

The Danish Committee on Research Misconduct  
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**Note on an intended decision by the Practice Committee at the University of Copenhagen on a complaint regarding questionable research practice, and an invitation to the Danish Committee on Research Misconduct to call in the case for decision as a matter of research misconduct, if it so wishes**

21 DECEMBER 2023

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With this report, the Practice Committee at the University of Copenhagen (the **PC**) hereby notifies the Danish Committee on Research Misconduct (the **DCRM**) of its intention to decide a scientifically complicated complaint of Questionable Research Practice on its own, *unless* the DCRM decides to *call in* the case for decision as a matter of research misconduct.

CASE NO: 74

Please specify on inquiry

If the DCRM so wishes, the PC expects to receive notice hereof not later than 29 January 2024. Should the PC not receive such notice within that time limit, the PC intends to decide the matter by itself according to the following observations and deliberations.

## 1. Line of events

### *1.1. The March 2020 publication*

On 27 March 2020, the research article *Flux-induced topological superconductivity in full-shell nanowires* by S. Vaitiekėnas et al. (the **Article**), was published in the scientific journal *Science* (**Science**).

The Article is submitted as an Appendix to a Complaint that was subsequently submitted by Science to the PC (as further discussed below) on 5 October 2021 (Exhibit 1), see pages 8 to 18 of the said Exhibit.

The respondent in the present case, Prof *Charles M. Marcus* of the Niels Bohr Institute at the University of Copenhagen (the **NBI**), is the senior and corresponding author of the Article.

The Article presented the authors' recent contribution to the field of one-dimensional (1D) topological *superconductivity*, a topic that has maintained interest for over a decade because of its potential relevance to future quantum technology.

The Article combined theory and experimental components in an effort to establish so-called full-shell superconductor/semiconductor *nanowires* with axial magnetic flux as a promising platform for the experimental realization of topological superconductivity.

Computation with 1D topological superconductors is achieved by braiding so-called *Majorana zero modes* (MZMs), protected zero-energy quasiparticles that are localized near the wire ends.

Experimental identification of MZMs both confirms topological superconductivity and establishes the starting point of a path toward topological quantum computation.<sup>1</sup>

### *1.2. The August-November 2020 dialogue on further data*

On 18 August 2020 and 21 September 2020, Prof Marcus was contacted by Assoc Prof *Sergey Frolov*, at the University of Pittsburgh, and Dr *Vincent Mourik*, at the University of New South Wales (both of these two individuals referred to in the following as **F&M**) who requested more data than those submitted with the Article.

F&M had articulated their views in a "Post-publication analysis" of the Article (the **PPA**), "Version 2" of which was submitted on 30 September 2021. This version is included on pages 19 to 48 of Exhibit 1.

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<sup>1</sup> This description of the subject of the Article is in part quoted from the introduction of the Summary to the Expert Report, discussed below in Section 2. This summary also gives a more detailed statement of the correspondence that has taken place between the Authors and Science in relation to the requests for data that this case is about.

On 8 October 2020, senior editor of Science, *Jelena Stajic*, conveyed a request for further data from F&M to Prof Marcus.

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This request gave rise to a dialogue between Science and Prof Marcus in the period from 8 October to 9 November 2020, which is included in Exhibit 2.

### *1.3. The 7 February 2021 NBI investigation*

On 3 February 2021, the head of NBI, Prof *Jan W. Nielsen*, acting as the chair of an evaluation committee appointed for that purpose by NBI, submitted the “Result of the Niels Bohr Institute assessment” in the form of a letter of the same date to Science editor-in-chief Prof H. Holden Thorp (Exhibit 3).

The letter concluded as follows:

*(a) We find no problems with the paper, nor with the conclusions in the paper, nor with the data supporting the claims of the paper.*

*(b) We find the complaints of Mr Frolov and Mr Mourik unjustified.*

*(c) All data connected with the present paper has – according to demand – been transmitted rightfully to third parties. No additional data is left out.*

Following the said NBI assessment, a Zoom meeting took place on 19 July 2021 between representatives of Science and the authors of the Article, during which the participants expressed their various viewpoints on the matter. No summary of the said meeting has been presented to the PC.

Following the 19 July 2022 meeting, an e-mail correspondence took place between Science and Prof Marcus in which Science indicated its intent to publish an editorial “Expression of Concern” (EoC) about possible missing data in the Article.

### *1.4. The 30 July 2021 editorial Expression of Concern*

On 30 July 2021, Prof *H. Holden Thorp*, published the following EoC in Science in his capacity of Editor-in-Chief of Science (page 7 of Exhibit 1):

*On 27 March 2020 Science published, the Research Article “Flux-induced topological super-conductivity in full-shell nanowires” by S. Vaitiekėnas et al. (1) Pursuant to a reader request, the authors released additional data — archived at Zenodo (2) — taken in association with the project that led to their paper. After the release of the additional data, two readers expressed a*

*joint concern that the tunneling spectroscopy data published in the original paper are not representative of the entirety of the data released in association with this project. While we await the outcome of a full investigation commenced by the authors' academic institution (Niels Bohr Institute, University of Copenhagen), we are alerting our readers to this concern.*

#### *1.5. The 5 October 2021 complaints to the PC*

On 5 October 2021, Dr Jake S. Yeston, acting as an editor of Science, conveyed the following Complaint to the Practice Committee from F&M (Exhibit 1, the **Complaint**):

*Professor Charles Marcus and collaborators published the appended research article, "Flux-induced topological superconductivity in full-shell nanowires" in Science in March of 2020. Eight months later, at the request of Professors Sergey Frolov and Vincent Mourik, Prof. Marcus publicly released additional data that had been acquired in the experiments leading to the paper, but had not been explicitly included in the analysis shown in the paper. Profs. Frolov and Mourik contend that consideration of the full dataset significantly undermines support for the scientific conclusions that were based on the subset of data included in the original paper.*

...

*The case is detailed thoroughly in the appended analysis by Profs.*

*Frolov and Mourik. Essentially, the question is whether the data presented in the original paper accurately represented the outcome of the experiments undertaken. Journal editors and reviewers can only assess data to which they have access. If data that did not support the claims in the paper were withheld or suppressed, then the paper submitted to the journal implied greater statistical support for the conclusions than the experiments in fact bore out.*

...

*The specifics, once again, are detailed in the appended analysis, but the source of greatest concern is the range of voltages and number of independently tested devices that were represented in the paper's second figure. The editors at Science believe that an independent, transparent investigation by experts in this subfield of Majorana physics is necessary to ascertain whether or not the authors unethically withheld data that undermined the conclusions of their paper.*

The Complaint referred to the PPA which, as said before, was made by F&M (19 to 48 of Exhibit 1).

### *1.6. Exchange of briefs before the Practice Committee*

On 8 November 2021, the Practice Committee notified Prof Marcus that it intended to process the complaint as a matter alleging questionable research practice, stating, *inter alia* the following:

*According to the complaint, the full dataset behind your paper “Flux-induced topological superconductivity in full-shell nanowires” from “Science”, Volume 367, no. 64865 available online co-authored with several others significantly undermines support for the scientific conclusions in said paper. The Practice Committee will now take steps to consider whether the alleged claim constitutes questionable research practice.*

On 20 November 2021 (Exhibit 4) Prof Marcus on behalf of the authors of the Article submitted his comments to the Practice Committee.

On 14 February 2022 (Exhibit 5), Science reiterated its wish “to convene a transparent, independent panel of external experts in keeping with the admirable precedent set by the University of Delft.” The said Delft precedent (NL) also involved a case of scientific disagreements within the scientific field of *Majorana physics*.

### *1.7. Appointment of the expert panel*

On 21 June 2022 (Exhibit 6), the PC informed the Parties of its decision to conduct an expert investigation of the Complaint, as proposed by the editors of Science (i.e. what Science had referred to as a “full” investigation).

The PC made reference to the investigation that had been made by the Technical University in Delft in 2020, regarding some of the conclusions reached by the paper “Quantized Majorana conductance” published in *Nature* in 2018. See <https://zenodo.org/record/4545812#.YkQlgzVJE2y>.

The PC underlined that this investigation should be both transparent and independent and that none of the appointed experts should have personal relations to any of the parties which are affected by the investigation that might bring them into a conflict of interest in performing their tasks.

Upon thorough investigations, the PC informed the parties that it had appointed the following expert panel (the **Expert Panel**):

- *Sophie Guéron*, CNRS Research Director, Université Paris-Saclay, Laboratoire de Physique des Solides, Orsay, France;

- *Pertti Hakonen*, Professor, Department of Applied Physics, Aalto University School of Science, Finland;
- *Allan MacDonald*, Professor of Physics, University of Texas at Austin, Texas, USA
- *Alfredo Levy Yeyati*, Professor, Departamento de Física Teórica de la Materia Condensada Universidad Autónoma de Madrid, Madrid, Spain.

Professor MacDonald subsequently had to resign from the Expert Panel due to a conflict of interest.

In the said letter, the PC also informed the parties that it had decided not to take a final decision at this point on *another* complaint (i.e. not related to the Article) submitted by F&M on 21 December 2021 to supply “full data” in support of physics claims made in 6 other papers published by the Marcus group at NBI before the expert report had been delivered.

On 27 June 2022, the PC decided the following Terms of Reference (**ToR**) for the Expert Panel, the contents of which was approved by each of the experts:

1. *whether the data presented in the Science Magazine article accurately represented the outcome of the experiments undertaken, and*
2. *whether the authors deliberately or due to gross negligence withheld data that undermined the conclusions of their paper.*

*The mandate of the experts is confined to the said scientific article and does not include any other complaint made towards the teams of authors of the disputed work*

The ToR also included a suggested Working Method for the parties as further detailed in the (identical) Appointment Letters that were forwarded to each of the Experts on 27 June 2022. Exhibit 7 displays the Appointment Letter from the PC submitted to one of the Experts, Prof *Sophie Gueron*.

## **2. The Report from the Expert Panel**

### *2.1. Procedure applied by the Expert Panel*

On 15 July 2023, the Expert Panel submitted its report (Appendix 8, the **Report**) in accordance with the ToR quoted above.

In page 4 of the summary of the Report, the Expert Panel stated that in order to perform its investigation, it was provided with

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*... all material related to the publication process and the additional data request at Science. We interviewed many of the parties involved and many independent experts on Majorana physics. We also examined all the data gathered in connection with the paper in question.*

...

*We are confident that we have seen all the data and that no data was fabricated.*

The Expert Panel also produced a 13 page Experimental Protocol dated 29 December 2022 and appended to its report. According to the introduction to this Experimental Protocol it

*... presents device fabrication, tuning, and measurement protocols, as presented during the visit by members of the Expert Panel on Dec. 15-16, 2022, and has been prepared at the request of the Expert Panel.*

## *2.2. Conclusions of the Expert Report*

Reference is made to the Expert Report and its Appendix.

Of the major conclusions of the report, apart from the one stated above that “We are confident that we have seen all the data and that no data was fabricated”, the main conclusions of the Expert Panel is summarized as follows on pages 4 and 5 of the Expert Report:

*The acceptability criteria applied by the authors have sound scientific motivations. However, they were not explicitly stated either in the paper or in the supplementary material. The authors’ success rates in fabricating devices that met the acceptability criteria were also not provided. Many nanowires with various diameters and shell thickness were studied, but excluded from further analysis after an initial examination of their electrical transport characteristics. Upon close examination of the full set of data accumulated by the authors for their paper, we found that the dividing line between qualified and non-qualified devices had a substantial gray area. In a few cases, data that were clearly not supportive of the paper’s conclusions were disqualified, even though they were not very different from data deemed to be qualified. Qualified devices were in most cases measured*

*carefully in several different Little-Park lobes. The Science publication reported on four NIS devices, three of which displayed evidence for Majorana physics. After reexamining all available data and using our independent judgement to classify data sets, we found that out of sixty measured devices from multiple wire batches, fifteen had successful NIS tunneling spectroscopy, and of these, seven exhibited evidence of Majorana physics. The MZM success statistics are therefore not quite as compelling in our independent reexamination of the full data set as in the Science paper, and much less compelling than suggested by the research article summary published in the print edition of Science. Similarly, after close examination, we have concluded that the dependence of even-odd splitting in Coulomb blockade on wire length is not quite as systematic as suggested in the Science publication. In our opinion, the authors should have been more forthright and explicit with readers and with referees in describing their success rate in fabricating devices that showed simple tunneling characteristics and had MZM behavior and, by flagging alternatives and uncertainties, more evenhanded in their discussion of interpretations.*

*We thus arrived at the following conclusions:*

- *The presented data do, for the most part, represent the outcome of the experiments: the authors have exercised scientific judgement in selecting which data to share using criteria whose application was partially subjective. Although data selection did, in our view, result in conclusions that did not adequately capture the variability of outcomes, the excluded data did not undermine the paper's main conclusions.*
- *The shortcomings we have noted in this manuscript do not constitute gross negligence.*
- *We do not view the authors' behavior in connection with this paper as an instance of scientific misconduct.*

*On the basis of our investigation, we recommend that:*

*1- A statement explaining the set of criteria used to select acceptable nanowire devices, and a statistical summary of the success rate for growth and fabrication of devices deemed acceptable by these criteria, should be appended to the Vaitiekėnas et al. paper as a note added.*

*2- Unpublished data from the Coulomb blockade experiments should be made public. And more generally that:*



3- *The nanoelectronics and low-dimensional electron system community, both its authors and its referees, should maintain high standards for fulsome objective reporting on technical details of sample fabrication, and on success rates in fabricating devices that exhibit the behavior described in any publication. These standards should be enforced by referees.*

4- *Prescreening of data to identify relevant regimes in a large parameter space should be exercised in a fully documented, transparent fashion, and discarded data should be made available to the community via a long-term data repository.*

5- *Journal Editors should make it more clear to readers which parts of the published material have gone through peer review and which parts are editorial addenda.*

Furthermore on page 27 of the Expert Report, the following observations are made:

### **5D Summary and Conclusion**

...

#### *Remarks on Conclusions:*

*In our view the authors carried out many experiments, built and studied sophisticated theoretical models, and analyzed considerable data in an effort to confirm the theoretical hypothesis – original to their paper - that topological superconductivity should appear in the non-zero Little-Parks lobes of quantum wires with axial magnetic fields. We have examined all that data and its analysis, and have concluded that the experimental and theoretical findings were not grossly misrepresented in the Science publication. We are confident that no data was fabricated and that we have seen all the data. We acknowledge that data selection is problematical in this paper, as in many studies of nano-electronic devices, because of their exquisite sensitivity to atomic scale disorder. The authors presented data from a reasonably representative subset of those measurements that satisfied acceptability criteria designed to filter out devices that were too disordered or had active degrees of freedom embedded in their tunnel barriers. In most cases this amounted to restricting attention to simple tunneling regimes in gate voltage regions in which the tunnel barriers were weakly pinched off; in some devices no simple tunneling regime could be identified. The authors should have been more explicit with readers and with referees in explaining their success rate in fabricating devices that showed simple tunneling characteristics and had*

*MZM behavior and, by flagging alternatives and uncertainties, more even-handed in their discussion of interpretations. Upon reexamination of the Coulomb blockade data, we find that the “Incompatibility with a power law”, claim written both in the Research Article summary and in the article itself, is probably too strong. The MZM success statistics are not quite as compelling in our independent reexamination of the full data set as suggested in the Science paper, but still consistent with theory. The research article summary seemingly pushes the conclusions beyond those made in the peer reviewed part of the article by neglecting some essential qualifications. In high impact journals, papers are often written in a manner that provides an account of the experiments that is both polished and optimistic. A positive tone is natural in papers describing work that is regarded as groundbreaking by its authors. In this sense, this Science paper does not differ from many others that we encounter in the nanoscience field and in science more generally. The tendency of enthusiastic authors to have inflated expectations is perhaps as much a part of the normal scientific process as the tendency of readers and referees to be skeptical and ever alert to errors in logic or judgment. Within this familiar landscape that surrounds our daily work as scientists, we judge that Vaitiėkenas et al. have not crossed the line that separates scientific discourse and debate from scientific misconduct.*

***We recommend that:***

***Regarding the Vaitiėkenas paper***

- *A statement explaining the set of criteria used to select acceptable nanowire devices, and a statistical summary of the success rate for growth and fabrication of devices deemed acceptable by these criteria, should be appended to the Vaitiėkenas et al. paper as a note added. The number of NIS devices that did not have successful tunneling spectroscopy should be stated, along with the number of devices with successful tunneling spectroscopy exhibiting ZBPs in the LP1 lobe and the number not exhibiting the ZBPs.*
- *The full set (25+56) of Coulomb blockade data files be uploaded to Zenodo, along with the descriptive table explaining why some datasets were excluded and the 2023 analysis.*

***More generally***

- *We recommend that the nanoelectronics and low-dimensional electron system community maintain high standards for fulsome objective reporting on technical details of sample fabrication, and on success rates in fabricating devices that exhibit the behavior described in a publication. These standards should be enforced by referees.*

- *Prescreening of data to identify relevant regimes in a large parameter space should be exercised in a fully documented, transparent fashion, and discarded data should be made available to the community via a long-term data repository.*
- *Journal Editors should make it more clear to readers which parts of the published material have gone through peer review and which parts are editorial addenda.*

### *2.3. Subsequent comments to the Expert Report*

On 28 September 2023, Prof Marcus on behalf of the authors provided his comments to the Expert Report ([Exhibit 9](#)). In this letter Prof Marcus stated, *inter alia*, that

*We are pleased to see that the Expert Panel’s report exonerates us of scientific misconduct and questionable research practices, and finds that the main conclusions of the paper are supported by the full data, which they examined.*

*The Expert Panel reviewed in impressive detail the complete body of the experimental and theoretical data relevant to our paper, examining over eleven thousand experimental runs on more than 80 devices, and concluded that the subset of data presented in the paper, and the conclusions we drew, were consistent with the entire body of data. That is, that we did not “cherry-pick” an unrepresentative subset of data, giving a misimpression to readers or reviewers. The question of cherry picking unrepresentative data was the core issue that Jake Yeston expressed in his complaint to the Practice Committee. That concern has now been addressed and answered by the Expert Panel.*

*The Expert Panel commented more broadly about the state of experimental mesoscopic physics in general, that experimentalists do not yet have enough control over fabrication methods that all devices work as designed. This circumstance typically forces experimentalists to reject devices that do not function properly in one way or another, often without understanding precisely why. Here the Panel found that we did this selection process in a thoughtful and reasonable manner, consistent with community standards.*

By letter of 4 October 2023, Dr Jake S. Yeston at Science provided Science’s comments to the Expert Report ([Exhibit 10](#)). Before rendering these comments, Dr Yeston had asked the PC for permission to share the expert report in confidence with F&M – a permission that was subsequently given by the PC.

In this letter Dr Yeston stated, *inter alia*, on the question of whether the conclusions of the Panel suggested that Prof Marcus and/or his collaborators had shown misconduct and/or questionable research practices that

*... we believe your Committee is better placed than we are to deliberate on that matter. However, in the interest of advising your deliberation, we would offer the following points for consideration:*

*1) Prof. Marcus was asked explicitly by our editor to release \*all\* of the data from working devices associated with the research presented in the paper. It is plain to see that he did not comply with that request, as through the Panel's diligent work a substantial amount of previously undisclosed data on working devices was uncovered.*

*2) Prof. Marcus furthermore represented to the editor and peer reviewers that 7 out of 8 devices showed Majorana signatures, in contradiction to the Panel's ultimate conclusion that the fraction was 7/15.*

*3) When we initially sought an investigation of precisely the sort that was ultimately carried out, Prof. Marcus and Prof. Jan Thomsen fought belligerently in correspondence with us and others to keep that from happening.*

*4) Prof. Marcus and Prof. Thomsen both continued to maintain, in the context of our efforts to justify the need for investigation, that all of the data had been released.*

*These three points pertain specifically to the following statement in the Panel Report: "Given that the article reports three devices (devices 1, 3 and 4) with a ZBP and one device (device 5) without a ZBP, and that the full NIS data points to seven devices with a ZBP and eight without, the statistical support suggested for the ZBP in the article was not grossly exaggerated. The number of unsuccessful devices (that did not satisfy the protocol), however, was clearly underreported." Although 3/4 and 7/15 are not statistically equivalent, we respect the Panel's subjective conclusion that the exaggeration was not "gross" and aim to follow their recommendation to correct the published record, so that readers can see the true statistics underlying the experiment. Nonetheless, it is clear that correcting the record would not have been possible had there been no investigation, and therefore the investigation was fully justified. We respectfully leave the decision to you of whether Prof. Marcus's decision to with-hold data—both initially before the paper was published and then afterwards when asked repeatedly not to—constitutes misconduct and/or questionable practice. We nonetheless firmly*

*request that Profs. Marcus and Thomsen both acknowledge that the Panel investigation was warranted, as copious real data emerged that they both previously insisted did not exist.*

#### *2.4. Preliminary decision of the PC*

On 27 October 2023, following a first round of deliberations of the PC, the PC provided Prof Marcus with an update of the recent steps decided by the PC in cases 74 and 77 (the latter of which is – as indicated above – *not* subject to the present decision).

In this letter, the PC made the following observation:

*Based upon the conclusions of expert report, it is the preliminary view of the Practice Committee that it is not entirely excluded that case 74 involves aspects that the Danish Board<sup>2</sup> of Research Misconduct might want to consider as a case of “research misconduct” for further investigation.*

*The reason for this is that according to the [Act on Research Misconduct](#) the Danish Committee on Research Misconduct shall process cases concerning research misconduct in scientific products, cf. Section 4 of the Act.*

*The term “research misconduct” refers to cases of fabrication, falsification and plagiarism committed wilfully or with gross negligence when planning, performing or reporting on research. Falsification means manipulation of research material, equipment or processes as well as changing or omitting data or results, thus making the research misleading, cf. section 3 of the act.*

*In their report the experts have stated that they “...do not view the authors' behavior in connection with this paper as an instance of scientific misconduct.”*

*However, at the same time they also criticize the selection of data “...using criteria whose application was partially subjective.”, and that this selection resulted “...in conclusions that did not adequately capture the variability of outcomes.”*

*It follows from the Act that all complaints concerning research misconduct must be submitted to the Practice Committee of the research institution at which the research was conducted. Each Practice Committee shall thus prepare the complaint to be processed by the Danish Board on Research Misconduct which will then determine whether research misconduct has or has*

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<sup>2</sup> The word “Board” should be replaced with “Committee” in this document.

*not occurred. If the Board concludes that a case may involve issues concerning questionable research practices not considered by the Board to constitute research misconduct, the Board may refer such issues to the relevant research institution for further consideration.*

Comments to the PC Preliminary Decision made by attorney Lars Kjeldsen on behalf of Prof Marcus on 3 December 2023 (Exhibit 12) in which Mr Kjeldsen, *inter alia*, highlighted a number of statements in the Expert Report in which the Experts have stated that scientific decisions on what data to make public are to a large degree subjective.

On pages 13-14 of his letter, Mr Kjeldsen states:

*The main conclusion of the Article, stated in the introduction and conclusion, was that this discovered phenomenon can occur. Once discovered and observed repeatedly, measurements on other wire batches should not be regarded as contributing to “unsuccessful” statistics. They in no way can invalidate the discovery.*

*However, when reviewing the Report in its entirety, it is the opinion of the Authors that the Report is only mildly critical of the data selection method used by the Authors when writing the Article. This is emphasized by the experts’ recommendations (p. 28) ...[quoted above in Section 2.2],*

...

*These recommendations capture the essence of the Expert Panel’s critical remarks in respect of the Article.*

*We urge the Practice Committee to consider whether these recommendations would be appropriate to rectify the situation if the Expert Panel had found that the Authors have exercised scientific misconduct.*

*In the other chapters of the Report, the issue is not whether the scientific data and scientific conclusions were based on falsified research material as it is clearly not. This issue is really a matter of whether the number of unsuccessful devices should have been reported and, as the Authors have repeatedly stated, they are in agreement with the experts that they should now have reported the number of unsuccessful devices. However, it must be reiterated that the main conclusions of the Article are not questioned by the experts, and therefore there is no case of research misconduct in this matter.*

### 3. The decision of the PC

#### 3.1. Legal basis

According to the Danish Act no. 383 of 26 April 2017 on Research Misconduct (the **Act**), the PC is competent to hear cases regarding “questionable research practices” which according to Section 3(1)(5) of Act is defined as:

*“Violation of generally accepted standards for responsible research practices, including the standards in The Danish Code of Conduct for Research Integrity and other applicable institutional, national and international practices and guidelines for research integrity.”*

The PC is not empowered to decide scientific disagreements. Such disagreements are often based upon differences in views and perceptions that might be well-founded by accepted scientific and academic methodologies, although they lead to different results and conclusions. It is, however, not for an entity such as the PC to serve as umpires to decide such disagreements. They should instead be openly debated within the scientific communities.

This principle is also applicable for the Danish Committee on Research Misconduct (the **DCRM**), see Sections 3(2)(2) and 3(2)(3) of the Act.

From reading the above presentation of the case, it is obvious that there are profound scientific disagreements within the area of *Majorana physics*, and that the dispute between the Marcus team on one side and F&M on the other can partly be ascribed to this.

The only questions before the PC, however, are whether the behavior of Prof Marcus and the co-authors to the Article

- 1) at the time of its publication; and
- 2) in response to the request for further data submitted by F&M (and through them, Science)

either qualifies as

- a) “questionable research practice” (**QRP**, in Danish: “tvivlsom forskningspraksis”) to be decided by the PC,

or as

- b) “research misconduct” (in Danish “videnskabelig uredelighed”) to be submitted by the PC to the DCRM for final decision).

### 3.2. *The PC's view on the case*

In its position on these *two plus two* issues, the PC must rely on the Expert Report, the conclusions of which have been accepted by Science.

As stated above in Section 2.2, nothing in the Expert Report gives basis for a conclusion that Prof Marcus in relation to either (1) or (2) was guilty of (b). Regarding (a) the conclusion is that the case is in a grey zone and that therefore there is need for forward-looking stricter guidelines to be issued by journals on the reporting of data in studies of this kind.

This transpires from the first bullet of the main conclusion of the Expert Report, in which the Expert Panel states that although data selection did result in conclusions that did not adequately capture the variability of outcomes,

*“the excluded data did not undermine the paper’s main conclusions”*,

and furthermore that

*“The shortcomings we have noted in this manuscript do not constitute gross negligence.”*

Also, and most importantly, the Experts conclude that

*“We do not view the authors' behavior in connection with this paper as an instance of scientific misconduct.”*

The only aspect of the case that might be considered as an instance of clear QRP might be the delay by Prof Marcus and his co-authors in submitting the additional data requested by F&M as fast and as complete as F&M, with support from Science, requested.

In order for the PC to reach the conclusion that this delay qualifies as QRP, the PC must take into account what practice is *applied* and *accepted* by the scientific community in question.

The PC finds no evidence, neither in the Expert Report, nor in other evidence brought before it, that the purported delay by Prof Marcus and his co-authors violated stated academic norms within the scientific community in question.



In relation to the question of possible *research misconduct*, the PC is mindful of Section 3(2)(3) of the Act according to which “fabrication” – being an important example of “research misconduct” under Section 3(2)(1) of the Act – is defined as: “Manipulation of research material, equipment or processes as well as changing *or omitting data or results*, thus making the research misleading.” (emphasis added).

However, given the conclusions of the Expert Panel, as quoted above in Section 2.2, the PC also finds no basis to reach a result different from that of the Expert Panel.

### *3.3.Procedural issues*

The PC has deliberated on the matter on several meetings, the latest of which took place on 23 October 2023 and on 11 December 2023.

During these two deliberations, the PC has been mindful of the letters sent to the PC by the Chairman of the DCRM on 18 August 2023 (which has been replied by the PC on 6 November 2023), and on 9 November 2023 from the Danish Ministry of Education and Research to the University of Copenhagen, both of which deals with Section 10(3) of the Act and of the PC’s interpretation of that provision in earlier cases.

According to the said provision, a research institution shall submit a notification to the DCRM if there is “reasonable suspicion” that a specific case at the research institution involves research misconduct covered by the DCRM’s authority.

It follows from the above conclusions that the PC does *not* find that the present case gives rise to a “reasonable suspicion” of “research misconduct”.

In this connection it should be noted that no formal complaint regarding “research misconduct” has been submitted directly to the PC.

Based on a preliminary assessment of the case, it is therefore the view of the Practice Committee that the case does not give rise to a reasonable suspicion of research misconduct in the form of “fabrication”.

In order to avoid any situation in which the DCRM might view this issue differently, the PC has chosen to formulate its opinion in such a way that, in relation to the issue of possible *research misconduct*, it is provisional and conditional on the DCRM formally indicating its wish to have the case submitted to the DCRM, which the Practice Committee will then do.

As the Board will know, the PC has made use of this procedure once before, namely in a case on alleged research misconduct in the quotation of scientific literature (case no. 22/49071).

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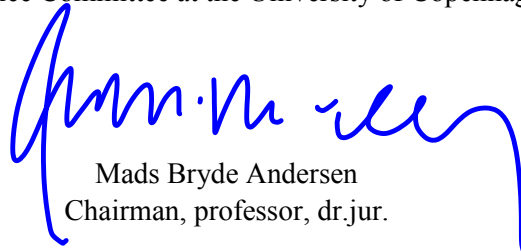
In regard to the issue of WRP, the opinion of the PC is final.

#### **4. Conclusion**

For the reasons stated above, the Practice Committee of the University of Copenhagen hereby notifies the Board on Research Misconduct of its intention to decide the case described above on its own as a case of QRP, unless the Board decides to call in the case for decision as a matter of Scientific Misconduct.

If the Board so wishes, the PC expects to receive notice hereof not later than 29 January 2024. Should the PC not receive such notice within that time limit, the PC intends to decide the matter by itself according to the following observations and deliberations.

On behalf of  
the Practice Committee at the University of Copenhagen



Mads Bryde Andersen  
Chairman, professor, dr.jur.

#### **Exhibits**

1. Complaint submitted by Jake Yeston on behalf of Science to the PU on 5 October 2021 against Prof Charles H Marcus, including the following appendices:
  - a. Form for reporting suspicion of research misconduct or questionable research practices to the Practice Committee at the University of Copenhagen (pages

- b. the Research Article “Flux-induced topological superconductivity in full-shell nanowires” by S. Vaitiekėnas et al. (Professor *Charles M. Marcus* being the last author), published in *Science Journal* on 27 March 2020.
  - c. Version 2 of the “Post-publication analysis” of the Article delivered by F&M on 30 September 2021.
2. E-mail dialogue between Science and Prof Marcus in the period from 8 October to 9 November 2020.
3. Letter of 3 February 2021 from NBI to Science conveying the result of the Niels Bohr Institute Assessment Committee.
4. E-mail of 20 November 2021 from Prof Marcus on behalf of the authors to the PC.
5. E-mail of 14 February 2022 from Science to the PC reiterating the wish of Science to convene a transparent, independent panel of external experts.
6. Status letter of 21 June 2022 from the PC to the parties.
7. Appointment letter from of 28 June 2022 from the PC to Prof Sophie Gueron.
8. Expert Report of 15 July 2023.
9. Prof Marcus’ letter of 28 September 2023 to the PC.
10. Science’s letter of 4 October 2023 to the PC.
11. Status letter of 27 October 2023 from the PC to Prof Marcus.
12. Letter of 3 December 2023 from attorney Lars Kjeldsen to the PC.