The Semantic Problem of Ontological Explanation

The Case of Idealised Models

Antoine Brandelet

Faculté des Sciences
Université de Mons

24 November 2023

Setting the Problem

2 main questions:

1. What does it mean for a model to be explanatory?
2. What are the consequences of the response to (1) on the conceptions of scientific explanation?

Explanatory Modelling Conundrum (EMC)

Models feature (deliberate) falsities, and are yet considered as explanatory

2 main consequences:

1. Veritism of explanation in danger
2. Choose your favourite flavour: model-explanation vs. explanatory models

$\Rightarrow$ Is accurate representation a necessary condition of explanation?

Setting the Problem

2 main questions:

1. What does it mean for a model to be explanatory?
2. What are the consequences of the response to (1) on the conceptions of scientific explanation?

Explanatory Modelling Conundrum (EMC)

Models feature (deliberate) falsities, and are yet considered as explanatory

2 main consequences:

1. Veritism of explanation in danger
2. Choose your favourite flavour: model-explanation vs. explanatory models

$\Rightarrow$ Is accurate representation a necessary condition of explanation?

Setting the Problem

2 main questions:

1. What does it mean for a model to be explanatory?
2. What are the consequences of the response to (1) on the conceptions of scientific explanation?

Explanatory Modelling Conundrum (EMC)

Models feature (deliberate) falsities, and are yet considered as explanatory

2 main consequences:

1. Veritism of explanation in danger
2. Choose your favourite flavour: model-explanation vs. explanatory models

$\Rightarrow$ Is accurate representation a necessary condition of explanation?

Setting the Problem

2 main questions:

1. What does it mean for a model to be explanatory?
2. What are the consequences of the response to (1) on the conceptions of scientific explanation?

Explanatory Modelling Conundrum (EMC)

Models feature (deliberate) falsities, and are yet considered as explanatory

2 main consequences:

1. Veritism of explanation in danger
2. Choose your favourite flavour: model-explanation vs. explanatory models

$\Rightarrow$ Is accurate representation a necessary condition of explanation?

What is Model Explanation?

Models represent target systems and license inferences (Epistemic Representation Condition)

Representation is not faithful: ontological aspects of the target are distorted

Examples:

- Newtonian gravity
- Semi-classical models, silogen atoms, . . .
- Lots of others. . .

Possible solution: counterfactual model-explanation ("what-if" or "how-possibly" explanation) (Bokulich 2016; Nguyen 2020; Verreault-Julien 2019)
Model M explains T by showing how a quantity A is counterfactually related to a quantity B

What is Model Explanation?

Models represent target systems and license inferences (Epistemic Representation Condition)

Representation is not faithful: ontological aspects of the target are distorted

Examples:

- Newtonian gravity
- Semi-classical models, silogen atoms, . . .
- Lots of others. . .

Possible solution: counterfactual model-explanation ("what-if" or "how-possibly" explanation) (Bokulich 2016; Nguyen 2020; Verreault-Julien 2019)
Model M explains T by showing how a quantity A is counterfactually related to a quantity B

What is Model Explanation?

Models represent target systems and license inferences (Epistemic Representation Condition)

Representation is not faithful: ontological aspects of the target are distorted

Examples:

- Newtonian gravity
- Semi-classical models, silogen atoms, . . .
- Lots of others. . .

Possible solution: counterfactual model-explanation ("what-if" or "how-possibly" explanation) (Bokulich 2016; Nguyen 2020; Verreault-Julien 2019)
Model M explains T by showing how a quantity A is counterfactually related to a quantity B

What is Model Explanation?

Models represent target systems and license inferences (Epistemic Representation Condition)

Representation is not faithful: ontological aspects of the target are distorted

Examples:

- Newtonian gravity
- Semi-classical models, silogen atoms, ...
- Lots of others...

Possible solution: counterfactual model-explanation ("what-if" or "how-possibly" explanation) (Bokulich 2016; Nguyen 2020; Verreault-Julien 2019)
Model M explains T by showing how a quantity A is counterfactually related to a quantity B

What is Model Explanation?

A deeper problem persists:

- First-order explanation: "Why does T exhibit A?"
- Second-order explanation: "Why does A depend on B?"

What-if $\neq$ change in initial conditions $\neq$ 9-planets Solar system $\neq$ $1/r$-gravity

Newtonian gravity can explain Solar eclipses by exhibiting a structure of counterfactual dependences but, as it misrepresents gravity's ontology, it cannot explain why gravity is $1/r^2$

Idealisations and misrepresentations can help generate first-order explanations, but fail to do so for second order.

What is Model Explanation?

A deeper problem persists:

- First-order explanation: "Why does T exhibit A?"
- Second-order explanation: "Why does A depend on B?"

What-if $\neq$ change in initial conditions $\neq$ 9-planets Solar system $\neq$ $1/r$-gravity

Newtonian gravity can explain Solar eclipses by exhibiting a structure of counterfactual dependences but, as it misrepresents gravity's ontology, it cannot explain why gravity is $1/r^2$

Idealisations and misrepresentations can help generate first-order explanations, but fail to do so for second order.

What is Model Explanation?

A deeper problem persists:

- First-order explanation: "Why does T exhibit A?"
- Second-order explanation: "Why does A depend on B?"

What-if $\neq$ change in initial conditions $\neq$ 9-planets Solar system $\neq$ $1/r$-gravity

Newtonian gravity can explain Solar eclipses by exhibiting a structure of counterfactual dependences but, as it misrepresents gravity's ontology, it cannot explain why gravity is $1/r^2$

Idealisations and misrepresentations can help generate first-order explanations, but fail to do so for second order.

What is Model Explanation?

A deeper problem persists:

- First-order explanation: "Why does T exhibit A?"
- Second-order explanation: "Why does A depend on B?"

What-if $\neq$ change in initial conditions $\neq$ 9-planets Solar system $\neq$ $1/r$-gravity

Newtonian gravity can explain Solar eclipses by exhibiting a structure of counterfactual dependences but, as it misrepresents gravity's ontology, it cannot explain why gravity is $1/r^2$

Idealisations and misrepresentations can help generate first-order explanations, but fail to do so for second order.

What is Model Explanation?

But first-order explanation may seem shallow

Because a model has features does not mean it portrays its target has having these features (fictional aspect of modelling)

1. Second-order explanation needs an account of laws
2. But then, are models superfluous in explaining?

What is Model Explanation?

But first-order explanation may seem shallow

Because a model has features does not mean it portrays its target has having these features (fictional aspect of modelling)

1. Second-order explanation needs an account of laws
2. But then, are models superfluous in explaining?

Ontic and Epistemic Conceptions of Explanation

2 conceptions of explanation: Ontic and Epistemic. Assessing the EMC seems to support EC: if explanations are "full-bodied things" (Craver 2013), deliberate falsities cannot be explanatory

Examples: explanations as arguments, eikonic conception (Bokulich 2018), fiction-view (?), understanding-enabling epistemic product

Do proponents of OC really dismiss the use of explanatory texts?

> "When defenders of the ontic view write about explanations as if they are, 'out there', as they are, independently of what anyone knows or thinks about them, they are expressing realism about the appropriate referents of explanatory texts, not abandoning the idea that scientists use texts to express explanations."
>
> — (Craver 2019)

Ontic and Epistemic Conceptions of Explanation

2 conceptions of explanation: Ontic and Epistemic. Assessing the EMC seems to support EC: if explanations are "full-bodied things" (Craver 2013), deliberate falsities cannot be explanatory

Examples: explanations as arguments, eikonic conception (Bokulich 2018), fiction-view (?), understanding-enabling epistemic product

Do proponents of OC really dismiss the use of explanatory texts?

> "When defenders of the ontic view write about explanations as if they are, 'out there', as they are, independently of what anyone knows or thinks about them, they are expressing realism about the appropriate referents of explanatory texts, not abandoning the idea that scientists use texts to express explanations."
>
> — (Craver 2019)

Ontic and Epistemic Conceptions of Explanation

2 conceptions of explanation: Ontic and Epistemic. Assessing the EMC seems to support EC: if explanations are "full-bodied things" (Craver 2013), deliberate falsities cannot be explanatory

Examples: explanations as arguments, eikonic conception (Bokulich 2018), fiction-view (?), understanding-enabling epistemic product

Do proponents of OC really dismiss the use of explanatory texts?

> "When defenders of the ontic view write about explanations as if they are, 'out there', as they are, independently of what anyone knows or thinks about them, they are expressing realism about the appropriate referents of explanatory texts, not abandoning the idea that scientists use texts to express explanations."
>
> — (Craver 2019)

Ontic and Epistemic Conceptions of Explanation

2 conceptions of explanation: Ontic and Epistemic. Assessing the EMC seems to support EC: if explanations are "full-bodied things" (Craver 2013), deliberate falsities cannot be explanatory

Examples: explanations as arguments, eikonic conception (Bokulich 2018), fiction-view (?), understanding-enabling epistemic product

Do proponents of OC really dismiss the use of explanatory texts?

> "When defenders of the ontic view write about explanations as if they are, 'out there', as they are, independently of what anyone knows or thinks about them, they are expressing realism about the appropriate referents of explanatory texts, not abandoning the idea that scientists use texts to express explanations."
>
> — (Craver 2019)

Model-explanations vs. Explanatory Models

Models are not the explanations. They support explanations by providing the semantic apparatus needed to express them

The problem of idealised models then turns out to be a problem of semantic realism: what are the referents of models that misrepresent the ontology of their target?

In conclusion, only questions partially answered:

1. Can counterfactual patterns be considered as explanations in OC? Probably yes (Brandelet in press)
2. Relation Laws $\leftrightarrow$ Models of any help? Probably yes (to be continued)

Model-explanations vs. Explanatory Models

Models are not the explanations. They support explanations by providing the semantic apparatus needed to express them

The problem of idealised models then turns out to be a problem of semantic realism: what are the referents of models that misrepresent the ontology of their target?

In conclusion, only questions partially answered:

1. Can counterfactual patterns be considered as explanations in OC? Probably yes (Brandelet in press)
2. Relation Laws $\leftrightarrow$ Models of any help? Probably yes (to be continued)

Model-explanations vs. Explanatory Models

Models are not the explanations. They support explanations by providing the semantic apparatus needed to express them

The problem of idealised models then turns out to be a problem of semantic realism: what are the referents of models that misrepresent the ontology of their target?

In conclusion, only questions partially answered:

1. Can counterfactual patterns be considered as explanations in OC? Probably yes (Brandelet in press)
2. Relation Laws $\leftrightarrow$ Models of any help? Probably yes (to be continued)

Thank You For Your Attention!


Bokulich, Alisa (2016). "Fiction As a Vehicle for Truth: Moving Beyond the Ontic Conception". In: *The Monist* 99.3, pp. 260–279. DOI: 10.1093/monist/onw004.


— (Dec. 2018). "Representing and Explaining: The Eikonic Conception of Scientific Explanation". In: *Philosophy of Science* 85.5, pp. 793–805. DOI: 10.1086/699693.


Brandelet, Antoine (in press). "Can fiction and veritism go hand in hand?" In: *Zagadnienia Filozoficzne w Nauce (Philosophical Problems in Science)*.


Craver, Carl F. (Oct. 2013). "The Ontic Account of Scientific Explanation". In: *Explanation in the Special Sciences*. Springer Netherlands, pp. 27–52.


Craver, Carl F (Sept. 2019). "Idealization and the Ontic Conception: A Reply to Bokulich". In: *The Monist* 102.4, pp. 525–530. DOI: 10.1093/monist/onz023.


Nguyen, James (Nov. 2020). "Do fictions explain?" In: *Synthese* 199.1–2, pp. 3219–3244. ISSN: 1573-0964. DOI: 10.1007/s11229-020-02931-6.


Verreault-Julien, Philippe (Feb. 2019). "How could models possibly provide how-possibly explanations?" In: *Studies in History and Philosophy of Science Part A* 73, pp. 22–33. DOI: 10.1016/j.shpsa.2018.06.008.