

# Narrative and Mathematical Argument

A workshop organised as part of the Narrative Science Project

Organisers: Prof. Mary S. Morgan and Dr Dominic Berry

*Vera Anstey Room, Old Building, London School of Economics  
and Political Science*

*28 September, 2019*



[www.narrative-science.org](http://www.narrative-science.org)

# Narrative and Mathematical Argument

*Workshop 28 September, 2019  
Narrative Science Project, LSE*

*Organised by Prof. Mary S. Morgan and Dr. Dominic Berry*

Doing mathematics and telling narratives might seem at the opposite end of the scientific research enterprise, but - as we have already found in our Narrative Science project - narratives crop up even where you least expect them in the sciences including in the company of mathematics. The issue to be explored in the workshop is how, when, and why, narratives work with mathematics rather than against it. The questions of interest include:

- \* How does narrative work with the deductive nature of mathematics? Is there a special form of 'narrative argument' to be found in mathematics? If so, is the narrative complementary to the reasoning, even perhaps an essential partner to the argument, or is there a creative tension between the two?
- \* What characteristics does narrative have when it is found with mathematical reasoning? Do such narratives share the virtues of elegance and simplicity often associated with mathematics? What counts as a 'good narrative' when found in or with mathematical work?
- \* Do narratives in (or of) proof-making work differently from narratives associated with other kinds of mathematical reasoning? Do narratives work more effectively with demonstrations or with explorations in mathematical work? Do narratives have a better hold, or find a more natural home, in certain kinds of mathematics, or with certain kinds of mathematical arguments?
- \* Are narratives associated with particular professional practices in mathematics? Do those narratives transfer without alteration into pedagogical practices or do they disappear there?

The aim of this workshop is to explore examples - cases - of the use of narratives in the practices of mathematics by mathematicians, or perhaps by scientists using various forms of mathematics. It is about how narratives function with mathematics in various way, at different sites, and for different purposes at the professional level, rather than on how narratives function in pedagogy, or in public engagement.

For further discussion of the project, we invite you to look at the website (above), and the introduction to the special issue of the project for Studies in History and Philosophy of Science (2017).

# Programme

- 11:00-11:20*                      *Arrival tea/coffee—Foyer of the Vera Anstey Room)*
- 11:20-11:30*                      Welcome: Mary Morgan
- Session One                      (Chair: Dr Kim Hajek)
- 11:30-12:15**                      **David Corfield (University of Kent)**  
The narratives category theorists tell themselves
- 12:15-13:00**                      **Michael Friedman (Humboldt University of Berlin)**  
On narratives regarding mathematics and the concept of “translation”
- 13:00-14:00*                      *Lunch – Director’s Dining Room*
- Session Two                      (Chair: Dr. Dominic Berry)
- 14:00-14:45**                      **Line Edslev Andersen, Mikkel Willum Johansen, and Henrik Kragh Sørensen (Aarhus University)**  
Mathematicians using narratives to help the reader validate their proofs
- 14:45-15:30**                      **Fenner Tanswell (Loughborough University)**  
Proofs as Recipes, Journeys, Craft and Story: Comparing Metaphors for Mathematics
- 15:30-16:00*                      *Coffee – Foyer of Vera Anstey Room*
- Session Three                      (Chair: Prof. Mary Morgan)
- 16:00-16:45**                      **Karine Chemla (CNRS & Université de Paris)**  
Unexpected forms of narrative in mathematical proofs: What is at stake in proofs from third century China?
- 16:45-17:30**                      **Stephanie A. Dick (University of Pennsylvania)**  
QED
- 17:30 – 18:00**                      **Plenary discussions.**
- 18:00 – 19:30*                      *You are welcome to join us for a drink at a nearby bar.*
- 19:30*                                      *Dinner for speakers and project team.*

# Location

The workshop will take place in the Vera Anstey Room, Old Building, London School of Economics and Political Science.



The simplest access to the Vera Anstey Room is by entering the Old Building via the LSE Main Entrance on Houghton Street. The room is up one flight of stairs from the lift foyer.

If you have any difficulties, you can contact Dr Dominic Berry on +44 78055 92637

**Remember, if you are a speaker, or one of the PhD students claiming a bursary, and you are either flying or taking the Eurostar, you MUST keep hold of your boarding passes.**

# Abstracts

## The narratives category theorists tell themselves

David Corfield  
University of Kent

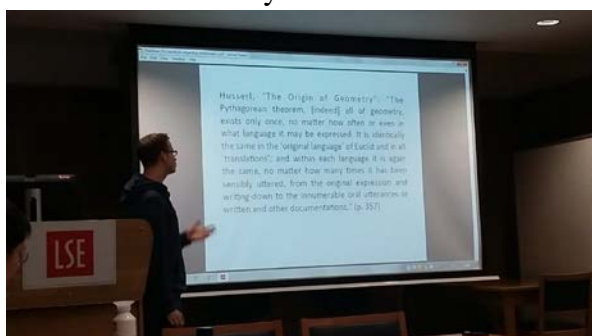


Category theory is an attempt to provide general tools for all of mathematics. Its history, dating back to the 1940s, is characterised by ambitious attempts to reformulate branches of mathematics and even mathematics as a whole. It has since moved on to influence theoretical computer science and mathematical physics. Resistance to this movement

over the years has taken the form of accusations of engaging in abstraction for abstraction's sake. Here we explore the role of narrative in forming the self-identity of category theorists.

## On narratives regarding mathematics and the concept of “translation”

Michael Friedman  
Humboldt University of Berlin



During the 19th and the 20th centuries, mathematicians used the term “translation” to describe the relations between different mathematical practices and domains. Which narrative(s) regarding the way mathematics functions and develops did they try to present or promote? Did they all mean to deliver the same narrative using this concept, or were

there complementing or even conflicting narratives? In my talk I am going to concentrate on several mathematician (Plücker, Poincaré, Bourbaki) and examine the narrative regarding mathematics they sought to present.

## Mathematicians using narratives to help the reader validate their proofs

Line Edslev Andersen, Mikkel Willum Johansen, and Henrik Kragh Sørensen  
Aarhus University



The talk will focus on interviews we conducted with two mathematicians, the talented PhD student Adam and his experienced supervisor Thomas. As a new PhD student, Adam had written a draft of a research article on a topic he was very knowledgeable about. But, being a new PhD student, Adam did not really know how to write for

mathematicians. Hence, Adam and Thomas together substantially revised the article with the purpose of making the article take into account the intended audience. We interviewed them about this process and found that they introduced narratives in the article to help the readers validate the proofs.

## **Proofs as Recipes, Journeys, Craft and Story: Comparing Metaphors for Mathematics**

Fenner Tanswell

Loughborough University



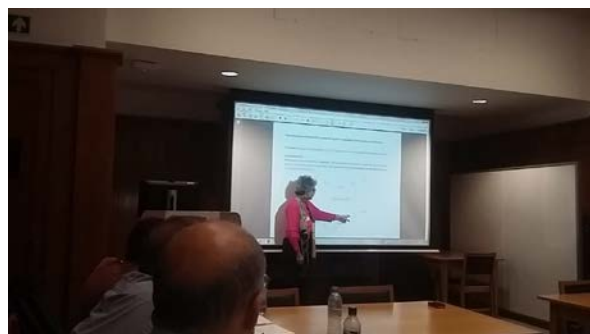
In this talk I compare different metaphors for proofs in mathematics. Having myself described proofs as akin to recipes, craft and journeys in previous work, I weigh up the different perspectives this provides on mathematics and the limitations of them. I contrast these with the view provided by thinking of proofs in narrative terms. I will argue that the key

is to emphasise the difference between proofs in themselves and proving activities carried out by mathematicians, and the way in which this shows up in the different metaphors.

## **Unexpected forms of narrative in mathematical proofs: What is at stake in proofs from third century China?**

Karine Chemla

CNRS & Université de Paris



Third century commentaries on *The Nine Chapters on Mathematical Procedures* (1st century CE) systematically establish the correctness of procedures contained in this classical work. Several of these proofs of correctness present the same unexpected narrative feature. On the basis of one example illustrating this feature, my talk argues that the specific narrative

structure is correlated with one of the objectives assigned to proof in this context. We thus need to restore this objective and attend to how the text of the proof was expected to be handled, if we want to interpret the proof in a way that does justice to actors' intention.

## **QED**

Stephanie A. Dick

University of Pennsylvania



The *QED Manifesto*, first published in 1994, called for a fully formalized, centralized, and automated repository for all mathematical knowledge to make it newly available to mathematicians, and to monumentalize what the manifesto's authors believed to be "the foremost creation of the human mind." Such a monument, they believed, would

"illuminate the fundamental reality of truth [and] thus provide some antidote to the degenerative effect of cultural relativism and nihilism." This talk will explore the *Manifesto* and the ensuing QED Project (which remains one of the largest automation

efforts in mathematics) with an eye to unpacking the narratives about the character of mathematical knowledge, technically and culturally, and the identity of the mathematician at work within it.

## Group discussion

The following five themes emerged during the day and from the final discussion - facilitated by Dr Dominic Berry - which wrapped up the workshop.

A.

The use by mathematicians themselves of narratives in conjunction with metaphors to describe their work, proved a particularly interesting dimension of the workshop. This conjunction was taken up in the commentaries by historians and philosophers of science. On the one hand, the importance of metaphors had the potential to change how we look at narratives in the sciences (including maths), and made both the narratives and the metaphors less like static units. On the other hand, thinking about and with the metaphors provided a resource for seeking and finding narrative elements in mathematics. (For example, translations can be part of a narrative and so used to do a number of things as well as translate; recipes were not just lists of ingredients but sketches for narratives of action.) In addition, discussions of the metaphors revealed that there was apparently no standard way in which narrative enters into a case. This thread concluded that the use of narrative in phil of maths/proof was very underdeveloped, and stressed the importance of practice to thinking about narratives and metaphors in mathematics.

B.

Surprise was expressed about the number of ways narrative gets into maths, and about the different kinds of narratives found in and with mathematics. By contrast with historical sciences, contingency and counterfactual reasoning don't seem to matter. Since those latter two characteristics are sometimes taken as essential to narrative, this raised the issue of whether maths and narrative really had any fit. Moving beyond that definition of narrative enabled us to focus on: how mathematics was home to narratives defined in other ways; the contexts in which they are shaped and taught; and so the features of narrative that can be shared amongst a collective.

C.

Another element that surprised some participants was discussion by mathematicians about what maths should be, or how it should be done differently. This involved narratives about the progress of mathematics, or about the unity or unifying project that mathematics could or should be. Related to these meta-claims, were elements about mathematics and truth claims, which the use of narrative might support or might deflate. This theme raised the question about the possibility that 'a grand narrative' resides at the bedrock of mathematics.

D.

Computing formed another theme in the discussions. This came out of questions about mathematics and algorithms, and mathematics using algorithms, and from those relations, to computer programming. Was narrative an essential part of an algorithm, or was it perhaps a commentary that accompanied an algorithm; and did algorithms embed narratives in their instructions or in their usage?

E.

Mathematics can be characterised as fundamentally an exercise in imagination, so (we might speculate) that its methodologies might have elements that are more clearly shared with those of the humanities than primarily STEM. This nominal fictionality of mathematics might in turn point to a very close link between narrative forms and practices to mathematical forms and

practices. Two elements could be part of this intersection. One is that some actors deny that there is narrative in mathematics – so what is at stake in the denial? The other is about the place of aesthetics in mathematics, is often recognised in discussions of mathematics in terms of elegance, simplicity, etc. These characteristics fit ill with the aesthetic characteristics ascribed to narratives which might include tellability (requiring a degree of complexity), character, and structures of plot.