Inconsistencies and theory observation & the limits of *Chunk&Permeate*

3rd Philosophy Graduate Conference

UNAM-Mexico City . February 2017

María del Rosario Martínez-Ordaz

martinezordazm@gmail.com

UNAM-Mexico

This work has been supported by the PAPIIT project IA401015 “After Consequences. A Universalist View of Logic (I) and by the PAPIIT project IA401117 “Philosophical aspects of contraclassical logics”.

This work was supported also by the PAPIIT project IN400514 “Logics of Discovery, Heuristic and Creativity in the Sciences”.

I am grateful to Elisángela Ramírez-Cámara for providing me valuable suggestions and objections to this paper.

I am greatly indebted to Luis Estrada-González, Michele Friend and Moisés Macías-Bustos for valuable comments on each of the previous versions of this work

Inconsistencies and theory observation & the limits of *Chunk&Permeate*

3rd Philosophy Graduate Conference

UNAM-Mexico City . February 2017

María del Rosario Martínez-Ordaz

martinezordazm@gmail.com

UNAM-Mexico

This work has been supported by the PAPIIT project IA401015 “After Consequences. A Universalist View of Logic (I) and by the PAPIIT project IA401117 “Philosophical aspects of contraclassical logics”.

This work was supported also by the PAPIIT project IN400514 “Logics of Discovery, Heuristic and Creativity in the Sciences”.

The aim for this talk is

- To point out at a particular limitation of *Chunk and Permeate* when describing inconsistencies in which observational independence is not present.

- To illuminate what could be some of the elements and requisites that a (paraconsistent) strategy should satisfy if one wants to give an account of some inconsistencies that might not be rare in empirical sciences at all.

The aim for this talk is

- To point out at a particular limitation of *Chunk and Permeate* when describing inconsistencies in which observational independence is not present.

- To illuminate what could be some of the elements and requisites that a (paraconsistent) strategy should satisfy if one wants to give an account of inconsistencies from empirical sciences.

In order to do so, the plan goes as follows:

[1] C&P
[2] Case study

[3] Limits of C&P
[4] On what is needed

C&P

Inconsistent reasoning

is something really weird

[a]ccording to the classical consistency presupposition, contradiction have an explosive character: <u>wherever they are present in a theory, anything goes, and no sensible reasoning can thus take place</u>

[Marcos 2005; xv]

According to Principle of Explosion, contradictions are malicious creatures:

$$\text{(PE)}\ \forall\alpha\forall\beta\left(\alpha,\neg\alpha\models\beta\right)$$

Whenever they are present in a theory, anything goes, any statement is equally derivable

[Marcos 2005: 211]

It could seem problematic, but…

there are some stories that we cannot ignore

Aristotle's Theory of Motion
Bohr's theory of the Atom
Classical Electrodynamics
Classical Mechanics (T-O)
Early Calculus
Kirchoff's Theory of Diffraction
Newtonian Cosmology

It has been suggested that:

If **science is inconsistent,**

formal strategies

could give a good explanation about how scientists could have reasoned from or with inconsistencies

(in both formal and empirical sciences)

Formal strategies are

specific technical procedures that help to achieve particular goals.

Strategies often substantiate the general dynamics of certain logics (however they are, most of the time, also logic-independent).

A formal strategy is successful when it entails, along with appropriate initial and boundary conditions, a solution for a target problem (or a way to avoid it).

C&P is a (mainly) paraconsistent reasoning **strategy** that has been used by its main authors to illustrate particular case studies of inconsistent science.

It is expected to be considered as a serious candidate for wider application.

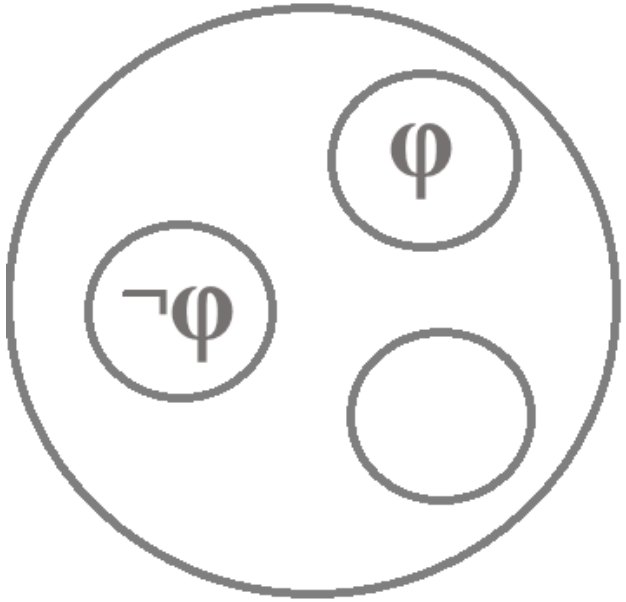
When dealing with inconsistencies

the main goal of C&P is to avoid the explosion of an inconsistent theory.

C&P assumes that explosion could be avoided even if a theory looks globally inconsistent. The secret for doing so, is to locally preserve consistency and never having contradictory propositions actually together.

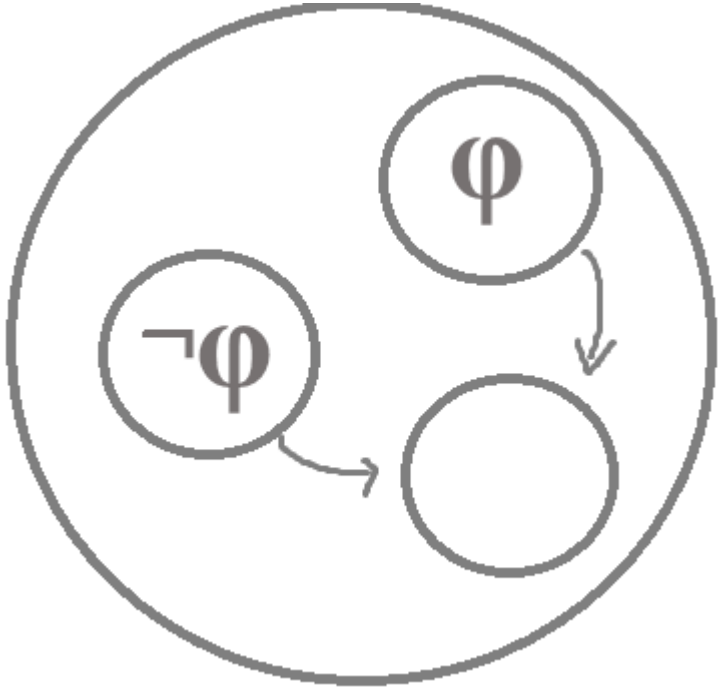
Initial & boundary conditions of C&P

*A given set of sentences separated into consistent fragments (henceforth, *chunks*)



Initial & boundary conditions of C&P

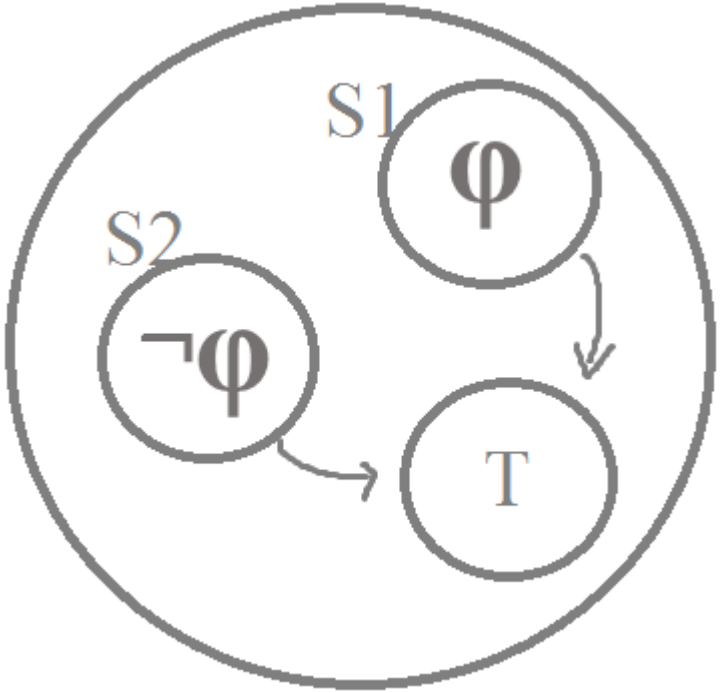
*Specific relations that allow particular information to flow between these chunks (henceforth, *permeability relations)*



Initial & boundary conditions of C&P

* There are two types of chunks:

Source and Target



Initial & boundary conditions of C&P

*A given set of sentences separated into consistent fragments (henceforth, *chunks*)

*Specific relations that allow particular information to flow between these chunks (henceforth, *permeability relations)*

Only a specific amount of information is allowed to move from one chunk to another, this mechanism is what generates the semi-permeability of the chunks.

Chunks are separated from each other by membranes that are permeable to sentences of some kind but not to sentences of any kind.

Not validate the (unrestricted) conjunction of propositions.

So, even when (globally) having contradictory propositions, **contradictions cannot arise**; each chunk remains all time consistent.

Even though the general set of sentences can look inconsistent.

Initial & boundary conditions of C&P

*A given set of sentences separated into consistent fragments (henceforth, *chunks*)

*Specific relations that allow particular information to flow between these chunks (henceforth, *permeability relations)*

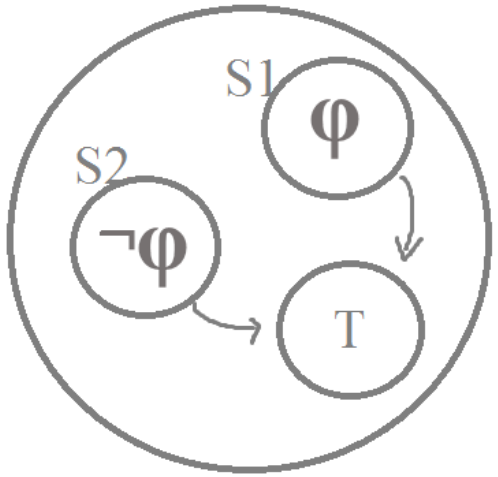
Only a specific amount of information is allowed to move from one chunk to another, this mechanism is what generates the semi-permeability of the chunks.

Chunks are separated from each other by membranes that are permeable to sentences **of some kind but not to sentences of any kind**.

Initial & boundary conditions of C&P

GIC$_{C\&P}$:

Given two source chunks, *S*1 and *S*2, and a target chunk, *T*, the boundaries between *S*1, *S*2 and *T* have also to be clearly distinguishable, as well as the permeability relation between *S*1 and *T*, and between *S*2 and *T*.



Initial & boundary conditions of C&P

However, GICC&P assumes two main types of independence requirements:

Initial & boundary conditions of C&P

Independent boundaries requirement:
Given two different sets of information, S1 and S2, the limits of each chunk have to be clear, even if some of the propositions that are contained in the first chunk are also contained in the second one.

Independent permeability relations requirement:
For any chunk to be eligible for being a target chunk, the direction of the flux of information has to be independently determined for each chunk, i.e., the permeability relation of each chunk does not underlie the permeability relation of any other chunk.

Initial & boundary conditions of C&P

Independent permeability relations requirement:

For any chunk to be eligible for being a target chunk, the direction of the flux of information has to be independently determined for each chunk, i.e., the permeability relation of each chunk does not underlie the permeability relation of any other chunk.

It seems that this $GIC_{C\&P}$ will be satisfied if and only if

it is possible for scientists (and logicians) to identify satisfactorily the components of the inconsistency and to separate them in different fragments in such a way that the inconsistency can somehow be dispensed or avoided.

Case Study

Inconsistency theory-observation :

An empirical theory Γ, that has an observational consequence **φ**;

and a (trustworthy) experimental outcome that states ¬ **φ**.

This type of inconsistency is generally tagged under the term *anomaly*

At the beginning, we had very little information about solar neutrinos.

The only things we knew were

Neutrinos were introduced in 1930 by Pauli as hypothetical particles that **were necessary to account for the reactions that later would be known as ‘β-decay’** (Pinch 1986; 50).

In 1933, Fermi named these particles ‘neutrinos’, building the first theory of β-decay based on their existence (Bilenky 2012).

The only things we knew were

Neutrinos were introduced in 1930 by Pauli as hypothetical particles that **were necessary to account for the reactions that later would be known as 'β-decay'** (Pinch 1986; 50).

In 1933, Fermi named these particles 'neutrinos', building the first theory of β-decay based on their existence (Bilenky 2012).

In the Sun, neutrinos are produced by weak interactions that occur during nuclear fusion.

The only things we knew were

Neutrinos were introduced in 1930 by Pauli as hypothetical particles that **were necessary to account for the reactions that later would be known as 'β-decay'** (Pinch 1986; 50).

In 1933, Fermi named these particles 'neutrinos', building the first theory of β-decay based on their existence (Bilenky 2012).

In the Sun, neutrinos are produced by weak interactions that occur during nuclear fusion

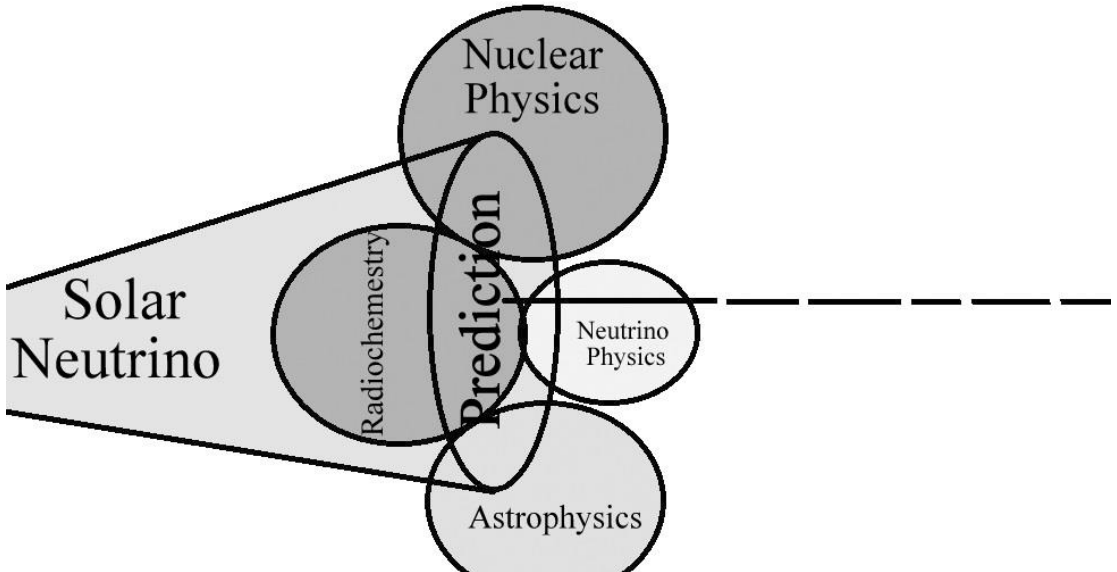
Neutrinos could be produced on Earth by natural radioactivity, by nuclear reactors, and by high-energy accelerators.

So, in order to test some hypotheses about the existence and particular properties of neutrinos, two things were developed:

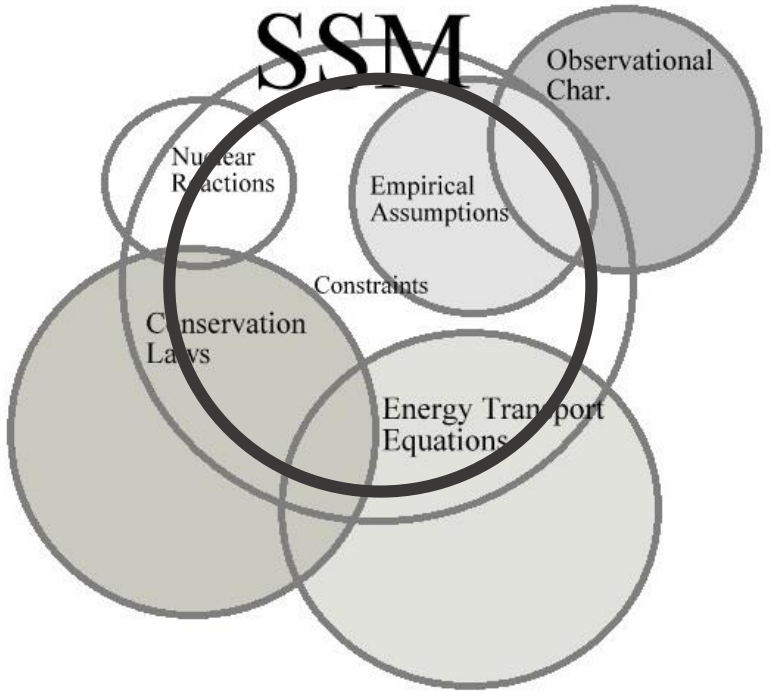
SSM Experiment

What is the Standard Solar Model?

Mathematical model that combines:



What is the Standard Solar Model?



Particle physics and standard cosmology

*Conservation laws and energy transport equations of physics.

*Sun's observable characteristics [observed radius and luminosity].

*Assumptions on the (steady) state of the Sun.

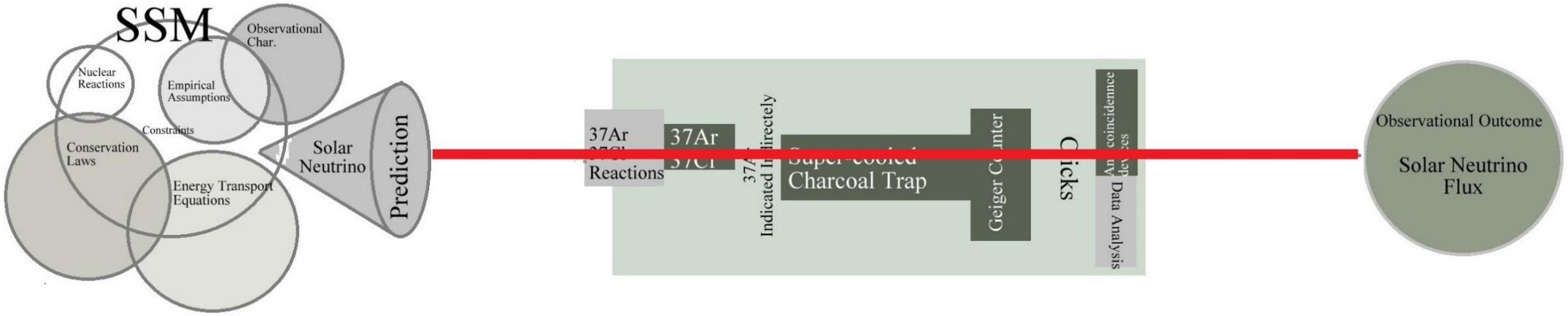
*Assumptions about the age and composition of the Sun.

…

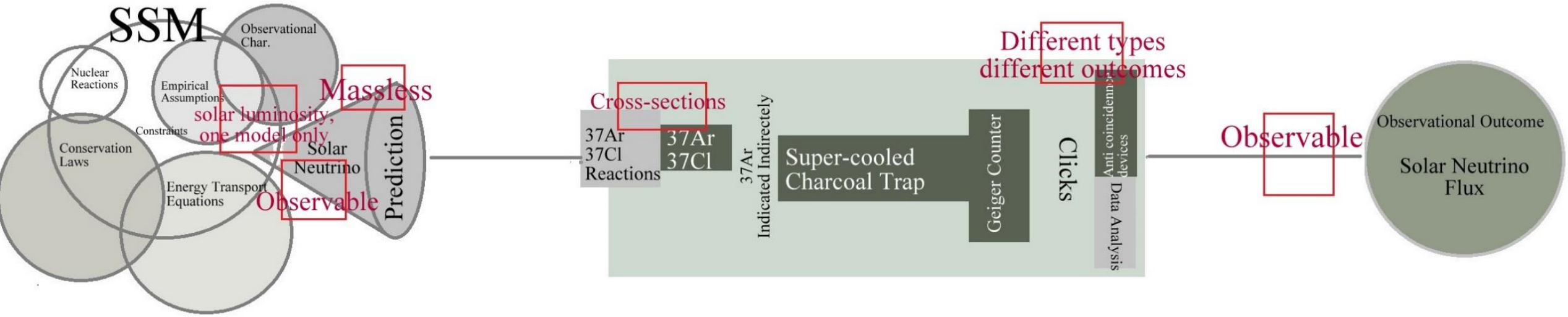
So, in order to test some hypotheses about the existence and particular properties of neutrinos, two things were developed:

SSM Experiment

the experiment for measuring the Solar Neutrino Flux?



the experiment for measuring the Solar Neutrino Flux ?



Were scientists able to know which part of the theory to trust?,

Was any agreement about where the problem was originated?

Was it seen as an inconsistency?,

Was the SSM still used?

What the hell was happening?

A possible explanation for all this confusion appeals to considerations related to observation

(Hacking, 1996; 214)

“something counts as observation more than as an inference when (…) the group of theories in which lays are not linked with the facts about the subject of study”

(Hacking, 1996; 214)

Observational Independence Condition:

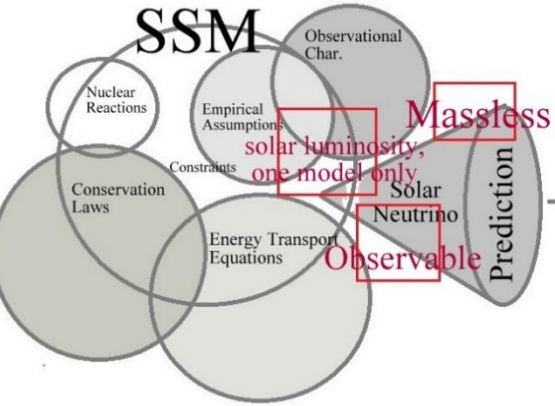
The set of propositions that underlie the design of instruments and methods used to evaluate the observational consequences of a particular theory, ideally, are achieved in a totally different way (or mostly) of the propositions that are used to define the theory in question.

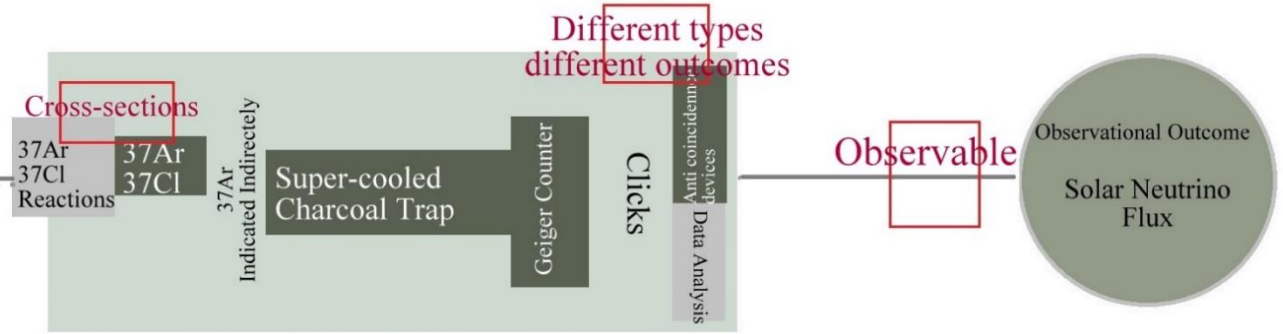
“something counts as observation more than as an inference when (…) the group of theories in which lays are not linked with the facts about the subject of study”

(Hacking, 1996; 214)

Observational Independence Condition:

The set of propositions that underlie the design of instruments and methods used to evaluate the observational consequences of a particular theory, ideally, are achieved in a totally (or mostly) different way of the propositions that are used to define the theory in question.





1960-1970

Standard Solar Model (SSM)

Measuring Solar Neutrino's flux

John Bahcall&Ray Davis' Experiment

Prediction _ Observational outcome:
+ 60% diff.

Scientists kept the theory in use and they continued experimenting with the solar neutrinos phenomena, as the reports from the Kamiokande, the SAGE, the GALLEX, and SuperKamiokande could show.

Do you remember that

C&P it is expected to be considered as a serious candidate for wider application?

The anomaly in the measuring of the solar neutrinos' flux

seems like a good candidate for being modeled by a paraconsistent strategy.

Limits

Do you remember?

Observational Independence Condition

$GIC_{C\&P}$

This condition stipulates that, as far as possible, "something counts as observation more than as an inference when (…) the group of theories in which lies are not linked with the facts about the subject of study" (Hacking, 1996; 214) .

Observational Independence Condition

It seems that this $GIC_{C\&P}$ will be satisfied if and only if, it is possible for scientists (and logicians) to identify satisfactorily the components of the inconsistency and to separate them in different fragments in such a way that the inconsistency can somehow be dispensed or avoided.

$GIC_{C\&P}$

This condition stipulates that, as far as possible, "something counts as observation more than as an inference when (…) the group of theories in which lies are not linked with the facts about the subject of study" (Hacking, 1996; 214) .

Observational Independence Condition

It seems that this $GIC_{C\&P}$ will be satisfied if and only if, it is possible for scientists (and logicians) to identify satisfactorily the components of the inconsistency and to separate them in different fragments in such a way that the inconsistency can somehow be dispensed or avoided.

$GIC_{C\&P}$

Observational Independence Condition

$GIC_{C\&P}$

are way very similar

The similarities between

Observational Independence Condition

$GIC_{C\&P}$

suggest that if OIC cannot be fulfilled, $GIC_{C\&P}$ will fail as well

- If C&P aims at modeling inconsistent information by separating it into fragments, where the division prevents contradictions to be formed and the problem to reemerge,
- If the anomaly regarding the measuring of SNF is the case,

then…

- **Even if a division could be provided, it will be of no use for avoiding contradictions to be formed and explosion to take place.**

- If C&P aims at modeling inconsistent information by separating it into fragments, where the division prevents contradictions to be formed and the problem to reemerge,
- If the anomaly regarding the measuring of SNF is the case.

then…

- **Even if a division could be provided, it will be of no use for avoiding contradictions to be formed and explosion to take place.**

The scientists' lack of understanding of the elements involved in the inconsistency was what prevented the problem to be solved for long time.

A deep understanding of the inconsistency is needed for proposing satisfactory partitions.

- **However, it could be not necessarily irretrievable that C&P cannot give account for some inconsistencies from empirical sciences**.

- On the contrary, I believe the other applications of the strategy (Brown and Priest 2015, Benham *et al* 2014) are indeed very successful; however, I wanted to present a scenario where the current limitations of C&P could be easily distinguished, in order to make it clear that many more can be explored regarding basic requisites of C&P and inconsistencies between theory and observation.

On What is Needed

What I understand to be the moral of the case study presented here is that if a paraconsistent reasoning strategy such as C&P aims at modeling scientific reasoning when dealing with inconsistencies from empirical sciences

the most important requirement that it should meet is the capability of the strategy for ***allowing for realistic reconstruction of natural reasoning in inconsistent contexts.***

Any paraconsistent strategy should portrait the use of the most natural information-transmitting inferences into, at least, conditional operations (Meheus 2002).

How can we do so?

Given any particular case of alleged inconsistent (scientific) reasoning, the strategy could model them satisfactorily.

No a priori restrictions about how can we recognize which are the legitimate objects to be modeled by specific paraconsistent strategies

Given any particular case of alleged inconsistent (scientific) reasoning, the strategy could model them satisfactorily.

No a priori restrictions about how can we recognize which are the legitimate objects to be modeled by specific paraconsistent strategies

Generality

It seems that in order to sensibly model scientific reasoning, logicians and philosophers of science should allow the (history of) science to determine which are the relevant patterns to be portrayed in each particular case

It seems that in order to sensibly model scientific reasoning, logicians and philosophers of science should allow the (history of) science to determine which are the relevant patterns to be portrayed in each particular case

Fredom

A paraconsistent strategy that aims at realistically modeling scientific reasoning instances it should portrait not only how explosion could be avoided, but also some of the dynamics that allowed scientists to construct the ‘final model’, and to do this it could be useful to incorporate some flexibility regarding the information-transmitting processes and structures.

A paraconsistent strategy that aims at realistically modeling scientific reasoning instances it should portrait not only how explosion could be avoided, but also some of the dynamics that allowed scientists to construct the ‘final model’, and to do this it could be useful to incorporate some flexibility regarding the information-transmitting processes and structures.

Flexibility

Any paraconsistent strategy should portrait the use of the most natural information-transmitting inferences into, at least, conditional operations (Meheus 2002).

- Generality,
- Freedom,
- Flexibility relative to the information-transmitting processes and structures

Inconsistencies and theory observation & the limits of *Chunk&Permeate*

3rd Philosophy Graduate Conference

UNAM-Mexico City . February 2017

María del Rosario Martínez-Ordaz

martinezordazm@gmail.com

UNAM-Mexico

This work has been supported by the PAPIIT project IA401015 “After Consequences. A Universalist View of Logic (I) and by the PAPIIT project IA401117 “Philosophical aspects of contraclassical logics”.

This work was supported also by the PAPIIT project IN400514 “Logics of Discovery, Heuristic and Creativity in the Sciences”.