Applicant: **Steeger, Jer**
Organisation: **University of Bristol**
[redacted]

IF23\100451

PRIMARY APPLICANT DETAILS

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CONTRIBUTOR DETAILS

Role **UK Sponsor**

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Role **Head of Department**

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Role	Nominated Referee 1
Title	[redacted]
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Role	Current Supervisor
Title	[redacted]
Name	[redacted]
Surname	[redacted]
Tel (Work)	[redacted]
Email (Work)	[redacted]
Address	[redacted]

Role	Research Support
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Email (Work)	[redacted]
Address	[redacted]

IF23\100451

Section 1 - Research Proposal

Primary Subject

Philosophy

Project Title

Credence and chance in a pluralist approach to quantum theories

Start Date

01 October 2023

End Date

01 October 2026

Proposed Host Institution

My choice of host institution is the University of Bristol. I plan to work in the Department of Philosophy with Professors Richard Pettigrew and Karim Thébault.

Reason(s) for Choice of Host Institution

The University of Bristol is an ideal hub for this project. Many of my technical methods overlap with those used by formal epistemologists at the university, such as Catrin Campbell-Moore, Jason Konek, and Richard Pettigrew. Drs. Konek and Pettigrew, in particular, do pioneering work on the accuracy-first approach to justifying norms of approximate reasoning, a methodology on which this project draws extensively. Moreover, some of my philosophical methods overlap with those used by philosophers of physics at Bristol, such as Nadia Blackshaw, James Ladyman, Karim Thébault, and Lena Zuchowski. Finally, my work fruitfully intersects with topics of interest to members of Bristol's Quantum Information and Foundations research group, such as Sandu Popescu and Tony Short. The university's strong support of interdisciplinary work sets this project up for success.

Additionally, in July 2022, Drs. Konek and Thébault invited me to a successful workshop at the university on the intersection between formal epistemology and quantum foundations (titled Non-Classical Probability: Formal Epistemology Meets Foundations of Physics, held in July 2022). Working at Bristol would allow me to develop and deepen the collaborative relationships that the workshop fostered.

Abstract

Quantum mechanics generally makes predictions about the world using probabilities, and philosophers of physics have given nuanced defenses of an intuitive and popular way of understanding those probabilities: namely, via dualism, the view that some are objective and others are subjective. However, these philosophers often sharply disagree on how to interpret quantum mechanics—and they tend to assume the correctness of their interpretation when they argue from dualism. My previous work argues that they need not do so in at least one case. It shows how one popular symmetry-based defense given within the many-worlds interpretation of the theory also applies to a single-world, pilot-wave interpretation. This argument shows a sense in which dualism is robust: it is well-motivated across different philosophical attitudes towards one of our best physical theories. That robustness, in turn, strengthens a pluralist approach toward interpretations of quantum mechanics by

providing a common understanding of probability among agents who might still sharply disagree about the nature of the reality that quantum theory describes.

Pluralism about the interpretation of quantum mechanics is an attractive view. Each existing interpretation has unique virtues that seem conducive to truth, and it is far from clear that a single consistent approach can maintain all of these virtues. However, one rarely sees formal methods put to work to develop and defend a pluralist approach. This project seeks to fill that gap by investigating how much additional common ground different interpretations might share regarding probability. The more common ground, the stronger pluralism gets.

As such, this project aims to test dualism's robustness across interpretations in two key ways. First, it seeks to unify the symmetry-based defenses with another popular class of defenses based on initial distributions over the space of possible particle configurations. Second, it aims to extend both sorts of defense to Generalized Probabilistic Theories (GPTs), a popular operational framework meant to house all interpretations of quantum theory (including both the many-worlds and pilot-wave approaches mentioned above) in addition to possible future theories with different empirical predictions. I also aim to extend an entirely subjective interpretation of probabilities to this class of theories to assess its relationship to the dualist's alternative. The result will be a robust quay from which agents can embark on a shared exploration of probability in quantum theory and beyond, irrespective of individual ontological commitments.

Research Proposal

Section 1: Background and summary of previous work

Epistemologists have long worried about beliefs in chancy settings. No small amount of the trouble comes from the frequent conflation of belief and chance in our everyday talk of "probability." Some typical probability locutions seem to be about subjective opinions or credences (e.g., "I will probably enjoy this soup"), while others refer to chances fixed by some physical system's proprieties (e.g., "That weighted coin will probably land heads when flipped"). Probabilities appearing in quantum mechanics (e.g., "This uranium isotope has a certain probability of decaying within this year") are often heralded as the examples par excellence of objective chances. But many researchers explicitly assert that at least some quantum probabilities are subjective. A prominent minority, led by the so-called QBists (or "Quantum Bayesians"), argue that all of them are.

Against such arguments, I defend an approach that mirrors an intuitive approach to the simple statements above: some quantum probabilities are objective, and others are subjective. This view, dualism, is overwhelmingly popular among experimenters and instructors, but few seek to weigh it against the QBists' alternative. On the contrary, philosophers of physics are deeply interested in giving dualism a principled defense —but the issue is often entangled with how one approaches the notorious measurement problem. For example, David Wallace influentially argues that symmetries of the quantum state space justify the standard chance values (i.e., those prescribed by the Born rule), but only if we assume the controversial many-worlds solution to the measurement problem.

My defense of dualism is the first that explicitly accommodates a range of interpretations of quantum theory. It comes in two parts. First, contra Wallace's claim, I show how a different interpretation of quantum mechanics, pilot-wave theory, can support the symmetry-based derivation. It does so by appealing to the well-known phenomenon of decoherence, which provides a widely-endorsed explanation of the stability of table-sized objects. As it turns out, much of the usual story applies to both many-worlds and pilot-wave theories. The details differ, but I show enough agreement for both camps to use Wallace's powerful derivation of chance values. This work also raises the interesting open question of how the symmetry-based derivation relates to more traditional pilot-wave derivations of chance values in terms of initial distributions over the space of particle configurations (more on which in the next section).

Second, I investigate an interpretation-neutral approach to the epistemology of agents learning about quantum

probabilities. This work starts with the intuitive idea that agents want these estimates to be as accurate as possible. I give an accuracy-based argument for many quantum rules in a general algebraic setting, and this argument is amenable to many different approaches to measurement. My most recent work expands on this interpretation-neutral approach with several new collaborators. The work is funded by the NSF project Quantum Epistemology Beyond Quantum Measurement (QEBQM), a two-year grant that I co-wrote with colleagues Benjamin Feintzeig and Samuel Fletcher. During the project's first year, I considered novel accuracy-based arguments for rules governing how agents should update their estimates in light of learning new evidence. Interestingly, several different updating rules have been proposed in the literature. My colleague Alexander Meehan and I show how accuracy arguments vindicate two of them while recommending against a third. Moreover, our demonstration applies to all interpretations of quantum theory (like many-worlds and pilot-wave views) that are dualist about probabilities.

Section 2: Structure and planned output

This project breaks into four discrete modules. The first three aim to strengthen dualism's robustness to promote a pluralist approach to interpretations of quantum theory. The first aims to unify the symmetry-based and initial-distribution approaches to chances discussed above. The second and third assess whether one can extend these approaches to theories that might supersede quantum mechanics—and, if not, how one should proceed. The fourth project gathers the technical results of modules two and three into a context-sensitive spin on dualism that remains agnostic about objective chances: maybe we should have chances, and perhaps we should not, depending on which physical theory we think is right. This alternative view, QUAYism (for quantum "unbelievers, agnostics, and yearners"), provides a quay for a shared understanding of probabilities in quantum theories while admitting a wealth of contrasting ontological commitments.

Module 1: Unifying symmetry-based and initial-distribution approaches. One can take the initial-distribution arguments of various Bohmians to show that (roughly) any smooth distribution over the pilot-wave theory's initial state space should lead one to expect the usual Born-rule statistics in the long run. Similar arguments have recently enjoyed a resurgence in popularity in non-quantum contexts. However, Laura Ruetsche has recently argued that the pilot-wave version of the result suffers from an explanatory deficit: one naturally describes the positions of particles in pilot-wave theory—the fundamental properties the theory posits—using Dirac delta distributions, which are manifestly not smooth. How, then, can one justify the smoothness assumption? I plan to argue that the appeal to the standard explanation of stability that powers my symmetry-based derivation also justifies this assumption of smoothness. Then, I aim to draw out similarities between the pilot-wave initial-distribution arguments and accounts of long-run statistics in many-worlds theories to show a sense in which this approach, too, is independent of one's interpretation of quantum mechanics.
Planned output: One (1) philosophy of physics paper.

Module 2: Symmetry-based chance in post-quantum theories. The second project will investigate what dynamical features of GPTs might be sufficient to reproduce the symmetry-based and typicality-based derivations of objective probabilities without requiring the full Hilbert-space structure of quantum mechanics. These approaches hinge mainly on the existence of dynamical transformations between states in quantum theory's state space. Derivations of quantum theory within the GPT framework often exploit two sorts of axioms: (a) that the dynamics are continuous and (b) that the state space can be fixed, in a certain way, by a finite list of measurements. In this module, I will investigate how assumptions of type (a) or (b) might be weakened while preserving these derivations of chance values.
Planned output: One (1) philosophy of physics paper.

Module 3: The QBist alternative in post-quantum theories. The third project will investigate the status of the QBists' alternative to dualism in the space of GPTs. As mentioned above, QBism interprets all quantum probabilities subjectively). However, it relies on representation theorems to show how talk of "estimating a chance value" translates into a statement involving only credences. In the case of classical statistics, de Finetti's representation theorem shows that one can re-describe commonly-used objective probabilities in terms of

subjective ones. However, such theorems are only partially developed for GPTs. In particular, the status of recent results for GPTs that are signaling, or such that distant measurement settings change the statistics, is unclear. This project aims to clarify this relationship to articulate the scope of QBism's applicability and compare it with the scope of the dualist option investigated by Module 2.
Planned output: One (1) philosophy of physics paper.

Module 4: QUAYism. The fourth project will gather the technical results of modules 2 and 3 under a new philosophical view of probability in physical theories, QUAYism, and connect this view to discussions of pluralism in the general philosophy of science. In short, QUAYism endorses objective chances only for a physical theory that can justify them while taking a pluralist stance on which of any number of empirically-equivalent theories is right (using the GPT framework to identify when theories are empirically equivalent). I plan to use the results of the previous modules to detail the extent to which QUAYism licenses agreement or disagreement about objective probability. Then I will argue that QUAYism serves as a paradigm of productive, good-faith dissent: it gives a concrete case of how different epistemic communities can create knowledge together while respecting their disagreements.
Planned output: One (1) general philosophy of science paper.

Section 3: Fieldwork
The equivalent of fieldwork for this project consists of conducting a research visit, organizing a workshop, participating in conferences in the UK and Europe, and coordinating conversations with the BBLOC (Bristol-Birmingham-London-Oxford-Cambridge) network of UK philosophers of physics.

The research visit, to be conducted during work on Modules 2 and 3, would be to the University of Oxford to discuss results with philosophers and researchers in quantum foundations, including Christopher Timpson, Harvey Brown, David Deutsch, and Samson Abramsky.

The workshop would be a larger sequel to the July 2022 Non-Classical Probability workshop described above, to be hosted at the University of Bristol. We would invite new voices (such as Chris Fuchs, a pioneer of QBism, and Laura Ruetsche, a prominent defender of pluralism) and accept submissions from junior scholars in the UK. Through co-organizing a summer retreat for early-career scholars on topics in epistemology and quantum foundations (through the National Science Foundation grant ``Quantum Epistemology Beyond Quantum Measurement''), I have experience supporting and connecting promising younger scholars doing cutting-edge interdisciplinary work. Through this workshop, I would continue to grow this emerging network with the hope of building more bridges among diverse research communities.

Ethical Issues

Are there any special ethical issues arising from your proposal that are not covered by the relevant professional Code of Practice? You must answer yes or no:

⦿ No

Have you obtained, or will you obtain ethical approval from your employing institution or other relevant authority? You must answer yes or no:

⦿ No

If the answers are yes to special ethical issues and no to having obtained prior approval, please describe here the non-standard ethical issues arising from your research and how you will address them:

If the answer is no to special ethical issues please enter N/A

N/A

Previous Contact

In July 2022, Jason Konek and Karim Thébault invited me to a workshop at the university on the intersection between formal epistemology and quantum foundations (titled Non-Classical Probability: Formal Epistemology Meets Foundations of Physics, held in July 2022), where I first met Richard Pettigrew.

Training Programme

The University of Bristol will provide many opportunities for me to develop my networking and outreach skills, gain institutional experience, and support my career development. I will become a fully-fledged member of the Faculty for the whole duration of my stay in Bristol, with the opportunity to join Research Centres and emerging Research Clusters and the Faculty Early Career Network. These organizations offer a wide array of targeted courses and career development advice, a comprehensive website, and research staff mentoring circles. With the help of Prof. Pettigrew, I will establish a Personal Career Development Plan based on my specific training needs. This plan will be monitored at regular intervals and developed throughout the project.

Benefits to Individuals/Institution

This project will give me the chance to work closely with experienced and like-minded scholars on a crucial issue at the intersection of formal epistemology and the foundations of physics. On the one hand, this project develops novel applications of the supervisor's research program in accuracy-first epistemology, expanding the scope of this program and strengthening Bristol as a leader of the formal epistemology community. On the other hand, the supervisor and supporting faculty's institutional experience will be invaluable for strengthening my skills as a research leader and organizer.

Benefits to Overseas Country/Territory

In the United States, there is a growing interest in pluralist and feminist approaches to the philosophy of physics, but this emerging field is still struggling to gain a foothold. Preliminary organizing work is being done by Alisa Bokulich at Boston University, Laura Reutsche at the University of Michigan, and myself and Samuel Fletcher at the University of Minnesota, among others. Building my skills as a research leader at Bristol will enable me to support and grow this community. Moreover, this project would further disseminate the pluralist approach and enable me to begin building an international support network for like-minded scholars, affording additional opportunities to pluralists and feminists working in the US.

Benefits to UK

The UK is already a world leader in the fields of quantum foundations and formal epistemology; researchers at Oxford are at the forefront of the former, while scholars at Bristol spearhead the latter. However, these research programs largely operate independently of both each other and the emerging pluralist trend described above. Thus, my interdisciplinary fieldwork would strengthen networks between both UK research programs while making cutting-edge contributions to both.

Outline of Data Management and Data Sharing Plan

This project does not aim to generate data; the research outputs of the project will be published as self-contained and peer-reviewed journal articles, so a data management plan will not be needed.

Overseas Field Research

⦿ No

Section 2 - Eligibility Criteria

Please confirm whether you meet the eligibility criteria for the International Fellowship Programme as follows:

Do you hold UK Citizenship?

⦿ No

Do you hold a PhD?

⦿ Yes

When do you expect to be awarded your PhD?

04 August 2019

Do you have between 0 to 7 years of research experience since your PhD (factoring in career breaks and/or part-time working)?

⦿ Yes

Are you proficient in reading, writing and speaking English?

⦿ Yes

Section 3 - Contact Details

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Address	[redacted]

CONTRIBUTOR DETAILS

Role	UK Sponsor
Title	Professor
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Role	Head of Department
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Role	Nominated Referee 2
Title	[redacted]
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Role	Current Supervisor
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Address	[redacted]

Role	Research Support
Title	[redacted]
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Surname	[redacted]
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Email (Work)	[redacted]
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GMS ORGANISATION

Type	University
Name	University of Bristol
Phone	01173310522
Email	finance-royalsociety@bristol.ac.uk
Address	2 Priory Road Bristol BS8 1TX

Nationality: You must select one but you may select up to three if applicable.

Please state your nationality:

[redacted]

Nationality: You must select one but you may select up to three if applicable.

Please state your nationality:

No Response

Nationality: You must select one but you may select up to three if applicable.

Please state your nationality:

No Response

Nationality - Other

[redacted]

[redacted]

[redacted]

[redacted]

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[redacted]

[redacted]

[redacted]

Current Position Start Date

[redacted]

Current Position End Date

[redacted]

[redacted]

[redacted]

[redacted]	[redacted]
[redacted]	[redacted]
[redacted] Physics	[redacted]
No Response	[redacted]
No Response	[redacted]

Other Academic Experience

Academic Posts

2019–2023. Postdoctoral Scholar, Department of Philosophy, University of Washington, Seattle, WA.

2022–2023. EPIC Program Training Specialist, SafeCampus, University of Washington, Seattle, WA.

2022. Affiliate, Minnesota Center for Philosophy of Science, Minneapolis, MN.

2020–2023. Instructor of Record, University of Washington. Spring 2023: Advanced Logic. Spring 2022: WXML: Visualizing Quantum Probabilities. Fall 2020: Introduction to Philosophy of Science.

2013–2019. Instructor of Record and Teaching Assistant, University of Notre Dame. Spring 2019: Topics in Philosophy of Physics: Puzzles of the Quantum (Instructor of Record). Fall 2017: Notre Dame Teaching Workshop (Participant). Fall 2017: Introduction to Philosophy of Science (Instructor of Record). Fall 2015: Introduction to Philosophy (Teaching Assistant for Prof. Meghan Sullivan). Fall 2014: Cosmology and Philosophy (Teaching Assistant for Prof. Katherine Brading).

2012. Teaching Assistant, Massachusetts Institute of Technology. Fall 2012: 8.13 Junior Physics Lab (Teaching Assistant for Dr. Sean P. Robinson).

Service

2020–2021. Organizer. Spring/Summer 2021: Philosophy of Science Reading Group, University of Washington. Summer/Fall 2020: Physical Probability Reading Group, University of Washington.

2018–2022. Co-organizer. Summer 2022: QEBQM Early Career Summer Retreat, University of Washington. Spring 2021: Constructing Quantum Theories Workshop, University of Washington. Spring 2018: Contextuality and Special Topics in Quantum Foundations Workshop, University of Notre Dame, London.

2021–2022. Diversity, Equity, and Inclusion (DEI) work. Fall 2022 to Spring 2023: EPIC Program Training Specialist. Fall 2021 to Fall 2022: UW Department of Philosophy Climate Committee Member. Spring 2020 to Fall 2022: UAW4121 Anti-Discrimination Work Group Member.

2018–2020. Facilitator. Summer 2020 MSSPP2020, University of Illinois Chicago (online). Summer 2018: MSSPP2018, University of Chicago

2019–2023. Reviewer. The British Journal for the Philosophy of Science; Erkenntnis; European Journal for Philosophy of Science Foundations of Physics; Foundations of Science; Philosophy of Physics; Philosophy of Science; Studies in History and Philosophy of Science; Synthese.

List your Key and/or Relevant Publications

2022. Hypothetical frequencies as approximations, Erkenntnis, forthcoming.
Abstract: Hájek (Erkenntnis 70(2):211–235, 2009) argues that probabilities cannot be the limits of relative frequencies in counterfactual infinite sequences. I argue for a different understanding of these limits, drawing on Norton's (Philos Sci 79(2):207–232, 2012) distinction between approximations (inexact descriptions of a target) and idealizations (separate models that bear analogies to the target). Then, I adapt Hájek's arguments to this new context. These arguments provide excellent reasons not to use hypothetical frequencies as idealizations, but no reason not to use them as approximations.

2022. One world is (probably) just as good as many, Synthese, 200 (97).
Abstract: One of our most sophisticated accounts of objective chance in quantum mechanics involves the Deutsch-Wallace theorem, which uses state-space symmetries to justify agents' use of the Born rule when the quantum state is known. But Wallace argues that this theorem requires an Everettian approach to measurement. I find that this argument is unsound. I demonstrate a counter-example by applying the Deutsch-Wallace theorem to the de Broglie-Bohm pilot-wave theory.

2021. Two forms of inconsistency in quantum foundations, The British Journal for the Philosophy of Science, 72 (4): 1083–1110 (with Nicholas Teh).
Abstract: Recently, there has been some discussion of how Dutch Book arguments might be used to demonstrate the rational incoherence of certain hidden variable models of quantum theory (Feintzeig and Fletcher 2017). In this paper, we argue that the "form of inconsistency" underlying this alleged irrationality is deeply and comprehensively related to the more familiar "inconsistency" phenomenon of contextuality. Our

main result is that the hierarchy of contextuality due to Abramsky and Brandenburger (2011) corresponds to a hierarchy of additivity/convexity-violations which yields formal Dutch Books of different strengths. We then use this result to provide a partial assessment of whether these formal Dutch Books can be interpreted normatively.

2021. Is the classical limit “singular”?, Studies in History and Philosophy of Science, 88: 263–279 (with Benjamin Feintzeig).
Abstract: We argue against claims that the classical $\hbar \to 0$ limit is "singular" in a way that frustrates an eliminative reduction of classical to quantum physics. We show one precise sense in which quantum mechanics and scaling behavior can be used to recover classical mechanics exactly, without making prior reference to the classical theory. To do so, we use the tools of strict deformation quantization, which provides a rigorous way to capture the $\hbar \to 0$ limit. We then use the tools of category theory to demonstrate one way that this reduction is explanatory: it illustrates a sense in which the structure of quantum mechanics determines that of classical mechanics.

2019. Probabilism for stochastic theories, Studies in History and Philosophy of Modern Physics, 66: 34–44.
Abstract: I defend an analog of probabilism that characterizes rationally coherent estimates for chances. Specifically, I demonstrate the following accuracy-dominance result for stochastic theories in the C*-algebraic framework: supposing an assignment of chance values is possible if and only if it is given by a pure state on a given algebra, your estimates for chances avoid accuracy-dominance if and only if they are given by a state on that algebra. When your estimates avoid accuracy-dominance (roughly: when you cannot guarantee that other estimates would be more accurate), I say that they are sufficiently coherent. In formal epistemology and quantum foundations, the notion of rational coherence that gets more attention requires that you never allow for a sure loss (or “Dutch book”) in a given sort of betting game; I call this notion full coherence. I characterize when these two notions of rational coherence align, and I show that there is a quantum state giving estimates that are sufficiently coherent, but not fully coherent.

Field of Specialisation

History and Philosophy of Science

Summary of your Current Research

My current project, joint work with Ray Pedersen at the University of Minnesota, Twin Cities, applies the framework of epistemic injustice from feminist epistemology to the history of quantum mechanics. Our first paper in this project argues that Bohr’s philosophy of complementarity has historically operated as a vehicle for epistemic violence, depriving the broader physics community of epistemic goods that have since become essential for quantum foundations. This thesis unifies and sharpens four touchstone historical arguments about the rise of complementarity: Kuhn’s (1996) assessment that it comprised a revolutionary shift; Heilbron’s (1985) account of the missionary zeal of its early converts; Forman’s (1971) thesis that it arose as an adaptation to a hostile Weimar intellectual environment; and Beller’s (1999) argument that it was more effective in enforcing dogma than creating new physics—a silencing “must not” rather than a liberating “need not.”

My training at the University of Notre Dame, which has strong specialties in the technical philosophy of physics and the history of quantum physics, and at the University of Washington, with its expertise in both the philosophy of physics and feminist epistemology, has equipped me well for my current and upcoming projects.

PhD Award Date

04 August 2019

PhD Institution

University of Notre Dame

PhD Country/Territory

United States of America (the)

Personal Statement

How should our best physical theories shape our beliefs about the world? Despite a mountain of empirical data, sharp disagreements remain: quantum mechanics, one of our most successful theories, has produced some of our most persistent philosophical debates. Unlike many in the field, I approach different interpretations of quantum theory as a landscape to be explored rather than a battle to be won. I apply a pluralist stance to questions like how we should interpret the probabilities prescribed by quantum states and how everyday objects like tables and coffee cups might arise from an underlying quantum reality. My work demonstrates how interpretations get stronger when they make peace with incompatible alternatives. I have uncovered novel and robust agreements across starkly different views, sharpening the traditional philosophical discourse while validating diverse epistemic communities.

Take the question of how classical physics might reduce to quantum physics. My collaborations with Benjamin Feintzeig on this topic have yielded new technical and philosophical results that show one approach to this reduction, known as the classical limit, explains common theoretical structure—an explanation that complements, rather than conflicts, with explanations of the stability of table-sized objects offered by another popular account of the quantum-to-classical transition (namely, “d"coherence”)" My recent work also offers a pluralist answer to the question of whether one can analyze probability in terms of its link to relative frequencies. Alan Hájek has famously given fifteen arguments against the idea that the limits of such frequencies can do the job. However, these arguments consider just one way of interpreting limits. John Norton argues that limits only sometimes yield idealizations, or new models bearing analogies to some target system. Often, Norton thinks, they offer mere approximations, or partial descriptions of the target. By viewing limiting frequencies as approximations, I develop a novel analysis of probability that is compatible with subjective credences and many sorts of chances.

In the long run, I aim to establish a unique and independent research career at the intersection of formal methods and feminist epistemology. While insights from the latter field have made great headway in the general philosophy of science, feminist perspectives are curiously scarce in the philosophy of physics and quantum foundations. My preliminary historical work on Bohr's complementarity has shown that such perspectives are sorely needed. Much more work is needed, including similar case studies for late-twentieth-century quantum physics and an investigation of how queer identities relate to quantum theory and its philosophy.

The aims of this fellowship align precisely with my needs for achieving this goals. By collaborating with my supervisor and other faculty at the University of Bristol, I can continue honing the networking and communication skills needed to make my research program a success. Moreover, I would continue to strengthen bridges between prominent formal epistemologists and philosophers of quantum phsyics in the UK, who have helmed successful but largely seperate philosophical research programs.

Applicant Research Funding

2021–2023. Postdoctoral Scholar on NSF Grant #2043089, “Quantum Epistemology Beyond Quantum Measurement.” Total Intended Award Amount: $450,950.00.

2013–2019. Bernard J. and Helen Holland Voll Presidential Fellow.

2019. John J. Reilly Center Graduate Student Travel Award.

2019. APA Graduate Student Travel Award.

2017. University of Notre Dame Department of Philosophy Graduate Student Travel Award.

2017. University of Notre Dame ISLA Professional Development Award.

Section 5 - UK Sponsor Career Summary

Full Name

Professor Richard Pettigrew

Title of Current Position

Professor of Philosophy

Current Employer

University of Bristol

Current Department

Department of Philosophy

Permanent Position

[redacted]

Current Position Start Date

[redacted]

UK Sponsor Qualifications

2004-2008 PhD in Mathematical Logic, University of Bristol (Supervisor: John Mayberry) Thesis title: Natural, Rational, and Real Arithmetic in a Finitary Theory of Finite Sets

2003-2004 MA in Philosophy, University of Bristol (awarded with Distinction) (Supervisor: James Ladyman) Dissertation title: Fictional Worlds: a defence of fictionalism concerning possible worlds talk

1999-2003 BA in Mathematics and Philosophy, University of Oxford (First Class in First Public Examination; First Class in Part I and Part II of Second Public Examination)

UK Sponsor Career History

2014-present Professor of Philosophy, University of Bristol
2012-2014 Reader in Philosophy, University of Bristol
2011-2012 Lecturer in Philosophy, University of Bristol
2008-2011 British Academy Postdoctoral Fellow, University of Bristol

Other Academic Experience

Funding awarded:

2021-2022 British Academy Mid-Career Fellowship (£169,741)
2017-2018 Leverhulme Trust Research Fellowship (£22,537)
2015-2018 Leverhulme Trust International Network Grant (£77,554)
2013-2016 ERC Starting Researcher Grant (€972,672)
2011-2012 AHRC Early Career Fellowship (£35,659)
2008-2011 British Academy Postdoctoral Fellowship (£187,816)

Many of these have involved organising conferences and workshops.

List your Key and/or Relevant Publications

Books:
(2022) Epistemic Risk and the Demands of Rationality (Oxford University Press)
(2016) Accuracy and the Laws of Credence (Oxford University Press)

Articles:
(forthcoming) 'Consequences of Calibration' (with J. R. G. Williams) British Journal for the Philosophy of Science
(2023) 'How should you beliefs change when your awareness grows?' Episteme
(2022) 'Accuracy-first epistemology without Additivity' Philosophy of Science 89(1):128-151
(2021) 'Bayesian updating when what you learn might be false' Erkenntnis DOI: 10.1007/s10670-020-00356-8
(2020) 'Logical Ignorance and Logical Learning' Synthese 198(10):9991-10020
(2019) 'What is Conditionalization, and why should we do it?' Philosophical Studies 177(11):3427-3463
(2018) 'An Accuracy-Dominance Argument for Conditionalization' (with R.A. Briggs) Noûs 54(1):162-181

Field of Specialisation

formal epistemology; rational choice theory; decision-making under uncertainty; accuracy-first epistemology

Summary of your Current Research

My current research covers three different areas: the first asks what norms of rational credence we can justify by appealing to the goal of accuracy; the second involves how we should aggregate the credences of different individuals to give the credences of the group; and the third involves how the notion of risk affects our epistemic lives.

PhD Award Date

01 April 2008

PhD Institution

University of Bristol

UK Sponsor Research Funding

2021-2022 British Academy Mid-Career Fellowship (£169,741)
2017-2018 Leverhulme Trust Research Fellowship (£22,537)
2015-2018 Leverhulme Trust International Network Grant (£77,554)
2013-2016 ERC Starting Researcher Grant (€972,672)
2011-2012 AHRC Early Career Fellowship (£35,659)
2008-2011 British Academy Postdoctoral Fellowship (£187,816)

UK Sponsor Statement of Support

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Section 6 - Financial Details

Please define the proposed budget for your project in the table below:

Budget heading		Year 1	Year 2	Year 3	Total
Directly Incurred Costs (at 80% FEC)					
Salary Costs	Cost	[redacted]	[redacted]	[redacted]	[redacted]
	Latest Cost	[redacted]	[redacted]	[redacted]	[redacted]
Directly Incurred Costs (at 80% FEC) Total	***Cost***	[redacted]	[redacted]	[redacted]	[redacted]
	Latest Cost	[redacted]	[redacted]	[redacted]	[redacted]
Directly Allocated Costs (at 80% FEC)					
Estate Costs	Cost	[redacted]	[redacted]	[redacted]	[redacted]
	Latest Cost	[redacted]	[redacted]	[redacted]	[redacted]
Directly Allocated Costs (at 80% FEC) Total	***Cost***	[redacted]	[redacted]	[redacted]	[redacted]
	Latest Cost	[redacted]	[redacted]	[redacted]	[redacted]
Indirect Costs (at 80% FEC)					
Indirect Costs	Cost	[redacted]	[redacted]	[redacted]	[redacted]
	Latest Cost	[redacted]	[redacted]	[redacted]	[redacted]
Indirect Costs (at 80% FEC) Total	***Cost***	[redacted]	[redacted]	[redacted]	[redacted]
	Latest Cost	[redacted]	[redacted]	[redacted]	[redacted]
Research Costs (at 100% FEC)					
Travel Costs	Cost	[redacted]	[redacted]	[redacted]	[redacted]
	Latest Cost	[redacted]	[redacted]	[redacted]	[redacted]
Subsistence and Accommodation Costs	Cost	[redacted]	[redacted]	[redacted]	[redacted]
	Latest Cost	[redacted]	[redacted]	[redacted]	[redacted]
Consumables Costs	Cost	[redacted]	[redacted]	[redacted]	[redacted]
	Latest Cost	[redacted]	[redacted]	[redacted]	[redacted]
Relocation Costs	Cost	[redacted]	[redacted]	[redacted]	[redacted]
	Latest Cost	[redacted]	[redacted]	[redacted]	[redacted]
Other Research Costs	Cost	[redacted]	[redacted]	[redacted]	[redacted]
	Latest Cost	[redacted]	[redacted]	[redacted]	[redacted]
Research Costs (at 100% FEC) Total	***Cost***	[redacted]	[redacted]	[redacted]	[redacted]
	Latest Cost	[redacted]	[redacted]	[redacted]	[redacted]
Grand Total	**Cost**	[redacted]	[redacted]	[redacted]	[redacted]

Budget heading		Year 1	Year 2	Year 3	Total
	Latest Cost	[redacted]	[redacted]	[redacted]	[redacted]

Value Sought

[redacted]

Justification for Salary Costs

The Fellowship appointment is at [redacted] - this is in line with the Faculty of Arts career grade policy for Fellowships of this prestige. Starting salary for this grade is [redacted] (as at the last pay award - February 2023) with additional employment costs (NI/Pension) making up the salary costing. Annual spine point increments increases will be made on 1 October each year ([redacted]) in line with University of Bristol Policy. A-L Pay rates can be found at http://www.bristol.ac.uk/media-library/sites/hr/documents/salaries/A-L-salary-scales-feb-23.pdf

Justification for Research Costs

[redacted]

[redacted]

This research visit will be conducted during work on Modules 2 and 3, to discuss results with philosophers and researchers in quantum foundations. Module 3, in particular, is of special interest to the research program of QBism described earlier in this proposal, and Oxford philosopher Christopher Timpson is a leading expert on that program. Oxford is also home to philosopher Harvey Brown and physicist David Deutsch, both leading voices on probability in the many-worlds interpretation, and Samson Abramsky, a pioneer in geometric approaches to quantum probability. My visit would build on my existing relationships with these scholars to workshop the broader impacts of my new results.

[redacted]

At this conference, I will disseminate the research outputs of Modules 2 and 3 and network with UK philosophers, including members of BBLOC.

[redacted]

At this conference, I will disseminate the research outputs of Modules 2 and 3 and network with UK philosophers, including members of BBLOC.

[redacted]

At this conference, I will disseminate the research outputs of Modules 2 and 3 and network with UK philosophers, including members of BBLOC.

[redacted]

At this conference, I will disseminate the research output of Module 4 and network with UK philosophers, including members of BBLOC.

[redacted]

This workshop will be a larger sequel to the July 2022 Non-Classical Probability held at the University of Bristol. We will invite new voices (such as Chris Fuchs, a pioneer of QBism, and Laura Ruetsche, a prominent defender of pluralism) and accept submissions from junior scholars in the UK. Through this workshop, I will continue to grow an emerging network of promising younger scholars doing cutting-edge interdisciplinary work. Moreover, I will make this conversation accessible to the UK public and bolster Bristol's online presence by sharing the talks on the university's YouTube.

Justification for Relocation and Visa Costs

[redacted]

[redacted]

[redacted]

Justification for Other Research Costs

Other Directly Allocated Costs - Estates and indirect Costs
The Full Economic Costing (fEC) tool is used for costing research project proposals and other research activities. UK universities use the Transparent Approach to Costing (TRAC) and fEC costing model for the purpose of calculating the appropriate amount of directly allocated estates and indirect costs for a project.
Details of these methods can be found at the following links: fEC: https://www.ukri.org/files/legacy/documents/fecfaq-pdf/ and for TRAC: https://www.trac.ac.uk/tracguidance/
Note the values added to the budget tables (above) are 80% of the Full Economic Costs (as per BA Guidance)

Section 7 - Applicant Declaration

Declaration

Checked

Applicant Name	Jer Steeger
Date	12 March 2023

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]