

*Testing Philosophical Theories Against the History of Science*  
Oulu, Finland/ September 21 & 22, 2015

# Theory choice & Incommensurability in the reconstruction of scientific episodes

## The case of Heterogenesis and Biogenesis

Maria del Rosario Martinez-Ordaz

Luis Estrada-Gonzalez

UNAM-Mexico

This work has been supported by the PAPIIT project IA401015 “After Consequences. A Universalist View of Logic (I)”.

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## Inconsistency and theory choice in the reconstruction of scientific episodes

María del Rosario Martínez-Ordaz and Luis Estrada-González

D. Trump



## Inconsistency and theory choice in the reconstruction of scientific episodes

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Our main concern...  
Under what circumstances is one  
reconstruction **‘better’**  
than another?  
[How can we tell?]

## **Our plan:**

- (1) History + Philosophy of Science: what for?
- (2) A methodological concern
- (3) Reinforcement evaluation: an alternative
- (4) On evaluating reinforcement:  
**Spontaneous Generation vs Biogenesis**
- (5) Conclusions

(1)

History and Philosophy of Sc.  
What for?

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*“Philosophy of science  
without history of  
science is empty;  
history of science  
without philosophy of  
science is blind.”*

*“History of science and its rational reconstructions”, 1970.*

Imre  
Lakatos

How the historiography of  
science should learn from  
the philosophy of science  
and *vice versa*?

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Theory choice & inconsistency  
in the **reconstruction of scientific episodes**

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## Inconsistency and theory choice in the reconstruction of scientific episodes

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What is a rational  
reconstruction?  
How do we get them?  
Why do we want  
them?





## Inconsistency and theory choice in the reconstruction of scientific episodes

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- **Rational reconstruction** aims at providing a rational explanation of the growth of *objective knowledge*.  
[*Rational* explanation of why certain facts were the case in the History of Sc.]

- Any rational reconstruction of history needs to be supplemented by an empirical (socio-psychological) ‘external history’.

Imre  
Lakatos

“History of science and its rational reconstructions”, 1970.

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Imre  
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“History of science and its rational reconstructions”, 1970.

# Good Reconstructions

- **Epistemic values**

[Accuracy, fruitfulness, wideness of scope, parsimony, consistency, simplicity]

+

- **Methodological virtues**

[historical relevance for the joint propositions, historical accuracy, etc]

Thomas  
Nickles

What do we want historical  
information for?

**Not only to falsify philosophical theses**

Historical information can help us  
to figure out how to proceed when  
identifying problems and solutions for them

What do we want historical  
information for?

***MAXIMIZING  
orientation***

What can our  
reconstructions tell us about Sc?  
Can a particular episode  
be reconstructed *fruitfully* in more than one way?

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# History and Philosophy of Sc. What could go wrong?

(2)



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Thomas  
Nickles

How to be sure that our  
philosophical  
considerations about science  
are not only the result of  
**accidental historical generalizations?**



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There is no marriage between  
History and Philosophy of Science

**The issue is not the role of history  
of science for philosophy of science,  
but the nature of philosophical analysis**

Jutta  
Schickor

Philosophical analysis is akin  
to the practice of other humanities,  
**Philosophy is an interpretation of,  
an attempt to understand science**

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# Zombi apocalypse

\*Philosophy of science tends to employ empirical data in order to support particular philosophical theses, instead of trying to use them as an orientation to build more accurate descriptions and explanations for the actual scientific phenomena.

\*It seems like the bridge between them is so diffuse and narrow that prevents us from sharply transmitting information from one side to the other.

# Apocalypse

Zombi

\*If all these criticisms are right, philosophers of science seldom tell us things about actual science, and history is not filling up philosophy, as it was expected to happen.

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# Why?

Pragmatic benefits  
for scientific  
understanding

Do we tolerate the  
non-satisfaction  
of epistemic  
values?

[“MAXIMIZING orientation”]

If

A reconstruction of scientific episodes has the main purpose of increasing our knowledge



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Can a particular episode  
be reconstructed *fruitfully* in more  
than one way?

What do we expect from our  
reconstructions?

[About what?]

***MAXIMIZING  
orientation***



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[About what?]

# Increase my knowledge then!



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Testing *philosophical theses*  
against the history of Sc

Can a particular episode  
be reconstructed *fruitfully* in more  
than one way?

[About what?]

**MAXIMIZING**  
*orientation*

But, is that all?

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[About what?]

**MAXIMIZING**  
*orientation*

Testing *philosophical theses*  
against the history of Sc

*\*Understanding*

*\*Describing*  
*in a more*  
*accurate way*

*\*Figure out new ones*

**Inconsistency and theory choice in the reconstruction of scientific episodes**

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[How can we tell?]

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# Reinforcement



# Reinforcement

**Strong reinforcement** could be achieved when, given a philosophical thesis (T) and a specific relevant historical reconstruction (H'), H' provides a “rationale” for (a great part of) T.

**Weak reinforcement** will be available if, given a philosophical thesis (T) a specific relevant historical reconstruction (H'), H' supports the basic assumptions of T, or helps to a better understanding of T, or illustrates mechanisms relevant for the understanding of T, or clarifies some of the concepts of the theory and their applications.

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(4)

CASE STUDY

# Spontaneous Generation

VS

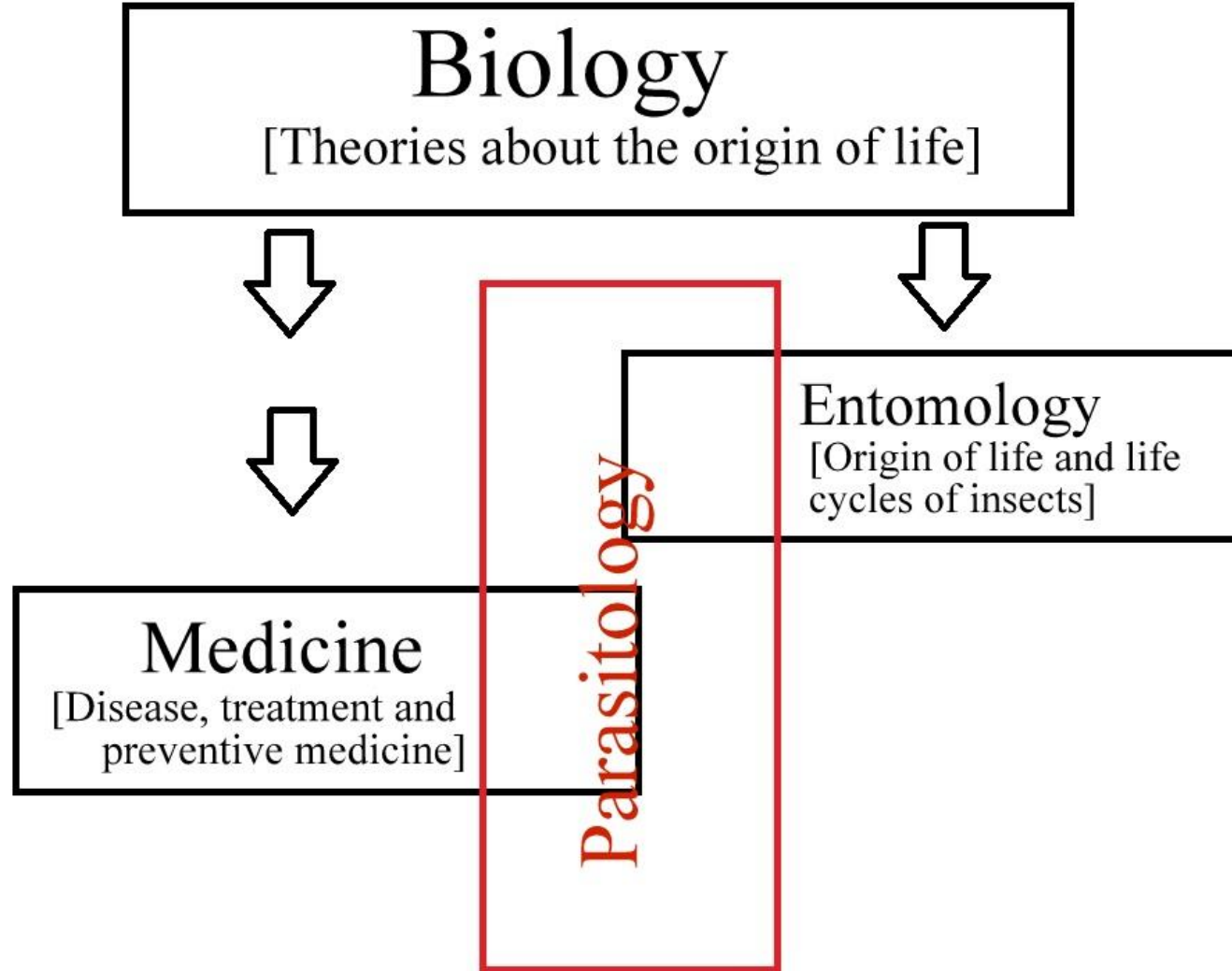
# Biogenesis

[1700-1860]

Abiogenesis or **Heterogenesis** (Organic matter is capable of generating new organisms. In cases where the organic matter was dead, infusoria and fungi were thought to be generated.)

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# Parasitic worms

Vallisneri (1661-1730): **Insects  
come from insects**

Studied some parasites as worms *ascaris*

**but parasites were implanted by God in Eve's ovaries**

**Carl Linnaeus** (1707-1778): listed lumbricius, ascaris, taenia and 25 species of intestinal parasites

# Theories of Disease

- \***Ontological** (the source of disease came from outside the body, chemical, filth and dirt)
- \***Physiological** (disease stemmed from a state of being)
- \***Contagionist** (diseases act the same way in every afflicted individual, the source was the same chemical or biological specimen)

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Cold water

Giovanni Maria  
Lancisio (1654-  
1720)

**Inanimate agents of  
infection**

**Vallisneri:** Insects come from insects  
all insects are generated from their proper parents

**Carlo Francesco Cogrossi**

(1682-1769):

*Itch mite* → Scabies

(Skin-dwelling worms)

Central Asia // Turkey

**The habit of bathing, which does not allow these  
worms to establish themselves on the skin**

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# Parasitic worms

**Daniel Lysons** (1762–1834)

purgatives [humoral theory]

**John Arbuthnot** (1667-1735) & **George Armstrong** (1719-1789)  
eggs were ingested

**William Black** (1749-1829)  
evil humors to develop against nature,  
caused imbalance of natural humors

Symptoms: Nausea, indigestion, vomiting, acidity, flatulence, lack of appetite, diarrhea, colored stool, skin eruption, pustules, disturbed sleep and rapid pulse.

**1780 the Royal Academy of Science in Copenhagen**  
**PRIZE ESSAY ON THE SUBJECT OF**  
**THE ORIGIN OF PARASITIC WORMS**

**BLOCH & GOEZE**  
**Spontaneous Generation!**

(Farley 1972)



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(4)

On reconstructing  
**CASE STUDY**

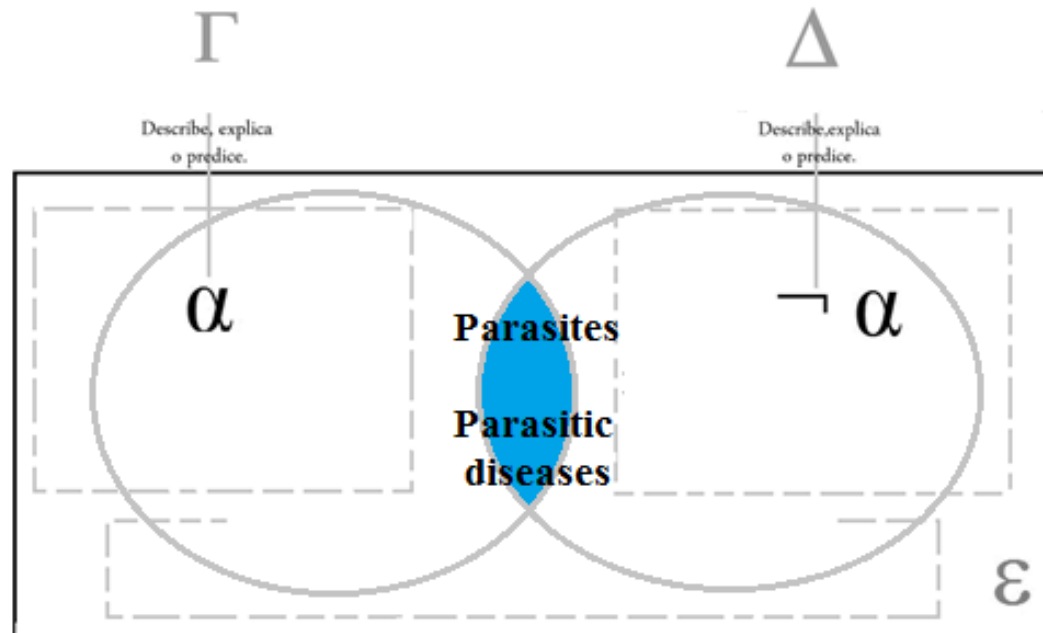
On reconstructing the case study

**Farley & non-epistemic *values* (1972)**

Importance of experiments  
French Academy of Sciences

# On reconstructing the case study

## *Luis Estrada* and Inconsistency toleration



On reconstructing the case study

# Lakatos and *research programs*

Positive and negative heuristics

Program  $X$  progresses or  
degenerates [or one is overtaking  
another]



On reconstructing the case study

# Farley & non-epistemic *values*

Connections historically non-relevant  
Weird conclusions (conspiracy theory  
against Pouchet (Galvez 1988))

Not all the necessary historical information  
(other debates, other essay prices, etc)

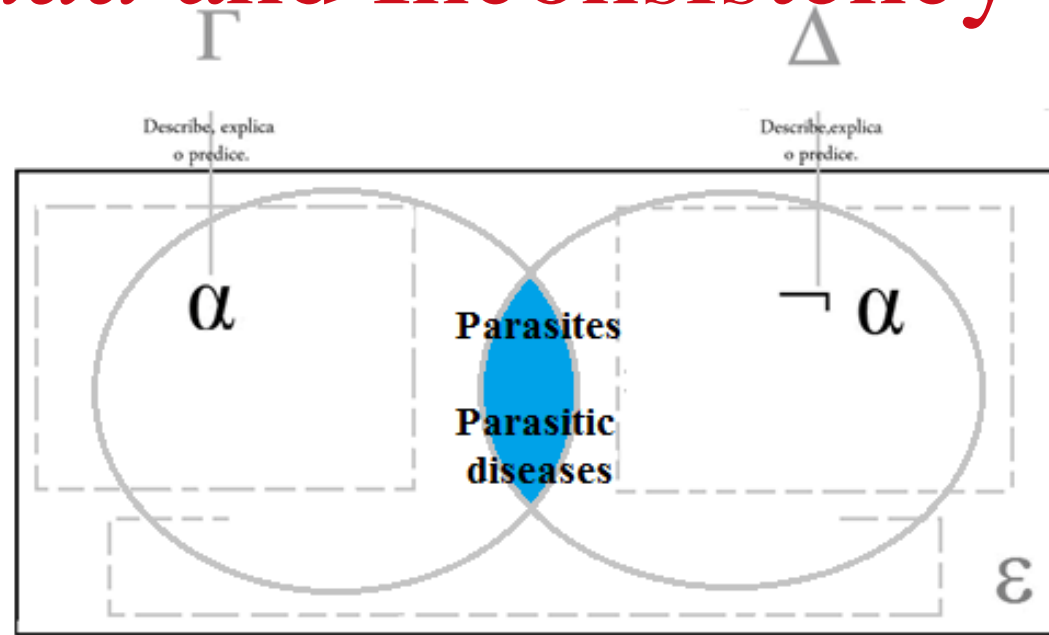
Etc.

**Your reconstruction made Trump cry**



## On reconstructing the case study

# *Luis Estrada and Inconsistency toleration*



Might not be the historians' favorite

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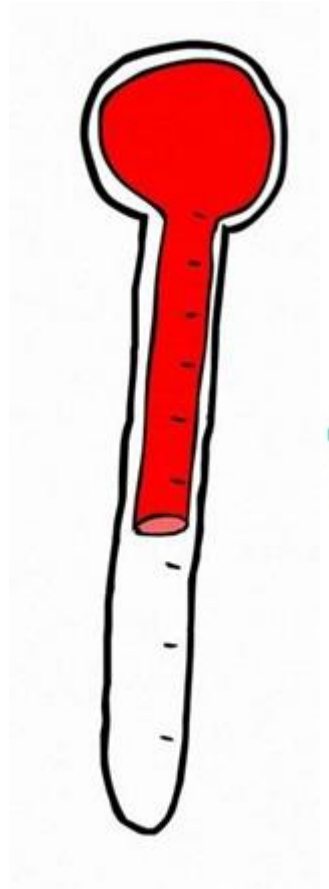
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## *Luis Estrada and Inconsistency toleration*

*Nada de nada:*

## Farley & external factors



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# (5) Conclusions



Under what circumstances  
is one reconstruction

**‘better’**

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[How can we tell?]



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*\*Understanding*

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in a more  
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Reinforcement

## Inconsistency and theory choice in the reconstruction of scientific episodes

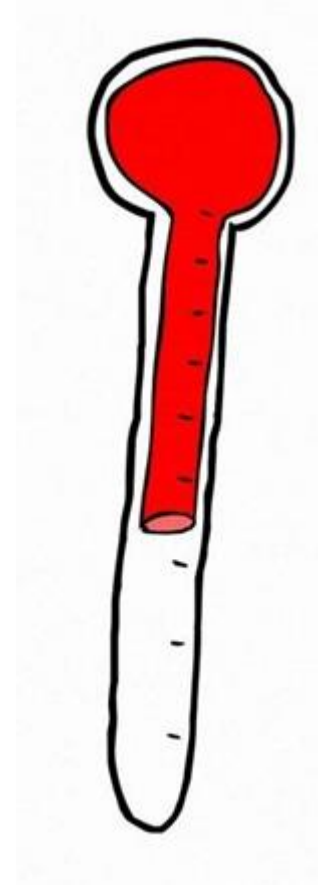
María del Rosario Martínez-Ordaz and Luis Estrada-González

# Reinforcement

**Strong reinforcement**

**Weak reinforcement**

*Nada de nada*



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This case study shows how very different reconstructions of a particular scientific episode can help us to increase our knowledge about science.

\*Inconsistency toleration one: give us a picture [perhaps historically less accurate] that illustrates an intertheoretic inconsistency thesis.

\*Lakatosian one give us a picture of scientific growth and theory choice [led by specific epistemic values in which historical accuracy plays a major role].

Nonetheless, although each scores better in different sets of values, and perhaps because of that, both reconstructions ***increase our knowledge about science in general.***

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