

# Mid Sem 2 (assisted self help)

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**Covering Law model = DN Model** is deductive nomological model (nomological means referring to laws)

The explanandum can be deduced from the explanans (given laws, background info, and initial conditions)

1. Explanans: deductively **entail** the explanandum
2. Deduction must make *essential* use of the **law**
3. Explanans must have empirical content (**testable**)
4. Explanans must be **true** (to avoid appealing to false propositions like salt dissolves in water because all substances dissolve in water)

Hidden Structure problem and resolution

1. The impact of my knee on the desk caused the tipping over of the inkwell

This doesn't have any apparent DN structure, but still it's explained.

Defense: structure exists, but isn't quite visible

[that you structure it something like a law which uses some initial conditions and then a triggering condition and deduct the outcome]

Drawbacks

## 1 Irrelevance

All metals conduct electricity

Whatever conducts electricity is subject to gravity

Therefore all metals are subject to gravity

## 2. Pre-emption

An event that was going to happen for some reason, happens earlier for a different reason

Everyone who eats a pound of arsenic dies within 24 hours

Marge ate a pound of arsenic

Therefore Marge died within 24 hours

Marge died because of an accident

## 3. Over determination

more than one set of causal conditions are in place, but each is sufficient

All people who do not have sex do not become pregnant (assuming no bio awesomeness)

Nick (who's a man) didn't have sex

Therefore, Nick didn't become pregnant

## 4. Symmetry

There's a building that's casting a shadow. The length of the shadow, can be explained using the building.

## 5. Prediction and Explanation

Prediction become explanations after occurrence of the prediction. For example, Newton's laws were used to predict Halley's comet in December of 1758, and once it was observed, the same laws became an explanation

Fall of a barometer needle, can allow us to predict storms. But the falling of the needle, doesn't explain the storm.

Evolutionary theory can only explain why things are the way they are, but can't quite predict.

Probabilistic explanations also can't exist

## Inductive Statistical Model

Inductive Statistical model assumed that in cases of probabilistic explanations, the law plus auxiliary conditions makes the the explanandum very likely

Law: Prob (O/F) is high

Conditions: F

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Explanandum

(Relation is not deductive, but inductive)

Draw Backs

Probabilistic co-relation but not an explanation: fall the of barometer needle is highly co-related but doesn't explain the storm

Low probability events which occur, can't be explained

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## Distinction between laws and regularities

1. All gold spheres, have a diameter less than 100 miles
2. All Uranium spheres, have a diameter less than 100 miles



The first is is accidentally true, meaning it could've been true, if somebody really wanted to make it.

However, the second, can't exist because its mass will be greater than that of the the critical mass. So it'll spontaneously (and catastrophically) disintegrate

Counterfactual:

It's not about what did happen, but what would have happened in a possible but not actual (counter-to fact) situation)

For instance, 'The chalk will break, if I drop it from a height h.'

Laws support counterfactuals

## SR (Statistical Relevance) Model

Specific Case, (easy to understand)

A is a class

C is some subset

B is an attribute

(Think of the following example:

A the set of all men,

C is set of all people who take birth control pills,

B is getting pregnant)

C is relevant if and only if

$P(B | A.C) \neq P(B | A)$

The Generic Case

1. Homogeneous partitioning
  - a. Partitions of A into subsets  $C_i$  such that they are mutually exclusive and exhaustive to A

- b. Where  $P(B|A.C_i)$  not equal to  $P(B|A.C_j)$  where  $i$  isn't equal to  $j$
  - c. There aren't any additional attributes which are statistically relevant (by the previous definition of being relevant) viz.  
No  $D_k$  exist such that  
 $P(B|A.C_i)$  not equal to  $P(B|A.C_i.D_k)$
2. SR model, explains why some member  $x$  of the class characterized by an attribute  $A$  has attribute  $B$ , consists of the following information
- a. Prior probability of  $B$  given  $A$  :  $P(B|A) = p$
  - b. If homogenous partitioning wrt  $B$  (partitioning depends on  $B$ , like birth control pills for  $B$  being pregnancy) is given by  $C_i$   
then,  
 $P(B|A.C_i) = p_i$
  - c. The specific  $C_i$  s.t.  $x$  belongs to  $C_i$
3. Look at the example from the presentation

[[  
why  $x$  who has a strep infection  $=S$ , recovers quickly  $= Q$ .

Let

$T(-T)$  according to whether  $x$  is (is not) treated with penicillin

$R(-R)$  = according to whether the subject has a penicillin-resistant strain.

Assume for the sake of argument that no other factors are relevant to quick recovery.

There are four possible combinations of these properties:

$T.R, -T.R, T.-R, -T.-R$

but let us assume that ,

$$P(Q|S.T.R) = P(Q|S.-T.R) = P(Q|S.-T.-R) = P(Q|S. T.-R).$$

That is, the probability of quick recovery, given that one has strep, is the same for those who have the resistant strain regardless of whether or not they are treated and also the same for those who have not been treated.

By contrast, the probability of recovery is different (presumably greater) among those with strep who have been treated and do not have the resistant strain.

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SR Model: How it's different

- 1. Explanation isn't an argument
- 2. It's just an assembly of statistically relevant information
- 3. Distinguishes between arguments and explanation:
  - a. Irrelevancies [are] harmless in arguments but fatal in explanations
  - b. Good arguments are based on different criterion than good explanations
- 4. IS can't explain low probability events, SR actually can

Drawbacks

- 1. Can't do homogenous partitioning at all times: All factors aren't known, and overlaps aren't clear
  - a. Bio science
  - b. Teenage delinquencies

### Causal Mechanical Model

*Causal Process* is a physical process, viz. a process that is capable of transmitting a mark over space time

*pseudo processes* are those in which the mark is not continuously transmitted like a distortion in the shadow

*Mark*: some local modification to the structure of a process

*Mark Transmission*: A causal process is capable of transmitting a mark if, once the mark is introduced at one spatio-

temporal location, it will persist to other spatio-temporal locations, even in the absence of any further interaction

*Counterfactuals:*

1. If the causal process was marked appropriately, it would've carried it
- ? 2. [a little bit I couldn't understand, sounds like non-sense right now]

*Causal interaction:*

Involves a spatio temporal intersection between two causal processes which modify the structure of both. Each process comes to have features it wouldn't have had in the absence of the occurrence of the interaction.

Eg. Accident of two cars is a causal interaction.

Etiological aspect (Etiology is a study of causes)

An explanation of some event E will trace the causal process and interactions leading up to E.

? Constitutive aspect of explanation (not clear)

Drawbacks:

1. It's hard to see how momentum conservation comes in the picture
2. Birth control pill example is still ambiguous [seems like asking if the swallowing of the pill was a causal process or not will give the explanation]
3. CM model and complex systems:
  - a. Newtonian gravity is not an explanation according to this
  - b. Boyle's law is not explanatory
  - c. Thermodynamics (all of it, without kinetics) is not explanatory  
Interaction of  $10^{23}$  particles isn't a child's play
  - d. Statistical Mechanics: Looks at macroscopic picture from a derivation of microscopic distribution
  - e. Economics, upward shift in supply demand curve
  - f. Level of description (abstraction, like physics and chemistry and biology)

## LAWS OF NATURE

Law vs. Generalizations

[support for counterfactuals]

Law vs. Statement of Law

1. It can exist without the linguistic statement of the same existing
2. Statement of the law is a human creation, laws aren't

Minimalistic viewpoint: Laws are just regularities

This is an expression of empiricism (which means every concept should be explicable in terms that relate to our experiences)

### SRT: [Simple Regularity Theory]

1. It's a law that Fs are Gs if and only if all Fs are Gs

Regularity that aren't laws:

1. Uranium and gold example: can't distinguish between laws and co-incidents [another example is Bode's non-law, showing exceptional uniformity in nature by coincidence]
2. There exist laws that have no instances: In logic, all empty generalizations are regarded as trivially true, but they're not all laws (intuitively speaking)
3. "gappy laws"
4. Counterfactual recognition: for laws are supported by counterfactual

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## **Systematic Account**

A regularity is a law of nature iff it appears as a theorem or axiom in that true deductive system, which achieves a best combination of simplicity and strength.

Example, QM and nature of Uranium puts a logically entailed limit to the size of uranium; For gold, there isn't a strong and simple deductive system

### **Drawbacks**

1. Subjective: depends on simplicity, strength balance, that appeals to one, dependent on cognitive skills, interests, purposes etc.
2. Can't quantify the virtues of simplicity and information content for the purpose of choosing one over the other

## **Universals**

Suppose it's a law that Fs are Gs. Then F-ness and G-ness are taken to be universals. A certain relation of non-logical or contingent necessitation, holds between F-ness and G-ness. This state of affairs may be symbolized as 'N(F,G)'

Conception of properties that have an independent existence.

There's no mind dependence (as long as necessitation is not mind dependent)

### **Gold/Uranium example**

1. The uranium spheres generalization implies (according to this model, if it were a law) that being uranium does necessitate being less than one mile in diameter, but being gold doesn't.

### **Drawbacks**

1. Identification problem: There needs to be a specification of what a law-making relation is
2. Does N's holding between F and G entail that Fs are Gs?