise, all quotations taken from the grant proposals are reproduced without any corrections.

Solving practical problems

The majority of the research grant applications (n=21) presented daring solutions to practical problems. Rather than setting up goals such as producing new scientific knowledge, for these applicants it was more relevant to create a working prototype that would allow new procedures or optimize existing ones. Consequently, reporting on previous research proposals underline the drawbacks and disadvantages of established practical solutions and do not highlight theoretical obscurities or examine unexplored phenomena. It is against this background that applicants introduce fresh ideas that are meant to overcome existing practical obstacles. For them, the grant's purpose is to run assessments and evaluations in order to provide a proof of concept.

Grant proposal Neuro36 is typical of this argumentative pattern. It starts with a description of a technique widely used 'in various technical applications including material and life science as well as in clinical research'. In the follow-up, the applicants depict how it works and name some disadvantages: 'Thus central requirement for intensity-based analysis is [a specific technique] to obtain an appropriate signal … which however has physical limitations' or as they continue to say; another strategy is 'resulting in artificial conditions … giving a bad taste to relevant scientific evidences'. Against this background, the authors propose to 'establish a novel analytic method' that 'will allow visualization and quantification of [a particular] label concentration which cannot be achieved by conventional intensity-based approaches'. In the means section they outline a procedure to overcome 'the above mentioned physiological and physical limitations'. According to the applicants, they will utilize some variations and 'quantitatively evaluate various biological processes'. In the end, they 'expect to gain quantitative information already at little … concentrations' which in their words 'makes the suggested approach predestined for early clinical diagnostics'. Intriguingly, in the section 'Reasoning for the explorative phase' the applicants mention similar approaches 'mostly focused on theoretical analyses, while suggested biomedical applications are still hypothetical. The transition of the [particular] analysis to life science is the major goal of this proposal'. Thus, the proposed solution might be 'one major step towards early clinical diagnostics' but not a potential breakthrough changing entire research fields.

Nonetheless, there also are some applications employing this argumentative pattern that are more enthusiastic about transforming the research field. Grant proposal Neuro49, for example, starts with the words: 'The [particular idea for a] neuroelectronic device has the potential to open up new research areas.' A whole paragraph is reserved for naming various advantages, especially for fundamental research, associated with the envisioned neuroelectronic device. With currently working systems, the authors associate a long list of drawbacks such as the fact that these devices are 'restricted to muscle recordings', 'single channel measurements' and have battery power systems that 'are too heavy for brain recordings in small animals'. As a solution, the applicants envisage a specific recording system with a new 'energy harvesting concept to shrink size and weight … for recordings in much smaller animals'. The funding then is planned for 'research into the feasibility of designing [certain] sensors with energy harvesting capability and their impact on [small animals]'. Various experiments and simulations 'will be used to find and evaluate strategies for [certain] devices, evaluate the behavioural impact on [small animals] and to overcome these interdisciplinarily connected problems by a close cooperation between different areas of expertise'.

Exploring specific phenomena

Applicants who chose this approach controversially refer to an unknown that needs to be identified and characterized for the advancement of science (n=13). They assume that previous researchers undervalued the relevance of characteristics, relations or processes of certain phenomena and they point to gaps or unclear assertions in common explanations. From their perspective, clarification will deepen knowledge, if not change related fields in science. Hence, in a proposed project, applicants promise to generate new scientific knowledge but not with an alternative theory in mind. Rather, they have the aim of understanding an under-studied phenomenon using new technologies or procedures or by including new species, subspecies or materials. However, the overarching goal is not to develop and implement new technologies but to identify unexplored traits or dynamics regarding certain phenomena.

Grant proposal Neuro30, for example, employs this argumentative pattern. It starts directly by naming a devastating disease and giving a short description of its characteristics and how it manifests itself. The first paragraph closes with an approximation of these words: 'Owing to the poor understanding of its pathomechanism, neither an adequate diagnostic nor specific treatment exists'. Taking it as a fact that investigations of this disease 'are still in its infancy' the applicants are 'aiming to perform a complementary systematic approach to directly assess the individual genetic background and the influence of environmental factors … applying a human model system' instead of working with another procedure 'applied in the past' that 'led to disappointing results … and poor clarification of the underlying pathomechanism'. Taking a different approach, they 'aim to establish an in vitro … cell culture model based on … neuronal progenitor cells …. Using this progenitor cell based model we will be able to better reconstruct … pathogenic changes in … patients'. The authors plot different monitoring strategies 'to nail down involved pathways' hoping 'to unravel the manifold pathomechanistic changes'. Finally, instead of fundamental changes the authors say: 'The outcome will significantly

improve insight into [the specific disease] pathophysiology and represent a solid basis for the development of novel diagnostic and therapeutic approaches.'

Grant proposal Neuro01, by contrast, does not promise a paradigmatic shift but is full of words indicating fundamental impacts on the research field: 'to achieve an unprecedented understanding of decision making', holding 'the potential for great advancements in our understanding of neuroscience and animal behavior' and used 'innovative technology [that] can revolutionize our ability to quantitatively characterize realistic animal behavior'. The applicants claim that understanding the decision-making processes is the major goal of neuroscience. To solve their riddle they bring together concepts and procedures from different disciplines ('a revolutionary combination of biology and engineering') to set up a new technology employed to study 'microbrains' in small animals for the 'characterization of decision making'. In the 'means' section, the authors describe various aspects of multicomponent stimulus systems combining different, already existing, technologies with the aim of 'using unsupervised machine learning algorithms, we will assess [animal movements] generated by the animal during [certain] experiments in order to identify behavioral units and decision points.'

Expanding confirmed knowledge

For this argumentative pattern (n=14), applicants characteristically propose to enhance, rather than challenge, the store of knowledge. They do not present counterintuitive theoretical ideas but draw on previously gained evidences and established theories and methods to broaden existing knowledge. Applicants identify shortcomings in certain research fields and offer theoretical or methodological amendments to validate well-known concepts and theories. This scientific strategy might be depicted as upgrading approved knowledge and methods while using the grant to test approaches.

Grant proposal Neuro52 opens with: 'Science is the incremental experimental validation and improvement of formal theories that make quantitative predictions about observable data.' The authors go on to say that certain procedures and methods are used to understand the neurobiology of the human condition. However, from their perspective, the research field 'lacks a coherent scientific framework' due to 'the juvenileness … as an independent research field'. Against this background, the authors propose to establish a formal scientific framework that would allow it 'to mature as a scientific field'. After describing different traditions of neurobiological approaches, the applicants indicate as their goal 'to address both methodological shortcomings of state-of-the-art [procedures] within a coherent scientific framework … in an exemplary scenario'. Interestingly, the proposed concept relies on and combines existing and acknowledged theories and methods, while 'the exploratory phase will provide a detailed account of the feasibility of the [particular] concept'.

In a more commonplace way (hypothesis testing), grant proposal Neuro16 reports on previous research and concludes the summary section with a hypothesis about a particular organic compound and its role in the development of a specific plaque in mammals: 'This led us to the idea that, as a proof of principle, the introduction of the critical [organic compound] may initiate the formation of [specific] plaques.' The authors do not expect to challenge existing knowledge about the named organic compound; their goal is to 'get

substantial support' for their hypothesis. In the following 'means' section they describe in detail a procedure to test their hypothesis using methods that are 'state-of-the-art, but not new. The unique kick of the proposed project is its hypothesis.'

Offering an alternative theory

With this rhetorical pattern, applicants introduce a counterintuitive idea which, if proven, could be expected to rewrite part of science's stock of knowledge. These applications are exclusively concerned with scientific theories and explanations. Sometimes, in this line of argument, the authors refer to practical problems or mention possible gains for people in general but the focus of these proposals is entirely on a revolutionary idea that challenges accepted knowledge.

Typically, authors precede their introduction of a radical new idea with polemical references to new findings that question established theories. They then present the new idea as being able to integrate the challenging findings. Finally, they announce the central purpose of the research project, testing hypotheses related to the idea. The 'means' section describes parameters and procedures to test the stated hypothesis and identifies conditions that would indicate its approval. It is characteristic of this argumentative pattern that applicants not only promise to extend the existing stock of knowledge by employing unpretentious writing (Myers, 1990) but also oppose established or 'common' theories and claim originality.

An exemplary proposal for this argumentative pattern is Neuro11. After a general statement about the devastating effect of a particular disease, the applicants start their argument with this observation: 'Numerous epidemiological studies have demonstrated that [a certain disease] is significantly associated with [a specific phenomenon]'. Hence, most authorities consider 'a causality between the disease and the mentioned phenomenon'. Against this, the 'research proposal takes a point of view that represents the exact opposite to current thinking'. In other words, they accept the correlation but suggest that the phenomenon causes the disease. To underline this hypothesis, the applicants present some previous research but also emphasize that there is 'currently no evidence, or even a published speculation' regarding the presumed causality. Further on, they outline a procedure in detail to test their hypothesis and expect, if they are successful, that the findings 'will modify our thinking' and 'will dramatically change the current fundamental concepts on the pathogenesis of [certain diseases]. Moreover, if our hypothesis is proven to be correct, it will impact not only on the field of [a specific neuroscience] but on the entire field'.

This argumentative pattern appears in three other grant proposals. A recurring rhetorical strategy is that of a description of how a certain phenomenon is seen from a well-known and established perspective in the research field. By highlighting some open questions, applicants make room for a contrastive reading which is not always described as oppositional to common understanding but as something that might offer a new perspective. The authors of grant proposal Neuro19, for example, report that correlations between forms and functions of certain brain areas are taken for granted in their field of research. Nonetheless, they identify some 'functional consequences' that are 'poorly understood'. Against this background they introduce their own hypothesis in which a

certain compound plays a central role in neuronal processes. In a relevance claim they write that '[t]raditionally' and 'usually' certain activities are connected to synapse-specific characteristics. However, they continue to assert that if they could provide evidence for their idea 'this would radically change our view of functional mechanisms determining a single cell's incorporation in a neuronal circuit'. This section is followed by an outline of how they plan to test their hypothesis and what they would be able to identify in on-going experiments.

Discussion

Applicants who present their anticipated unconventional ideas and promise groundbreaking findings rationalize their approach within scientifically acknowledged conventions and paradigmatic requirements. In their grant proposals, they present themselves as well-trained scientists demonstrating their mastery of accepted scientific approaches and methods in the related research field. They identify gaps in previous research, propose a goal and also an approach to generate methodologically validated and reliable results. Doing so, they more or less select approaches to explore their unconventional ideas in accordance with the basic premises of neuroscience as a multidisciplinary branch of biology (including physiology, molecular biology and developmental biology as well as psychology, mathematical modelling, neuroinformatics, neural engineering and others) because all identified argumentative patterns reproduce research strategies that are standard procedures to generate new knowledge in these research fields.

Of course, the present study only reports on argumentative patterns in grant proposals related to neuroscience. Interestingly however, in contrast to Barlösius' (2018a) observation that neuroscientists construct newness temporally, applicants in our sample employ a broader variety of argumentative patterns. While Barlösius concentrated on typical disciplinary differences, our findings indicate that neuroscientists also use argumentative patterns that she primarily associated with biology and medicine (explore the unknown), with the field of engineering (solving problems) and with physics (testing alternative hypotheses). A possible explanation might be the fact that neuroscience is a relatively new multidisciplinary approach to brain and neuronal systems, bringing together researchers from disciplines such as biology, anatomy, biochemistry, psychology, engineering, mathematics and medicine. From this perspective, neuroscience, in particular, might qualify as a suitable case to identify a range of argumentative patterns typical for sciences. Nonetheless, concentrating on neuroscience is not exhaustive. Disciplines such as engineering may operate with more variants of problem solving than others. Thus, additional studies on proposals and other research practices may reveal additional (sub) types and variations.

In a nutshell, investigated grant proposals indicate that unconventional ideas are conventionally arranged. Applicants draw on common argumentative patterns to generate knowledge and to demonstrate their mastery of established theories, methods and procedures. There is just one argumentative pattern that explicitly challenges approved scientific knowledge, theories and models; presumably, offering an alternative theory is a provocative rhetorical move. However, even such explicitly voiced heterodoxy is organized according to scientifically approved forms and functions: grant proposals are not a

Table 2. Number of argumentative patterns in total and after selection in neuroscience, and for all funded proposals in 2013.

Argumentative patterns	Proposals from neuroscience			Proposals from all disciplines
	All	On the shortlist	Funded	Funded
Solving practical problems	21	2	1	7
Exploring specific phenomena	13	2	0	2
Expanding confirmed knowledge	14	0	0	0
Offering an alternative theory	4	2	1	4
Total	52	6	2	13

place to be scientifically unconventional and unorthodox. In principle, scientists might leave scientifically accepted courses of research in their laboratories or in the field – if they have capacities and resources to do so. If they have to apply for a research grant, though, scientists are forced to comply with scientific standards formally and functionally (i.e. basing their programme on previous research, charting it in a familiar-looking plan, answering to potential bottlenecks). Otherwise, according to Bourdieu (2004), they risk being perceived as outsiders to the scientific field.

Flexibility and leeway are therefore two common features of funding programmes for exceptional research (Heinze, 2008; Laudel and Gläser, 2014). This is also true of the Volkswagen Foundation's 'Experiment!' funding programme. However, a closer look at the guidelines reveal criteria, such as providing proofs of concept for non-standard methodologies, for imponderables and potential bottlenecks. These criteria might help to assess the scientific soundness of the proposed idea but at the same time they force scientists to frame unconventional ideas not as mere exploratory research (i.e. present a potentially unpredictable course of research in a working plan).

The review board, ranging from organizational members to professional experts, did not exclusively fund applications that were, formally speaking, counterintuitive and radical. Even so, the call for applications explicitly asked for unconventional and unorthodox ideas that would qualify as instances of 'extraordinary' (Kuhn, 1970) or heterodox research (Bourdieu, 2004). Table 2 shows that the members of the funding organization selected applications employing all argumentative patterns except *expanding confirmed knowledge*. In the next round, the jury of experts selected a proposal offering an alternative theory and another that argumentatively aims at solving a practical problem. Thus, appropriate proposals are not necessarily unorthodox in their arguments. This tendency is also evident if we include all other funded proposals in the year 2013. As we see, apart from expansions of the acknowledged, the jury also gives priority to all other forms of argumentative patterns. This might indicate that even reviewers abstain from narrowing discoveries and inventions to extraordinary research. It rather seems that they expect revolutionary science if a grant proposal has at least convincible potentials leading to 'a conceptual or technological breakthrough'; even so it might 'not necessarily destroy or invalidate earlier work but rather place it in a new light' (Casadevall and Fang, 2016: 1–2).

Hence, it is obvious that funded applications in the sample are not restricted to unconventional ideas argumentatively presented as extraordinary or revolutionary. However, this observation raises two substantial questions. First, to what degree is the selection of applications for funding inconsistent with the goal of the funding programme? In 2013, not all proposals offering an alternative theory were selected for the shortlist, although they best represented what extraordinary research means. Second, against this background, one might ask for the reviewers' specific criteria for choosing proposals. Apart from unorthodox approaches, there seemed to be other criteria at work. When do reviewers reject unconventional and heterodox ideas – especially if they passed through the first round? How do experts evaluate whether testing an alternative explanation is unworthy of funding? What are their stated reasons to justify such decisions?

Finally, a great proportion of the examined proposals are argumentatively dedicated to solving practical problems. Why does this argumentative pattern constitute more than one third of all applications? Neuroscience, of course, includes some, but not primarily, researchers with disciplinary backgrounds in engineering and medicine; a great deal of work in this scientific field is committed to fundamental research. Concepts such as mode-2 (Gibbons et al., 1994) or finalization (Böhme et al., 1983) offer one possible explanation, assuming that all fields of science are now more concerned with conducting research that has direct practical relevance. However, the argumentative pattern *solving practical problems* does not sufficiently match with the understanding of pure applied research (Stokes, 1997). Of course, applicants who presented unconventional solutions had highly sophisticated arguments that included approved knowledge and methods in order to assess and evaluate their ideas. But, more importantly, rather than creating something for immediate use, they usually requested an exploratory phase to allow them to investigate the feasibility of their particular idea. Applicants can align their idea with the grant programme's purpose of funding exploratory research and they might argue differently if presenting their idea to other funding organizations. However, taking into account that most unproven and preliminary ideas in science are explored outside of funding schemes, we assume that these proposals are borne in circumstances Stokes described as 'research that systematically explores particular phenomena …, driven by the curiosity of the investigator about particular things' (Stokes, 1997: 74). Against this background, the funding programme may often be used for probing unconventional ideas that will, if successful, provide grounds for developing a properly run procedure or technology that then becomes attractive to industrial and more predetermined funding schemes. Usually, scientists have limited time and resources to run this type of research. It might be possible; hence the 'Experiment!' funding programme is most attractive to scientists with potential, but incomplete and/or untested, solutions to a practical problem. However, further research is needed to understand the relation between calls for exceptional research and proposals advancing ideas on alternative solutions.

Our findings indicate that scientists who applied for funding of exceptional research hardly ever submitted grant proposals that presented extraordinary or heterodox approaches. Adapting to the standard form and functions of applications, these researchers arrange their potentially ground-breaking ideas in scientifically acknowledged ways. We doubt that sticking to scientific criteria is preferable for funding heterodox research and encourage new methods of supporting this research.

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