

CONFIDENTIAL REPORT

Investigation of complaint against

Professor Iver Cairns and Dr Joachim Schmidt,

School of Physics

Professor Richard de Grijs

School of Mathematical and Physical Sciences, Macquarie University

Professor Rob Wittenmyer

Centre for Astrophysics, University of Southern Queensland

January 2023

1 Introduction

1.1 Background

We have been appointed by the University of Sydney (the **University**) to investigate a complaint about computer simulation results in an unpublished manuscript, "*Explaining a Metric Type II Burst*" (the **Type II Paper**), authored by Professor Iver Cairns and Dr Joachim Schmidt (the **Respondents**).

The terms of reference for our investigation [REDACTED] are summarised in **Part 1.4** below.

The complaint was made by Professor Gábor Toth, Dr Bart van der Holst and Professor Ward Manchester III of the University of Michigan (the **Complainants**). They have alleged that the results of a simulated Coronal Mass Ejection (**CME**) event presented in Figure 1b in the Type II Paper (**Figure 1b**), have been falsified. The results were purportedly derived using the Block-Adaptive-Tree-Solarwind-Roe-Upwind-Scheme (**BATS-R-US**) simulation code, which is part of a software tool (the Space Weather Modelling Framework) developed by Professor Toth, Dr van der Holst and other University of Michigan researchers.

Professor Cairns is a Professor of Space Physics in the University's School of Physics and the Director of the ARC Training Centre for CubeSats, UAVs and their Applications (**CUAVA**) [REDACTED]

At the time the Type II Paper was developed and at the time the concerns about its integrity were raised, Dr Schmidt was a Post-doctoral Research Fellow working under Professor Cairns' supervision. He was employed by the University on a series of fixed term contracts from [REDACTED] to 31 March 2021. [REDACTED]

The concerns about Figure 1b were raised by the Complainants as part of a wider series of allegations that were the subject of a preliminary assessment by the University's Pro-Vice-Chancellor (Research), Professor Laurent Rivory (see **Part 1.3** below).

The Complainants had initially raised their concerns with Professor Cairns on 29 October 2019, and he notified the University's Research Integrity Office of the matters raised by the

Complainants on 18 November 2019 [REDACTED] The Complainants had raised their concerns with Professor Cairns after he had sent Professor Toth, Dr van der Holst and other researchers a draft of the Type II Paper inviting them to be co-authors.

The Complainant's concerns were reiterated in a subsequent letter from Mr Bryce Pilz of the University of Michigan's Technology Transfer Office dated 10 December 2019 [REDACTED] and an email from Professor Toth dated 22 December 2019 [REDACTED]. These complaints were also examined by Professor Rivory as part of his preliminary assessment process.

1.2 Regulatory framework

As noted earlier, the complaint that we are investigating was made in November 2019. It relates to conduct that was alleged to have occurred in the first half of 2019 (or earlier). During the period between the alleged conduct and the complaint being made the University introduced a new Research Code of Conduct, the *Research Code of Conduct 2019* (the **2019 Research Code**). The 2019 Research Code (which is the University's current Research Code), includes transitional provisions that apply to complaints received after 1 July 2019 in respect of conduct that allegedly occurred before that date. Clause 31 of the 2019 Research Code relevantly provides that:

- (a) *"the prior policy will apply and*
- (b) *"the allegation will be dealt with in accordance with the procedure and outcomes provided in [the 2019 Research Code]"*

We have been advised by the University that this means that:

- (a) the standards to be met by researchers are to be assessed by reference to the *Research Code of Conduct 2013* (the **2013 Research Code**); and
- (b) the procedure for managing and investigating allegations and for determining outcomes (i.e., assessing the seriousness of the breach and post-investigation processes) is as provided for in the 2019 Research Code.

As an administering institution for funding from the National Health and Medical Research Council (**NHMRC**) and Australian Research Council (**ARC**), the University is also required to comply with the *NHMRC/ARC Australian Code for the Responsible Conduct of Research* (the

Australian Research Code). For the purposes of this investigation, the version of the Australian Research Code that was in place at the University at the time that Figure 1b was allegedly produced was the version published in 2007.¹

1.3 Preliminary Assessment

As noted earlier, Professor Laurent Rivory was appointed to conduct a preliminary assessment of the matters raised by the Complainants in their email to Professor Cairns dated 29 October 2019, in the letter from Dr Pilz dated 10 December 2019, and in the Complainants subsequent communications to the University dated 22 December 2019.



In addition to assessing the material submitted by the Complainants, the University of Michigan and the Respondents, Professor Rivory also sought expert advice from a researcher with extensive experience and expertise in the area of space physics (**Expert A**).

On the basis of Expert A's advice and the evidence available to him, Professor Rivory concluded that Dr Schmidt appeared to have used Photoshop to edit Figure 1b of the Type II Paper and had selected parameters that would alter the output. He noted that there appeared to be consensus between Expert A, Professor Cairns and Dr Schmidt that the selected parameters had not been adequately disclosed in the draft manuscript that had

¹ The Australian Research Code was revised in 2018 but the amended version did not come into

⁰ [Redacted]

been sent to the Complainants, with the effect that the image could not be regenerated by either Dr Schmidt or readers of the manuscript.

Professor Rivory noted (and concurred with) the view expressed by Expert A that Photoshop should not have been used to prepare an image that was intended for publication in a physics journal. He also found that, having decided to use Photoshop, Dr Schmidt should have properly disclosed any edits he made as well as the analytical parameters required to replicate the image.

Professor Rivory found that there was evidence of misrepresentation that arguably constituted a breach of clause 11(3) of the 2013 Research Code which required researchers to take all reasonable steps to ensure that their findings are accurate and properly reported. However, having regard to the criteria in the 2019 Research Code for assessing the seriousness of breaches, he viewed the breach as 'less serious'. In so concluding, he noted that:

- the paper had not been published, so there was scope for Dr Schmidt to amend the figure or provide additional details about the processing of the image prior to submission for publication; and
- There did not appear to be any wilful intention to deceive on Dr Schmidt's part. Professor Rivory accepted Dr Schmidt's explanation that he used Photoshop to improve the visibility of the internal structures of the simulated CME.

Having assessed the breach as being less serious, Professor Rivory concluded that a full investigation of the Complainants' concerns about Figure 1b was not warranted.

The preliminary assessment outcome was communicated to the Complainants on 11 December 2020. They responded by email on 21 January 2021 with additional information relating to their concerns about Figure 1b [REDACTED] and this led Professor Rivory to re-open the matter. He sought a further opinion from Expert A, and also engaged a second subject-matter expert (**Expert B**) to provide advice taking account of the additional information that had been provided by the Complainants.

On the basis of the opinions of Experts A and B, Professor Rivory reversed his earlier decision that a formal investigation was unwarranted. He determined that the appropriate course was to engage a digital forensics expert to analyse the electronic evidence relating to Figure 1b.

He also decided that the expert forensic analysis should be received in the context of a formal research integrity investigation to be carried out in accordance with the University's 2019 Research Code and the Australian Research Code. Professor Rivory's decision was communicated to the Complainants on 11 October 2021. The Investigation Panel was appointed in April 2022 and at the same time [REDACTED] were approached to provide expert digital forensics advice.

1.4 Terms of reference for investigation

We have been asked to examine and make findings of fact in relation to the following points:

1. That Dr Schmidt ran simulations using the Block-Adaptive-Tree-Solarwind-Roe-Upwind-Scheme model, part of the Space Weather Modelling Framework;
2. That the simulation referenced in 1. above was able to be used to generate Figure 1b of the *Explaining a Metric Type II Burst* manuscript; and
3. That Adobe Photoshop or another image editing tool was used to create or alter Figure 1b of the *Explaining a Metric Type II Burst* manuscript.

If we find that Photoshop (or another editing tool) was used to create or alter Figure 1b, we are also asked to make findings as to:

- (a) whether any changes applied in the creation or alteration of that figure were acceptable having regard to applicable disciplinary practices or standards; and
- (b) if any changes applied in the creation or alteration of the figure were not within the bounds of acceptable standards, whether the changes involved fabrication or falsification on the part of one or more of the Respondents.

In investigating the matter, we have been asked to consider the meaning of the terms 'fabrication' and 'falsification' as used in the *Research Code of Conduct 2013* and the *Australian Code for the Responsible Conduct of Research 2007* (noting that neither Code defines the terms, and that the preliminary assessment adopted the definitions used by the US Office of Research Integrity).

On the basis of our findings in respect of Points 1 to 3 above, we have also been asked to:

- (i) determine whether either or both of the Respondents have engaged in conduct that breached any of the following:
 - (a) the *University of Sydney Research Code of Conduct 2013*;
 - (b) the *Australian Code for the Responsible Conduct of Research 2007*; and
 - (c) the *University of Sydney Code of Conduct - Staff and Affiliates*;
- (ii) in the event of any finding of a breach of the *Research Code of Conduct 2013* or the *Australian Code for the Responsible Conduct of Research 2007*, determine the seriousness of the breach in accordance with the criteria in clause 19(2) of the *Research Code of Conduct 2019*; and
- (iii) in the event of any finding of a major breach of the *Research Code of Conduct 2013*, determine whether there was conduct amounting to research misconduct as defined in the *Research Code of Conduct 2019*.

The terms of reference also provide for us to make other recommendations arising from our findings if we consider it appropriate to do so.

2 Summary of findings

Our findings are summarised as follows:

1. We have found that Dr Schmidt ran simulations using the BATS-R-US model.
2. We have found that the BATS-R-US simulation referenced in Point 1 was not able to be used to generate Figure 1b of the “Explaining a Metric Type II Burst” manuscript.
3. We have found that Adobe Photoshop was used to create or alter Figure 1b.
4. The changes that were applied in the creation or alteration of Figure 1b were not acceptable having regard to applicable disciplinary practices or standards.
5. The changes that were applied in the creation or alteration of Figure 1b involved fabrication and falsification on the part of Dr Schmidt.
6. Professor Cairns did not engage in conduct that breached either the University’s 2013 Research Code or the Australian Research Code.
7. Dr Schmidt engaged in conduct that breached:
 - (i) the University’s 2013 Research Code; and
 - (ii) the Australian Research Code.

We have assessed Dr Schmidt’s Code breaches as sufficiently serious to warrant a finding of research misconduct as defined in the 2013 and 2019 Research Codes and also the Australian Research Code.³

³ See Part 4.8 of this report.

3 Conduct of investigation

3.1 Confidentiality

The University requested that the investigation be conducted on a confidential basis, with information being disclosed by the Panel only as necessary within the University and to other affected parties.

Participants were informed that material would be received on a confidential basis for the purposes of the investigation. All participants were asked to keep confidential all information that they provided to the Panel, or became aware of as a result of their participation in the investigation.

3.2 Evidence

(a) Interviews

The following interviews were conducted:

8 July 2022

Professor Gabor Toth

Dr Bart van der Holst

Professor Ward Manchester III

(joint interview)

[REDACTED]

Dr Joachim Schmidt

[REDACTED]

Professor Iver Cairns

[REDACTED]

[REDACTED]

All interviews were recorded with the consent of the interviewees.

Mr Matthew Wynn of the University's Research Integrity Office also prepared notes of each interview. These notes were intended to provide a summary of the responses provided by the interviewees to questions put by the Panel rather than a complete transcript of each interview.

Interviewees were provided with a copy of Mr Wynn's notes of their interview for checking, comment and approval.

(b) Supplementary submissions and responses to supplementary questions from the Panel

Professor Toth made a supplementary submission to the Panel by email on 12 July 2022

[REDACTED]

We put supplementary questions in writing to Dr Schmidt on 14 October 2022 and he responded by email the following day [REDACTED]

We also put supplementary questions in writing to Professor Cairns on 17 October 2022 and he responded by email on 6 November 2022 [REDACTED]

(c) [REDACTED] Report

As proposed by Professor Rivory as part of his preliminary assessment, the University engaged forensic analysis experts, [REDACTED], to identify and undertake an analysis of electronic evidence relating to the creation and editing of Figure 1b. [REDACTED] were also asked to identify any evidence that may assist in determining whether Figure 1b could be derived from either a simulation image of a CME event (**Simulation Image**) or an Observation Image of the same event (**Observation Image**).

[REDACTED] provided their report to the University on 30 August 2022 [REDACTED]
[REDACTED].

(d) Additional documents

In addition to the documents specifically referred to in this report, the Panel also received a range of other documents from the Research Integrity Office and the interviewees. These are listed in Annexure table at the end of this Report.⁴

3.3 Standard of proof

The relevant standard of proof is the civil “balance of probabilities” standard. What constitutes adequate proof will vary according to the circumstances, and the Panel has applied the legal principle that the more serious the allegation or the more serious the consequences for party against whom the allegation is made, the higher the standard of proof required. While the standard of proof is still the civil standard, the issues in this matter are sufficiently serious that we must be comfortably satisfied that there is clear and compelling evidence to prove that the alleged acts or omissions occurred before making any affirmative finding.

3.4 Opportunity for Respondents to comment on draft report

On 12 December 2022, following the drafting of the Panel’s report, the Respondents were provided with an opportunity to view the final draft report and submit any comments they wished to make.

Dr Schmidt responded [REDACTED], stating:

⁴ The Panel also received copies of the legislation, codes of practice/conduct and policies listed in its terms of reference.

[REDACTED]

[REDACTED]

Professor Cairns provided his response to the final draft report on 19 December 2022

[REDACTED]

[REDACTED]

4 Issues & Findings

4.1 Did Dr Schmidt run simulations using the BATS-R-US model?

Findings

We have found that Dr Schmidt ran simulations using the BATS-R-US model.

Evidence

Dr Schmidt said in his written response to the interview questions and at interview that he ran simulations using the BATS-R-US model. He also indicated in his written response that he had carried out the simulation work exclusively, and that Professor Cairns had not been involved in running the simulations. Professor Cairns confirmed at interview that Dr Schmidt had run simulations using the BATS-R-US model, and that he (Professor Cairns) had no involvement in this work. This was also consistent with information provided by Professor Cairns in an email to the Research Integrity Office dated 13 April 2020.

Reasons for findings

It is not disputed that Dr Schmidt ran simulations using the BATS-R-US model. Dr Schmidt confirmed at interview that he did so, and Professor Cairns also said at interview that Dr Schmidt had run simulations using the BATS-R-US model.

4.2 Was the BATS-R-US simulation able to be used to generate Figure 1b?

Findings

We have found that the BATS-R-US simulation was not able to be used to generate Figure 1b of the Type II Paper.

Evidence

Figure 1, including the caption, from the Type II Burst paper is presented below

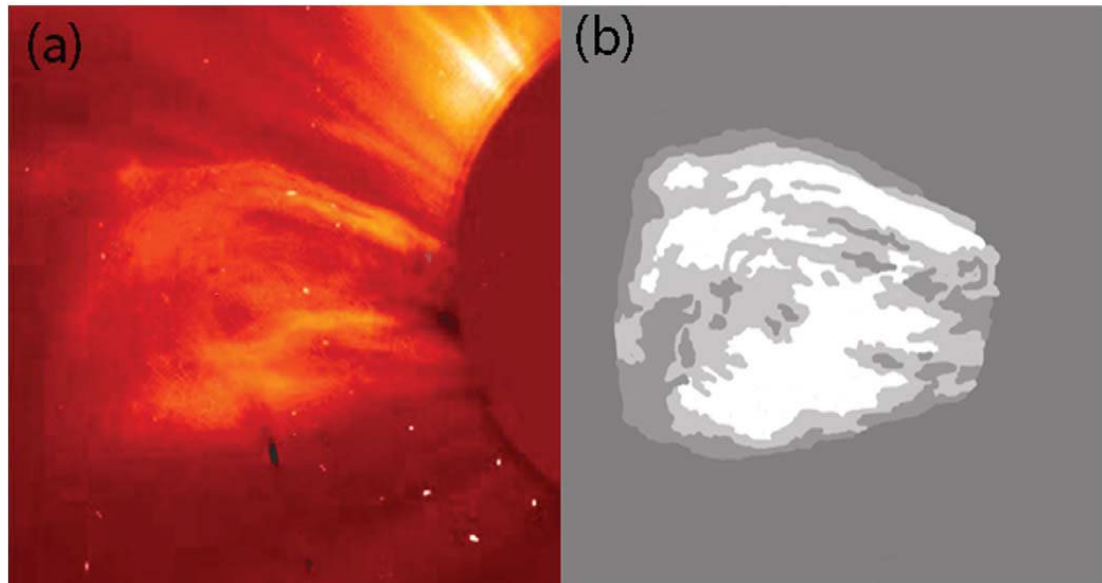


Figure 1. (a) Coronagraph image of the 7 Sep 2014 CME. (b) Synthetic white light prediction of the same CME. The predicted size and bright features of the CME agree well with the observations.

The Complainants' position is that Figure 1b could not have been generated from BATS-R-US simulation data. Professor Toth said at interview (and in earlier submissions to Professor Rivory) that he had attempted without success to recreate the BATS-R-US simulation from which Figure 1b was said by Dr Schmidt to have been derived.

Professor Toth provided a series of PowerPoint slides that highlighted significant discrepancies between his own simulation results and Figure 1b. He told the Panel that he had asked Professor Cairns and Dr Schmidt to provide him with the input and output files, and in response he received input files and a Tecplot⁵ file which he said could not have produced the results depicted in Figure 1b. When he re-ran the simulation with a corrected version of the input file that Dr Schmidt provided (at Professor Cairns' request), it was able to produce "*some kind of CME and a white light image*", but that the CME in the simulation had erupted far too quickly and looked nothing like the image in the manuscript.

⁵ BATS-R-US simulation output files are in a binary format and are not human readable. Dr Schmidt said that he used Tecplot software to visualise the BATS-R-US output files.

In Professor Toth's view, Figure 1b was more likely to have come from the associated observational image (i.e., panel (a) of Figure 1) than from BATS-R-US simulation data. In support of this view, he highlighted a black spot in the lower centre of Figure 1a and explained that this spot is an instrumental artefact which could not have been produced from a simulation. He also referred to features of Figure 1b that matched the shape created by the artefact present in the observational image (Figure 1a) in addition to other features which correspond to the simulation image.

At interview, Dr Schmidt confirmed he assembled the images for the Type II Paper. Dr Schmidt told the Panel that he simulated a CME image using BATS-R-US and visualised the output using Tecplot.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] reported that they [REDACTED]
[REDACTED] found
that the file system metadata of a series of images created and modified on [REDACTED] 2019
show a progression of creation/modification dates and file name behaviour that indicated a

link between Figure 1b and Figure 1a image. This is explained in [REDACTED] the

[REDACTED] report [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

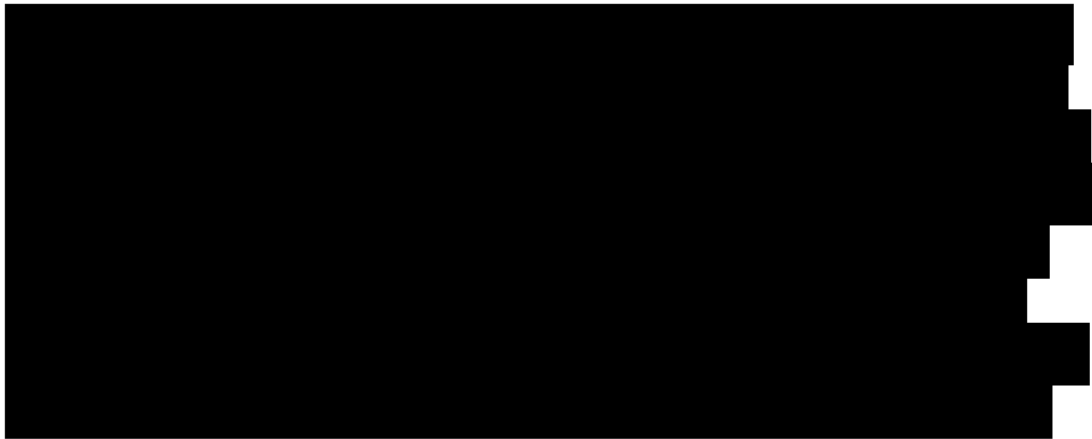
[REDACTED]

In summary, the file system modification time stamps of Items 3-6 [REDACTED] occur progressively on the afternoon of [REDACTED] 2019. The naming convention of each of these file [REDACTED] Iso indicate an iterative relationship. As Item 4 appears to be [Figure 1a], and Item 5 appears to be "Figure 1b" [...], the above analysis and observations show a connection between [Figure 1a] and Figure 1b.

[REDACTED]

[REDACTED]

[REDACTED]



Reasons for findings

While it is not disputed that the BATS-R-US model is capable of producing simulations of CMEs, there is compelling evidence to support a conclusion that Figure 1b of the Type II Paper was not generated, and could not be generated, from BATS-R-US simulation data.

Both Dr Schmidt and Professor Cairns agreed that Dr Schmidt was the individual conducting simulations, and the individual assembling figures for the Type II Paper.

The digital forensic analysis of Dr Schmidt's computer [REDACTED] suggest Figure 1b was derived directly from Figure 1a. The Panel agreed with this analysis and found the presence of shapes in Figure 1b which corresponding to artefact present in Figure 1a to be particularly compelling.

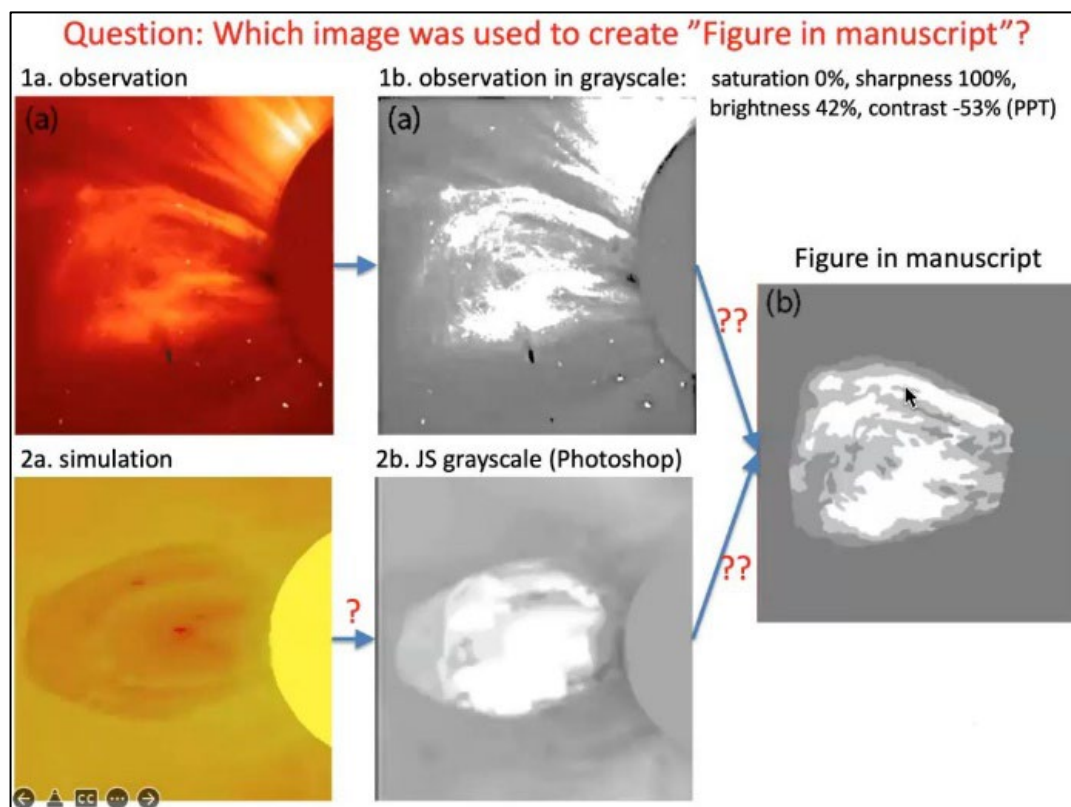
4.3 Was Adobe Photoshop or another image editing tool used to create or alter Figure 1b?

Findings

We have found that Adobe Photoshop was used to create or alter Figure 1b.

Evidence

At interview, Professor Toth summarised his concerns in a brief presentation, which included the following slide:



Professor Toth outlined how Dr Schmidt had sent the original data⁶, which was purportedly processed into Figure 1b, including the simulation image (labelled above as 2a). He noted

⁶ Professor Cairns told the Panel that he had requested Dr Schmidt to send the original data to Professor Toth.

that Dr Schmidt had claimed he was unable to reproduce Figure 1b due to losing access to a particular version of Photoshop. At interview, Dr Schmidt maintained that he had lost access to the particular version of Photoshop that he had used to create Figure 1b.

At interview, and in prior responses to Research Integrity, Dr Schmidt acknowledged that Photoshop had been used to generate Figure 1b.

efforts to reproduce these adjustments proved unsuccessful

[REDACTED]

At interview, Professor Cairns explained that he has no experience with Photoshop, confirmed that he did not make any amendments, and could not recall asking Dr Schmidt to make any amendments using Photoshop. [REDACTED]

[REDACTED]

The Panel notes an email from Professor Cairns to the Complainants (and others) on 15 November 2019, in which he stated "*I agree that the process used by [Dr Schmidt] was severely flawed. I also do not know why Photoshop was used, since as best I know it wasn't in our 2016 "white-light" paper*", [REDACTED]

Reasons for findings

The Panel find that Photoshop was used, by Dr Schmidt, to alter or create Figure 1b. The use of Photoshop in generating Figure 1b was not contested by Dr Schmidt in either his written submissions or at interview. [REDACTED]

While Dr Schmidt contended that he had merely adjusted or modified the Tecplot output to generate Figure 1b, we do not accept this claim. Our view is based on the totality of evidence available and the inability of either Dr Schmidt [REDACTED] to reproduce an image resembling Figure 1b from the Tecplot visualisation of the simulation output.

4.4 Additional issues relating to the use of Photoshop

Findings

Having found that Dr Schmidt used Photoshop to create or alter Figure 1b, we have also been asked to consider whether any changes applied in the creation or alteration of Figure 1b were acceptable having regard to applicable disciplinary practices or standards, and if not, whether the changes involved fabrication or falsification on the part of one or more of the Respondents.

We have found that the changes that were applied in the creation or alteration of Figure 1b:

- were not acceptable having regard to applicable disciplinary practices or standards; and
- amounted to fabrication and falsification on the part of Dr Schmidt.

Evidence



[REDACTED]

the Panel also notes that in a 15 November 2019 email to the Respondents and Professor Cairns (and others), Dr Schmidt stated that he felt "*Figure 1(b) is not very appropriate. Photoshop alters the original image so much that the result looks artificial*".

[REDACTED]

[REDACTED]

We agree with [REDACTED] view regarding minor, cosmetic adjustments to images for scientific publications, where such adjustments do not alter the data presented in the figure. In our view such 'cleaning-up' adjustments are consistent with accepted scientific practice, provided that they are appropriately declared and described in the resulting manuscripts. We consider that the nature of the changes in this case, even on Dr Schmidt's own evidence, amount to material changes which altered the substance of the image and substantially exceed what might be regarded as minor, cosmetic changes.

The Panel notes that the Type II Paper contains no reference to any amendments to the simulation output being manipulated in Photoshop. The image is presented in a way that suggests the output of the BATS-R-US simulation can directly result in Figure 1b. Indeed, the body of the Type II Paper states "*Figure 1(b) shows that the prediction for time 04:00 UT agrees very well with the corresponding observational data in Figure 1(a), providing evidence that the observed CME is modelled well*",

[REDACTED]

[REDACTED]

[REDACTED]

When concerns were initially raised by the Complainants, Professor Cairns instructed Dr Schmidt to provide a number of Photoshop files which purportedly showed how Figure 1b could be generated from the Simulation output. These files were provided by Dr Schmidt on 14 November 2019 and were identified by [REDACTED] in their analysis of Dr Schmidt's computer.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

The Panel [REDACTED] are not persuaded by Dr Schmidt's claim that Figure 1b was legitimately derived from the Simulation image.

[REDACTED] report details their attempts to replicate the Photoshop procedure that Dr Schmidt had described applying to the simulation image in generating Figure 1b in his response to Research Integrity. They applied this procedure to both the Simulation output and the Observation image [REDACTED]

[REDACTED] Neither effort was able to generate Figure 1b as presented in the Type II Paper.

[REDACTED]

[REDACTED] concluded that the shape and detail present within the Simulation image would require direct manipulation and modification in order to alter the Simulation image to become substantially similar to Figure 1b. The Panel considered the analysis detailed [REDACTED] to be sound and agreed with their conclusions.

Reasons for findings

In considering whether the changes made by Dr Schmidt to Figure 1b were acceptable, it is noted that changes that are cosmetic in nature would be permissible, while material changes would be unacceptable.

Cosmetic changes could range from, for example, increases to font sizes or the addition of labels and/or arrows through to more substantial (although still cosmetic) changes such as stretching a colour scale or excising part of an image to highlight particular features.

Changes of the latter kind would need to be explained by way of a note in the paper while changes of the former kind could be made without adding any explanatory note.

If we were to accept Dr Schmidt's assertion that he used Photoshop to make the internal structures of the image brighter and more visible, it would have been necessary for him to have included an explanatory note to this effect in the paper. This should have been done at the draft stage so that Professor Cairns and other prospective authors were made aware of the adjustments for the purposes of their consideration of the draft paper.

We consider the changes to Figure 1b made by Dr Schmidt to be material changes to the substance of the image and as such, they were incompatible with accepted scientific practices and standards.

We were also asked to consider whether the changes that had been made to Figure 1b involved fabrication or falsification on the part of Dr Schmidt and/or Professor Cairns.

As noted in our terms of reference, the terms 'fabrication' and 'falsification' are not defined in either the 2013 Research Code or the Australian Research Code. The terms are, however, defined in the US Office of Research Integrity's definition of 'research misconduct' and the UK Research Integrity Office's (UKRIO) *Concordat to Support Research Integrity*.

The US Office of Research Integrity definitions (which were adopted by Professor Rivory in his preliminary assessment) are as follows:

Fabrication is "making up data or results and recording or reporting them", and

Falsification is "manipulating research materials, equipment, or processes, or changing or omitting data or results such that the research is not accurately represented in the research record."

The UKRIO definitions are very similar to those adopted by the US Office of Research Integrity, but are, in our view, more apt in the context of assessing the manipulation of images. The UKRIO definitions are as follows:

Fabrication: "making up results, other outputs (for example, artefacts) or aspects of research, including documentation and participant consent, and presenting them and/or recording them as if they were real".

Falsification: “inappropriately manipulating and/or selecting research processes, materials, equipment, data, imagery and/or consents.”

We have found that Dr Schmidt utilised Photoshop to make up results and presented them to Professor Cairns and the Complainants as if they were real, thereby engaging in fabrication of results. The way in which he used Photoshop to manipulate Figure 1b was inconsistent with accepted scientific practice and was therefore inappropriate and amounted to falsification.

4.5 Other items for noting

[illegible]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] it is our view that science, and research more broadly, naturally rely on a degree of trust in one's colleagues and co-authors, and it appears that trust may have been taken advantage of in this instance. The Panel considered that Professor Cairns was entitled to rely on Dr Schmidt's expertise [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

The Panel appreciates the time this investigation has taken and recognises the broader matter has taken a relatively convoluted path to reach this point. The Panel also appreciates that delays may have led to frustration on the part of the Complainants in this matter.

This being said, the Panel wishes to put on record that the frequency and tone of unsolicited emails from one of the Complainants were not constructive, and to the extent that they were suggestive of improper conduct or an unwillingness on the part of the University or the Panel to give proper consideration to the matters they had raised, they were entirely without foundation. [REDACTED]

[REDACTED]

4.6 Breaches of the 2013 Research Code, Australian Research Code and Code of Conduct for Staff & Affiliates

Professor Cairns

The Panel did not consider Professor Cairns to have engaged in any conduct, whether by act or omission, that breached the 2013 Research Code, the Australian Research Code or the University's Code of Conduct for Staff and Affiliates.

We are satisfied that Professor Cairns had no part in the creation of, or adjustment to, Figure 1b, and we are also satisfied that he was unaware that Dr Schmidt had fabricated and falsified the image. We also note that when the Complainants first raised their concerns with Professor Cairns, he acted promptly in notifying the Research Integrity Office of the matter

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Dr Schmidt

On the basis of the findings set out in **Parts 4.1 to 4.4** above, we have found that Dr Schmidt, engaged in conduct that breached the 2013 Research Code, the Australian Research Code and the University's Code of Conduct for Staff and Affiliates.

2013 Research Code

We have found that the proven conduct of Dr Schmidt as set out in **Parts 4.1 to 4.4** above breached the following provisions of the University's 2013 Research Code:

2013 Research Code requirement	Conduct by Dr Schmidt in breach of the Code
Clause 8(1) Researchers must foster and maintain high standards of responsible research ⁸ including: (a) respecting truth (i) promoting compliance with the Code and any other applicable laws, regulations and codes.	Dr Schmidt breached this requirement by: <ul style="list-style-type: none">• fabricating and falsifying research results;• dishonestly representing his results to Professor Cairns as having been validly produced;• failing to disclose to Professor Cairns the manner in which he had produced Figure 1b, with the result that Professor Cairns forwarded a draft paper containing a fabricated and falsified image to prospective co-authors;
Clause 9(1) Responsible conduct of research includes the proper management and retention of research data, and proper recordkeeping.	Dr Schmidt breached this requirement by creating and maintaini

⁸ Clause 7(1) of the 2013 Research Code also relevantly provides that responsible research is characterised by: (a) honesty and integrity; ... and (e) responsible communication of research results.

2013 Research Code requirement	Conduct by Dr Schmidt in breach of the Code
[REDACTED]	
Clause 11(3): Researchers must take all reasonable steps to ensure that their findings are accurate and properly reported. If they become aware of misleading or inaccurate statements about their work, they must correct the record as soon as possible.	Dr Schmidt breached this requirement by fabricating and falsifying research results

Australian Research Code

We have found that the proven conduct of Dr Schmidt as set out in **Parts 4.1 to 4.4** above breached the following provisions of the Australian Research Code:

Australian Research Code requirement	Conduct by Dr Schmidt in breach of the Code
<p>Clause 1.6 Researchers must foster and maintain high standards of responsible research including:</p> <ul style="list-style-type: none"> • respecting truth • avoiding departures from the responsible conduct of research • complying with institutional research policies. 	<p>Dr Schmidt breached this requirement by:</p> <ul style="list-style-type: none"> • fabricating and falsifying research results; • dishonestly representing his results to Professor Cairns as having been validly produced; • failing to disclose to Professor Cairns the manner in which he had produced Figure 1b, with the result that Professor Cairns forwarded a draft paper containing a fabricated and falsified image to prospective co-authors; <p>[REDACTED]</p>
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
Clause 4.5 Researchers must take all reasonable steps to ensure that their findings are accurate and properly reported.	Dr Schmidt breached this requirement by creating and maintaining fabricated and falsified research data.

Australian Research Code requirement	Conduct by Dr Schmidt in breach of the Code
	<p>The fact that the results were not published is immaterial in the context of this clause.</p> <p>Dr Schmidt had presented his work to Professor Cairns with a view to it being submitted for publication, and was aware that Professor Cairns had forwarded the draft paper to the Complainants for the purpose of inviting them to be co-authors.</p>

Code of Conduct for Staff and Affiliates

In failing to comply with the 2013 Research Code and Australian Research Code, Dr Schmidt also breached clause 4 of the University's Code of Conduct for Staff and Affiliates (the **Code of Conduct**) which relevantly requires staff to comply with all applicable legislation, industrial instruments, professional codes of conduct or practice and University policies, including in relation to the conduct of research.



4.7 Seriousness of Dr Schmidt's breaches

Clause 19(1) of the 2019 Research Code provides that breaches may range from minor (less serious) to major (more serious), and that major breaches may constitute research misconduct.

Clause 19(2) of the 2019 Research Code sets out the following non-exhaustive list of factors to be taken into account when assessing the seriousness of a breach:

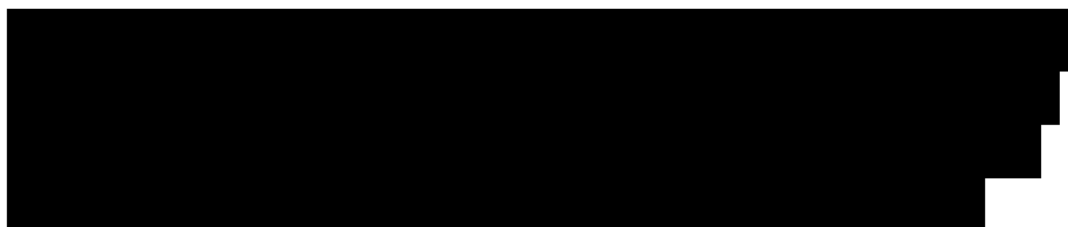
- (a) the extent of the departure from approved or accepted practice;*
- (b) the extent to which research participants, the wider community, animals and the environment are, or may have been, affected by the breach;*
- (c) the extent to which it affects the trustworthiness of research;*
- (d) the level of experience of the researcher;*
- (e) whether there are repeated breaches by the researcher;*
- (f) whether institutional failures have contributed to the breach; and*
- (g) any other mitigating or aggravating circumstances.*

We have assessed the breaches in this matter against the criteria in clause 19(2) as follows:

(a) Extent of departure from approved or accepted practice

We consider Dr Schmidt's fabrication and falsification of Figure 1b to constitute a major departure from accepted scientific practice.

Accepted practice permits minor cosmetic adjustments to images without any accompanying annotation and permits more substantial changes only with appropriate disclosure and explanation.



This was not a defect that was capable of being remedied by simply adding a note at a later stage disclosing the adjustments that had been made to Figure 1b.

It is also noted that even on Dr Schmidt's version of events, the adjustments he made would have required disclosure.

[REDACTED]

- (b) The extent to which research participants, the wider community, animals and the environment are, or may have been, affected by the breach

This factor has no application in this matter.

- (c) The extent to which the breach affects the trustworthiness of research

In our view, public knowledge of the conduct and breaches established would be damaging to the trustworthiness of research. The Panel also noted that the situation would appear to already have resulted in reputational harm to Dr Schmidt (and Professor Cairns) and to the University of Sydney, as evidenced by the communications received from Professor Toth.

It is possible that Dr Schmidt's conduct may have been a one-off instance of 'cutting corners' and would therefore not necessarily undermine all of his research.

[REDACTED]

- (d) Level of experience of the researchers

[REDACTED]

The Panel considered Dr Schmidt to be an experienced researcher, and did not consider that a lack of experience was a contributing factor to the breaches identified.

(e) Whether there have been repeated breaches

Dr Schmidt has no record of prior breaches of any research code.

(f) Whether institutional failures have contributed to the breach

Dr Schmidt did not put to the Panel that there were institutional failures that contributed to the breaches, and no such failures were identified during the course of our investigation.

(g) Other mitigating or aggravating circumstances

We have considered whether the fact Figure 1b has not been published is a mitigating factor. In our view, it is not. Dr Schmidt presented Figure 1b to Professor Cairns, who in turn presented it to the Complainants and other potential co-authors with Dr Schmidt's knowledge, as if the results were real. The figure had been produced for a paper that had been prepared with a view to submitting it for publication, and Professor Cairns forwarded the paper to other researchers inviting them to be co-authors. Although the fact that the paper had not been published meant that the practical consequences of Dr Schmidt's conduct were less severe than would have been the case had the Type II Paper been published, this is not of itself a factor that mitigates his conduct.



Conclusion

Taking into account the above considerations we have assessed Dr Schmidt's 2013 Research Code breaches as representing serious breaches of this policy.

4.8 Was there conduct amounting to research misconduct?

Research misconduct is defined in clause 20(1) of the 2019 Research Code as a "*serious breach*" of that Code "*which is also intentional, reckless or negligent*". This definition is identical to the recommended definition provided in the NHMRC/ARC/Universities Australia *Guide to Managing and Investigating Potential Breaches of the Australian Code for the Responsible Conduct of Research*.

Clause 20(2) of the 2019 Research Code sets out a non-exhaustive list of examples of conduct that may amount to research misconduct. This list relevantly includes (at clause 20(2)(a)) "*fabrication, falsification, or deception in proposing, carrying out or reporting the results of research*".

The *Guide to Managing and Investigating Potential Breaches of the Australian Code for the Responsible Conduct of Research* states that "*[f]abrication and falsification are types of breaches that are commonly recognised as being undertaken intentionally or recklessly and are examples of research misconduct.*"

While our terms of reference require us to determine whether there has been research misconduct as defined in the 2019 Research Code, as noted earlier, this code was not in operation at the time that Dr Schmidt produced Figure 1b and provided the image to Professor Cairns. For completeness, we have therefore additionally considered the question of possible research misconduct under the 2013 Research Code.

Clause 18 of the 2013 Code provides as follows:

18(1) A complaint or allegation relates to research misconduct if it involves all of the following:

- (a) an alleged breach of this Code;*
- (b) intent and deliberation, recklessness or gross and persistent negligence; and*
- (c) serious consequences, such as false information on the public record, or adverse effects on research participants, animals or the environment.*
(emphasis added)

18(2) Research misconduct includes any of the following on the part of any researcher:

(a) fabrication, falsification, or deception in proposing, carrying out or reporting the results of research;

Importantly, for a Code breach to amount to research misconduct under the 2013 Research Code, it must involve conduct which breaches that Code, and meet the criteria specified in clauses 18(1)(b) and (c) of the 2013 Research Code. Examples of conduct which may amount to research misconduct are set out in clause 18(2) of the 2013 Research Code. The same requirements applied under the Australian Research Code as applicable at the University at the time Dr Schmidt produced Figure 1b.

Professor Cairns

As we have not found Professor Cairns to have breached any Code, it follows that his conduct does not amount to research misconduct.

Dr Schmidt

[REDACTED]

We have found that Dr Schmidt's conduct [REDACTED] meets the requirements of clause 20(1)(a) of the 2019 Research Code. We have assessed his Code breaches as sufficiently serious to warrant a finding of research misconduct as defined in the 2019 Research Code.

As indicated above, we have found that Dr Schmidt's conduct in fabricating and falsifying research results, dishonestly representing his results to Professor Cairns as having been validly produced [REDACTED] amounted to serious Code breaches.

our view, the fabrication and/or falsification of research results is a most serious matter, irrespective of whether the results at issue have been published.

We find that Dr Schmidt's [REDACTED] Code breaches were sufficiently serious to warrant a finding of research misconduct as defined in the 2019 Research Code and the Guide to Managing and Investigating Potential Breaches of the Australian Code for the Responsible Conduct of Research.

Given that Dr Schmidt created Figure 1b before the 2019 Research Code and Guide came into operation, we have also considered whether his conduct amounted to research misconduct as defined in the 2013 Research Code and Australian Research Code as in place at the University at the time he produced Figure 1b (the 2007 Code).

To be satisfied that his conduct constituted research misconduct under these Codes, we must be satisfied, in addition to finding that the breaches were serious and intentional or reckless, that the breaches had "serious consequences such as false information on the public record, or adverse effects on research participants, animals or the environment".

It is evident from the words 'such as' in the definition in both Codes that the specific examples of 'serious consequences' that are mentioned do not constitute an exhaustive list. This means that while the publication of false information is an example of the kind of serious consequences that could flow from a Code breach, it does not follow that false information that has not been published cannot also have serious consequences.

In our view, the present matter is a situation in which serious consequences have resulted from Dr Schmidt's Code breaches. As noted earlier, Dr Schmidt engaged in dishonest conduct in the way he presented Figure 1b to Professor Cairns and allowed it to be included in the draft paper that was forwarded to prospective co-authors. Figure 1b formed part of a paper that was clearly developed with a view to publication. We are satisfied that by failing to disclose to Professor Cairns the way in which he had derived Figure 1b Dr Schmidt had dishonestly presented it to Professor Cairns as a valid representation of a CME simulation using BATS-R-US. Professor Cairns in turn relied on Dr Schmidt's work and forwarded it to prospective co-authors, with the effect that Professor Cairns' reputation has been damaged



In our view, the above consequences are serious, and as such, Dr Schmidt's conduct also amounted to research misconduct under the 2013 Research Code and the Australian Research Code 2007.

5 Recommendations

The Panel recommends that:

- 1 the University notify Professor Cairns, Dr Schmidt, the Complainants, and the University of Michigan's Director of Licencing of the Panel's findings as set out in Part 4 of this Report. The communication to the Complainants and the University of Michigan informing them of the outcome should indicate that the matter is concluded;

[REDACTED]

- 3 if Professor Cairns and Dr Schmidt wish to submit the Type II Paper for publication, they will need to omit Figure 1b and any analysis that relies on or is related to Figure 1b; and ensure that any modifications applied to figures in future manuscripts are consistent with accepted scientific practices and standards and are fully disclosed;

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Professor Richard de Grijs

Professor Rob Wittenmyer

Annexure Table

Documents provided to the Panel

Concerns raised

Emails from Professor Cairns to Research Integrity raising concerns, dated 18 November 2019
Mr Wynn's catalogue of emails provided by Professor Cairns, prepared 18 March 2022

Preliminary Assessment

Letter from Mr Bryce Pilz (University of Michigan Director of Licencing), dated 10 December 2020
Email from Dr Schmidt to Research Integrity with initial response to concerns, dated 26 March 2020
Email from Dr Schmidt to Research Integrity providing additional response, dated 30 March 2020
Email from Professor Cairns to Research Integrity with response to concerns, dated 13 April 2020
Email from Expert 1 to Research Integrity with advice on figures, dated 21 September 2020
Preliminary Assessment Outcome Report - Schmidt & Cairns, dated 8 December 2020
Letter from Professor Toth to Professor Rivory re preliminary assessment, dated 21 January 2021
Email from Dr Schmidt to Research Integrity with additional response, dated 15 February 2021
Email from Professor Cairns to Research Integrity with additional response, dated 15 February 2021
Email from Professor Cairns to Research Integrity with additional responses from Dr Schmidt, dated 24 February 2021
Email from Expert 1 to Research Integrity with additional advice, dated 28 April 2021
Advice from Expert 2 to Research Integrity with advice on figures, dated 25 May 2021
Letter from Professor Toth to the University of Sydney Chancellor & Vice-Chancellor, dated 8 February 2021

Relevant codes and policies

University of Sydney Research Code of Conduct 2013
University of Sydney Research Code of Conduct 2019
Australian Code for the Responsible Conduct of Research 2018

Additional documents received by the Panel during the investigation

Forensics analysis report [REDACTED], dated 30 August 2022
Professor Toth's supplementary response to the Panel, received 21 July 2022
Dr Schmidt's responses to supplementary questions, received 15 October 2022
Professor Cairns' response to supplementary questions, received 6 November 2022
Email from Professor Toth to the Panel, dated 12 July 2022
Statement from Professor Toth to the Panel, dated 29 July 2022
Universities UK 'Concordat to support research integrity' 2019
Email from Professor Toth to Research Integrity and the Panel, dated 6 September 2022
Email from Professor Toth to Research Integrity and the Panel, dated 4 October 2022
Email from Professor Toth to Research Integrity and the Panel, dated 9 November 2022