

SOCIAL FORMATION OF MEDICAL KNOWLEDGE

Ludwik Fleck; Genesis and Development of a
Scientific Fact

Pentti Alanen

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Scientific Fact

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WHO WAS LUDWIK FLECK?

- A polish-jew physician
- Published in 1935 a book entitled
Entstehung und Entwicklung einer
wissenschaftlichen Tatsache
 - Einführung in die Lehre vom Denkstil und
Denkkollektiv
- Survived nazi's concentration camp
- Died in Israel 1961

FLECK VERSUS KUHN

- Fleck did introduce already in 1935 the basic ideas of Thomas Kuhn (1962) book: *The Structure of Scientific Revolutions*
- Kuhn has admitted that he had read Fleck's book in 1949 or 1950

- Fleck's book has been translated into English in 1979

Every PhD student (in health sciences) should read this book

Please start on the page 82: Epistemological considerations concerning...

After that, you can read also the beginning. It will be much easier because now you can more easily find the message of Fleck

FLECK

- In Fleck`s terminology, the concepts **thought style**, and **thought collective** have (about) the same meaning as **paradigma** in Kuhn`s terminology
- The concept **thought collective** brings the social basis/background of science into the picture

PARADIGMA

- Kuhn: normal science as puzzle-solving activity
- Science is in crisis if new observations do not fit with the –unconsciously applied – paradigm guiding our way to see the world
- A revolution means changes in paradigmas

FLECK; SOME CITATIONS

- "The more deeply one enters into a scientific field, the stronger will be the bond with the thought collective and the closer the contact with the scientist.
- **If a research experiment were well defined, it would be altogether unnecessary to perform it. (Bold added, PA)**

- For the experimental arrangements to be well defined, the outcome must be known in advance; otherwise the procedure cannot be limited and purposeful. The more unknowns there are and the newer a field of research is, the less well defined are the experiments.

- Direct perception of form requires being experienced in the relevant field of thought. The ability directly to perceive meaning, form, and self-contained unity is acquired only after much experience, perhaps with preliminary training.
- *All empirical discovery can therefore be construed as a supplement, development, or transformation of the thought style.*

- The preceding chapter tried to show how even the simplest observation is conditioned by thought style and is thus tied to a community of thought. I therefore called thinking a supremely social activity which cannot by any means be completely localized within the confines of the individual.

(underlining added, PA)

- *All paths toward a positive, fruitful epistemology lead toward the concept of thought style, ...*
- *We can therefore define thought style as (the readiness for) directed perception, with corresponding mental and objective assimilation of what has been so perceived.”*

HUSSERL; THE ORIGIN OF GEOMETRY

- "The objective world is from the start the world for all, the world which "everyone" has as world-horizon. Its objective being presupposes men, understood as men with a common language. Language, for its part, as function and exercised capacity, is related correlative to the world, the universe of objects which is linguistically expressible in its being and...

- ... its being and its being-such. Thus men as men, fellow men, world – the world of which men, of which we, always talk and can talk – and, on the other hand, language, are inseparably intertwined; and one is always certain of their inseparably relational unity, though usually only implicitly, in the manner of horizon.”

(underlinings added, PA)

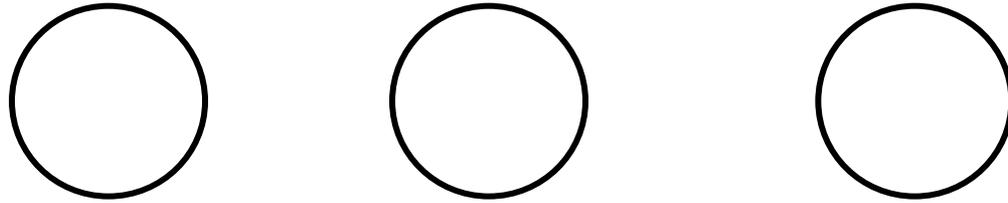
HUSSERL *VERSUS* KUHN

- Kuhn; science is in crisis if the pieces of the puzzle do not fit with each other
- Husserl; science is in crisis if the scientists are not aware of the basis of all science: **Lebenswelt**, life-world
 - (Life-world is an unlucky translation; "Leben" means both the noun "life" and the verb "to live": to be there, to experience the world: Lebenswelt = world of living)

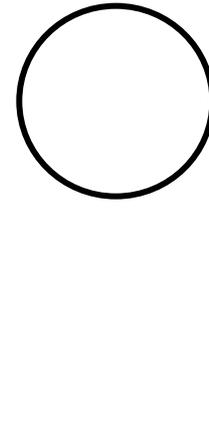
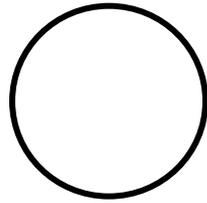
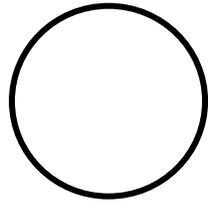
SOME COMPARISONS

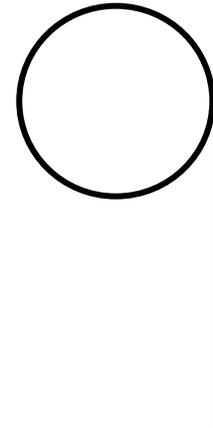
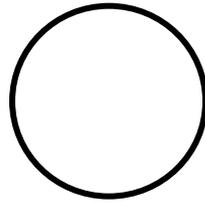
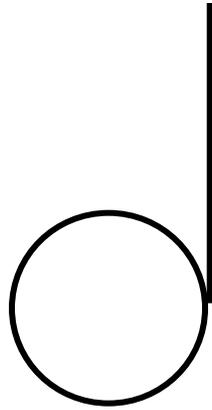
- Fleck thought collective
- Husserl Horizon, Lebenswelt, life-world
- Heidegger In-der-Welt-sein
- Wittgenstein language games
- Popper facts in the light of theories
- Sellars no theory-free observations

Some examples:

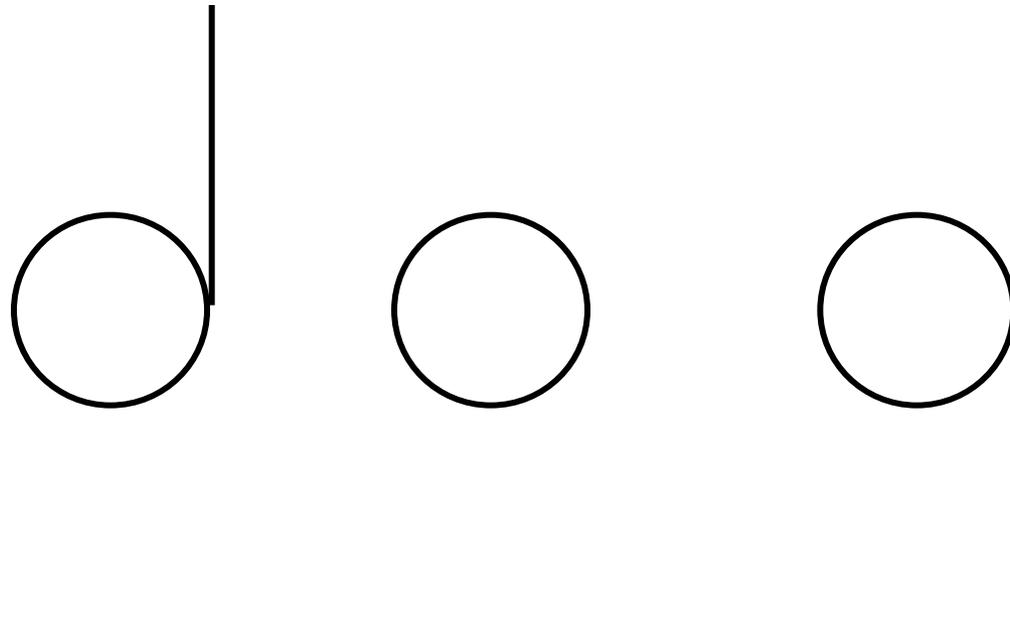


Please draw two lines into this picture to get a dog





"Something is seen as something";
we see the world through theories



- This kind of solution based on change in paradigm is possible only for subjects knowing English enough
- The possibility, the alternative paradigm, has to be there in advance
- We have to be members of the community speaking that language
- Wittgenstein: There is no private language
- Wittgenstein, Husserl, Fleck

- Change of paradigmas means that there are alternative paradigmas available beforehand
- **There are no private paradigmas**
- A thought collective is (usually?) not aware of the guiding nature of the principles but can accept the change if it identifies or knows the new paradigm beforehand

THE ROLE OF PHILOSOPHY

- One of the roles of philosophy of science is to increase our awareness of the hidden paradigmas guiding our thinking
- The old paradigm can still be relevant but now we can select it consciously; we know in which way it guides our thinking

EXAMPLE 2

- The following equation is not true

$$62 - 1 = 63$$

Move one of the numbers into another place so that the equation becomes true

- $62 - 1 = 63$

- $2^6 - 1 = 63$

- Mathematicians have made an agreement to indicate powers by putting the exponent up.
- We have to understand and accept the rules of this language in order to accept this position as a solution.
- The language (game) has to exist beforehand to open the horisont

EXAMPLE 3

- There are three lamps in a closed room, and three switches for them outside the room. We cannot see inside the room. We do not know the wiring diagram. We can press the switches freely but go inside the room only once. How to find out the connections between the lamps and the switches?
- (According to an urban story this is an employment test for Microsoft.)

MARSHALL AND PEPTIC ULCER

- Le Fanu: "... This brings into focus the singular peculiarity of the illnesses that do occur in the middle years, such as diabetes, rheumatoid, multiple sclerosis, schizophrenia, Parkinson's and many others. ... The unifying feature of all these illnesses is that their cause is not known.

- "Stomach (or peptic) ulcers were yet another of these illnesses of middle life whose cause was unknown, though they seemed to be related to an excess of acid production in the stomach which had been variously attributed to genetic factors, faulty diet and, of course, "stress". And then along comes Dr Marshall, who identifies a single type of bacterium as the "trigger", which not only profoundly changes the nature of understanding of...

- ... the disease but also the manner in which it should be treated. If this is the situation for peptic ulcers then, by analogy, perhaps there should be a similar singular explanation for the other diseases of middle life.”
- ”There was no reason why anybody should share the youthful Dr Marshall’s excitement about his observations, but what he may have lacked in experience he certainly made up for with enthusiasm.”

- "The next step in understanding the properties and behaviour of this unusual bacterium was to grow it – but this proved surprisingly difficult. It is standard practice, once bacteria have been inoculated on to a dish of culture medium, to incubate them for forty-eight hours and look for evidence of growth, but nothing happened. The thirty-fifth attempt was interrupted by a five-day Easter holiday, and unintentionally the culture dishes were...

(underlinings added, PA)

- ... were incubated for a further three days. When the microbiologists returned from their break they found that the culture plates were stubbed with small colonies of helicobacter. ...”
- Fleming and penicillium (1928): ”He then extracted ... and showed it was capable of inhibiting the growth of a whole range of micro-organisms. Curiously, however, when other scientists tried to replicate the accidental method by which he had...

- ... had made his discovery – by dropping some penicillium mould on a plate of stafylococci – they were quite unable to do so.
- It was not until 1964, when Fleming's former assistant, Ronald Hare, investigated the matter in detail, that the reason emerged. Hare found that this failure to replicate Fleming's original observation was because the growth of ...

- ... the growth of the penicillium mould occurred at a different temperature (20 degrees Celsius) than the staphylococcus, which grows best at a temperature of around 35 degrees of Celsius. So what had happened?”

...

- Consulting the meteorological records for London at the end of July 1928, Ronald Hare discovered that while Fleming was away there had been an exceptionally cool nine-day period

- ...

- -which would have favoured the growth of the penicillium mould - after which the temperature rose, which would have stimulated the growth of the staphylococcus. ... Thus, without the "nine cool days" in London in summer 1928, Fleming would never have discovered penicillin."
- Serendipity = luck?

CASE-CONTROL STUDIES

- Etiology of rare diseases with long incubation time can be studied in case-control settings
- Subjects with disease are compared with their age and gender matched healthy controls in order to find out possible differences in their exposure histories

MATCHING

- It is not informative to compare 60-year-old cases with 30-year-old controls
- Age and gender are routinely used for matching but the study could be much more effective if we match the groups also according to living area, profession, family structure, physical activities, hobbies, height, weight, dietary habits etc.

MATCHING

- Methodical problem: If we match the groups maximally we increase the risk for a wrong result
- Why? The more similar the groups are, the higher is the probability that also the controls have been exposed to the factor increasing the risk for the studied disease

OVERMATCHING

- The selection criterion for the control group is freedom from the studied disease
- Some subjects can tolerate "everything"
- Our controls would be subjects tolerating the suspected causative factor
- Therefore, the study setting is not fair

MATCHING

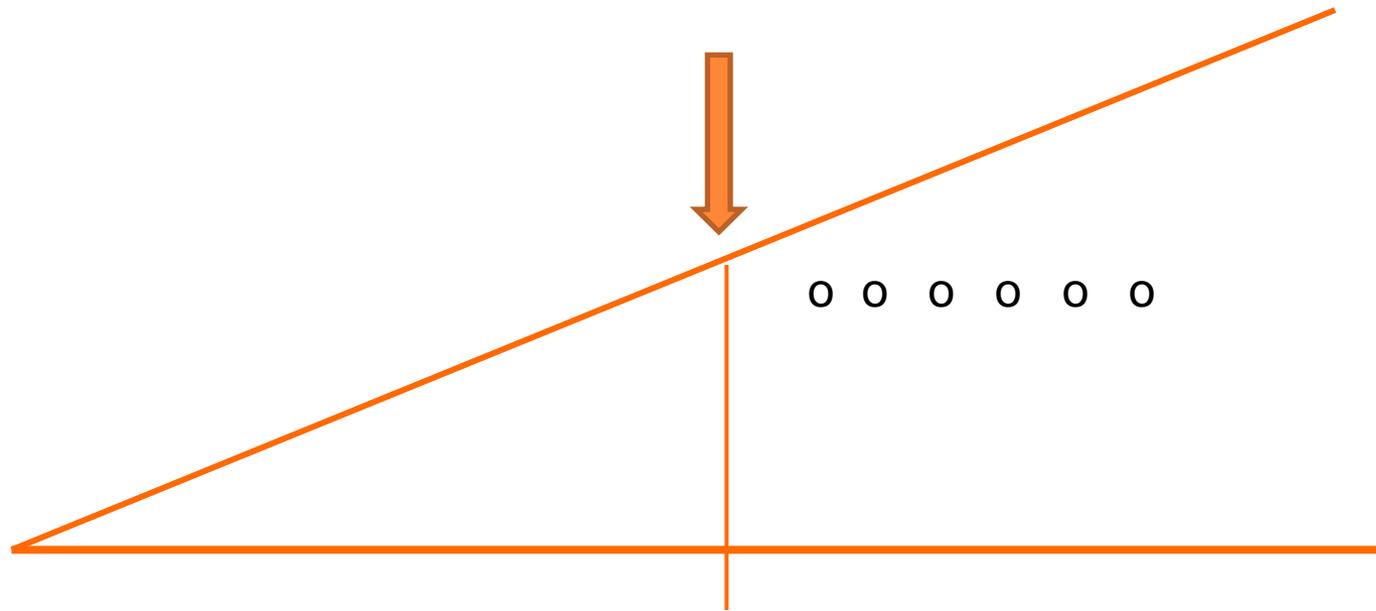
- If we do not match at all we will not get good, relevant information
- If we match maximally we will get wrong results
- When to stop with matching?
- The rule is simple: do not match the groups according to any member of the causal chain leading to the studied disease

MATCHING

- In order to be able to do this, one has to know the causal factor(s) of the disease beforehand to avoid overmatching but the very study is organised in order to find out the causal factor(s)!
- How to know the causes beforehand so that one can find them with a correct study design?

- We need a correct hypothesis for a correct study design
- If the hypothesis is already correct, why to conduct the study at all?
- "The method of finding is not identical with the method of proving"
- Difference between research and demonstration; education of new researchers
- Fleck: "If a research experiment were well defined, it would be altogether unnecessary to perform it."

FAT CIRCULATION IN RATS



ANTIBIOTICS DO NOT AFFECT VIRUSES

- A PhD student did fail in her virus studies week after week because she protected routinely her virus samples with antibiotics to keep the bacteria away.
- Her virus was a rare exception; it was sensitive to antibiotics
- This fact was known beforehand but she did not check for it because she applied a standard method to study viruses

REACTION SENSITIVE TO ULTRAVIOLET LIGHT

- The research group did not succeed in calibrating their instruments. The method did give different results in different days.
- At last they begin to suspect that the reaction is sensitive to ultraviolet light varying according to the cloudiness
- They started to work in a dark room to avoid the variation caused by sunny and cloudy days. Everything went now well

EXPERIMENT AND OBSERVATION

- Theories and hypotheses are tested in empirical sciences by well-designed critical studies (“Evidence based medicine”)
- Observation presupposes an observer
- Correct study design presupposes the existence of the planner/performer of the study

- To be able to conduct an empirical study means that the conductor is beforehand a member of an interpretation community
- This interpretation gives the guidelines for studies understood as meeting the criteria of reliable analyses
- To become as a researcher means membership and – at least partially – the acceptance the basic ideas of the field

HUSSERL AND HEIDEGGER

- People "are" always there beforehand
- The existence of human beings as members of an interpretation community, thought style is a prerequisite for any empirical science
- What do the words "to be", "to exist" mean?
- Heidegger: fundamental ontology



Thank you !