How are theories formed?

Science

What is a Theory? We often hear someone say “ That’s just a theory” or on the contrary - “ In theory and in practice, it always works. ” This term may indeed hold in itself a somewhat ambiguous undertone, and lead to confusion and misuse. Let’s look at the origin of the word; according to an etymology dictionary, theory derives from the Greek “ theoreo” which means ‘ to look at’, ‘ to observe’. The definition tells us that one must firstly observe a phenomenon so that a theory about a certain aspect of it could form.

There are essentially three forms of theories, and although they are different, all of them have one thing in common – a theory is always born withobservation. The first form is theory as a belief, found in humanities such asphilosophyand arts – this type is a theory that can guide or predict certain behavior in a social situation. For example: Maslow’s Hierarchy of Needs or the Karl Marx Theory of Bureaucracy. This is when someone might say “ That’s just a theory”.

The second form of theory is used primarily as a possibility, in other words as a tentative insight into the natural world – for example, the most famous in this category would be the Evolution Theory or in physics a String Theory. Finally, the third form is the scientific theory, and according to www. wordnet. princeton. edu, it is “ A well-substantiated explanation of some aspect of the natural world; an organized system of accepted knowledge that applies in a variety of circumstances to explain a specific set of phenomena. In order for a theory to be considered scientific, it needs to satisfy certain parameters, which distinguishes it from the other two forms. Firstly, a scientific theory will explain how nature works for example Newton’s Theory of Universal Gravitation, or Kinetic Theory of Gases, and it will do so with

significant evidence – unlike in the other forms, a scientific theory is always well tested by numerous experiments. This leads to the next point - scientific theories are mathematical in nature, meaning they explain measurable phenomena, and not abstract concepts, such as the theories in the first category.

Why did I state that String Theory and Evolution Theory are not scientific theories as opposed to Kinetic Theory of Gases? The answer lies in the hypothesis of these theories. A hypothesis is a proposal intended to explain certain observations, a prediction. It must be testable, meaning that whichever prediction you make, you need to be able to prove it works. It also must be falsifiable, meaning capable of being proven wrong. In both the String Theory and the Evolution Theory, the hypothesis fails, because you cannot possibly test them and also prove them wrong. These are the steps in the formation of a scientific theory: 1.

Observation 2. Hypothesis based on observation 3. Experiments 4. Evidence 5. Theory First form doesn’t make it to step 3 and second form doesn’t make it to step 4 – only scientific theories make it to step 5. The method outlined in these steps is called an inductive approach toscience. It was introduced by Francis Bacon and he said that a scientist needs to erase what he knows in terms of science, and start with a clean slate, tabula rasa; his knowledge will be based on observation, lead to hypothesis, then to evidence (or lack thereof), then to theory and its generalization.

The relationship between a theory and evidence is crucial – without evidence, there is no theory and no science, just random observations. To

better demonstrate inductive method, let’s take Aristotle as an example. He observed dropping down two objects at the same time, and with numerous experiments he saw that objects which are heavier fall faster to the ground than lighter ones. So that was his theory, and it stayed that way until Galileo Galilei opposed it. This is what inductive method is about – you base your theory on observation and make it a scientific fact until something else contradicts it.

It is similar to coming across mammals and saying all animals are warm blooded – until you come across a reptile. When Galileo objected to Aristotle’s theory, he said to forget inductive method and instead focus science on the deductive approach, an exact opposite. Instead a scientist would work from an already existing theory – an argument is that scientists make progress when they hold an idea in mind and then they go to observe and gather evidence for that idea/theory.

Proponents of the deductive method assert that science makes progress through meta-theories, meaning that in place of one theory, another one will emerge. So when Galileo opposed Aristotle’s theory, he proposed that the different speeds of objects falling to the ground have nothing to do with their masses, but instead occur because of air resistance and acceleration due to a gravitational pull. He was right and Aristotle was wrong. Below is a summary of how evidence and a theory interact in their relation to each other. Evidence -> theory (inductive) Theory -> evidence (deductive)

Meta-theory -> theory -> evidence (deductive) As mentioned throughout the paper, the validity of a theory and its worthiness depend primarily on the

evidence and proof which is gathered after the theory has been stated. For example, the recent theory that all physical objects in the world and all living organisms are holograms is mind bending and would be a tremendous breakthrough in the world of science had the hypothesis been testable. Just like with the Theory of Evolution and Theory of Creationism, the Theory of a Hologram World, remains a theory " yet to be proved right".

The issue here though is overwhelming – how much information and evidence does one theory require in order for it to become a law/fact of science? And even when it does become a law such as Law of Gravity or Law of Multiplication Table inmathematics, it exists only as far as contradictory evidence is not presented, because in science, observations take precedence over everything else. Scientists also know that in science, there is no certainty. Before 1800's people thought they have sufficient evidence that the Earth was flat, it is funny to us now, but who knows maybe in three centuries down the road we will also be laughed at.

Going back to the question of how much evidence is needed for a theory to become accepted as science – this has also to do with the way a theory is structured, worded. Again, its linked to mathematics and measurement – the more precise the theory is in terms of numbers, the easier it would be to measure it. The more vague and open to interpretation it is, the harder it would be to come to a conclusion. This is concerned with issues of metaphysical/ontological theories – examination of nature as a physical experience versus a mental, spiritual experience.

Another very important issue arises from the question – who researches scientific theories? At the end of the day, science is researched by people, and written by people. When evaluating theories, one might question the bias factor and the personal interest factor in the developments of science. Enterprise and governmental politics may play a key role when time will come to take a closer look at a contentious theory. Part 2: Question 4 One of the most controversial issues is regarding the question whetherpsychologyreally can be encompassed as a science or not.

Psychology means the study of the human mind, also the study of human behavior, and science in its simplest definition is the explaining of the world through empirical and numerical evidence. Science as a concept is very structured – because the very nature of things it looks at, can be researched and studied under laboratory, experimental conditions. Paul Lutus, in his article “ Is Psychology a Science? ” states, “ We should determine whether psychology can be relied on to objectively support the social and legal policies that are based on it.

In modern times, such a serious public burden can only be borne by a field that is based on reason, on science. ” If psychology is in fact responsible for providing answers, what is the content of this science? Psychology differs from biology and neuroscience primarily because it is concerned with the study of the mind rather than the brain. It focuses on the study of concepts of perception, cognition, interpersonal relationships between people and what motivates individuals to behave the way they do. Psychology also aims at treating mental disorders and classifying abnormalities and ways to cure them.

Psychology differs from other social sciences such as anthropology, economics andsociologydue to experimentation and the primary focus on the individual, or on small groups of individuals, rather than society as a whole. The next question would be, what is the methodology applied in psychology as a science to research the content? As the object of interest in psychology is the human mind, the most effective way to gain insight would be to apply projective techniques to the subjects of research. Projective techniques involve asking subjects to interpret or fill in visual stimuli, complete sentences, or report what ssociations particular words bring to mind. The way the questions are structured, enables the patients to project their own personalities onto the stimulus, often revealing personal conflicts, motivations, coping styles, and other characteristics. The best known projective test is the Rorschach test, created in the 1920’s by a Swiss psychologist Hermann Rorschach (rorschach. org). It consists of a series of ten cards, each containing a complicated inkblot. Some are in black and white, some are in color - subjects are asked to describe what they see in each card.

Another famous projective technique in its purest form was established by Sigmund Freud, called free association, where the subjects are told not to filter out anything that comes into their mind and speak it out freely, so that language and voicecommunicationacts as a direct channel to what is going on inside a person’s head. Methodology applied in psychology, consists of essential three elements: research, diagnosis and therapy. Most importantly, in order for diagnosis and therapy to be meaningful, the research i. e. he experiments need to be conducted in a way that assumes minimal bias and

maximum control of the variables. Psychology is excellent at describing phenomena, however it often cannot reliably explain these occurred phenomena; this is to be expected, after all the object of study is the most complex and genius creation in nature – the human mind. Works Cited Lutus, Paul. (2009, May 12) Is Psychology a Science? Retrieved from http://www. arachnoid. com/psychology/index. html Online dictionary www. wordnet. princeton. edu/perl/webwn? s= theory www. rorschach. org