Present knowledge is wholly dependent on past knowledge

It has been said, that we as humans never stop learning. Whether we want it or not, we never stop acquiring new knowledge and almost always it comes from someone else. We mainly gain knowledge by interacting with other, more experienced people either directly, by speaking with them, or either indirectly- through books, videos and otherwise. The gain of knowledge can be thought of like an infinite chain- I learn something from my mother, who has learned that from her mother, who in turn has learned that from her mother and so on. There are countless chains like this as there are different types of knowledge, that are not necessarily interlinked together. Some chains will be longer and some will be shorter, as there is a lot of knowledge, that the mankind has acquired only recently. Looking at these chains and arguing, that is it possible to find the starting point for at least of some of them, and thus showing, that not all knowledge wholly depends on past knowledge is the aim of this essay.

For knowledge not to wholly depend on past knowledge, it has to be something new, never seen before. In the case of natural sciences it can be debated, that some of the knowledge can be completely new, because much of natural sciences have been rather practical and rely on experiments, that sometimes disprove the theories and knowledge known before. Some of the great scientific discoveries, for example, the discovery of penicillin[1] in 1928 by Sir Alexander Fleming have been results of experiments, that have gone wrong and accidentally created a new branch in that science. In this case, the scientist had forgotten to keep care of his petri dishes and a

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[1] Healio. "Penicillin: An Accidental Discovery Changed the Course of Medicine." Healio, August 10, 2008. https://www.healio.com/endocrinology/news/print/endocrine-today/%7B15afd2a1-2084-4ca6-a4e6-7185f5c4cfb0%7D/penicillin-an-accidental-discovery-changed-the-course-of-medicine, date accessed: 04.02.2020

mould had started growing on it. Inspecting it, Fleming realized, that mould was stopping bacteria from growing and realized, that penicillin could be used to stop bacteria growth in humans and so the branch of study of antibiotics was born. Thus, it can be argued, that this knowledge was not completely dependent on the past, because this knowledge was suddenly acquired and using the metaphor from introduction, a new chain had been created.

At the same time though, it can be argued, that even accidental discoveries are dependent on past knowledge. For example, if a small child would come across the same petri dish Sir Alexander Fleming came across in 1928, he most likely wouldn't have noticed the pattern in the dishes and simply would have thrown them away. The difference between the scientist and the child is, that Fleming knew, that bacteria should have already grown, while the child would be clueless and thus would not find it interesting and would have no interest in examining the dish further.Henceforth, it can be argued, that even knowledge such as this is wholly dependent on past knowledge, as without the prerequisite knowledge on how bacteria grows it would be impossible to see mould's growth stopping properties. Additionally, at that time, moldy bread was a known tool to disinfect wounds[2] and thus it is possible, that Fleming was already aware of the possible relationships between mould and medicine, further building on the point, that this new branch of medicine still relies on past knowledge.

This example shows, that although knowledge can be acquired by luck, it cannot be just luck alone, it has to be paired with some way to acquire knowledge, for example, reason, as it acts as a tool to catch this opportunity to develop new

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[2] Jeschke, Marc.G et al., "Wound healing" in *HANDBOOK OF BURNS VOLUME 1: acute burn care,* 325, (Springer Science & Business Media, 2012), https://books.google.lv/books?id=olshnFqCI0kC&printsec=frontcover&dq=Handbook+of+Burns+Volume+1:+Acute+Burn+Care&hl=lv&sa=X&ved=0ahUKEwj-tafBrf7nAhVvyMQBHSYkDKYQ6AEIKDAA#v=onepage&q&f=false , date accessed: 04.02.2020

knowledge. However, it is this exact moment of luck, which suggests that knowledge is not wholly dependent on past knowledge. It definitely is a requirement, however, it is not the only factor in the equation.

In the case of mathematics, when in 1736 Leonard Euler solved the problem involving seven bridges of Königsberg[3] he laid the foundations of graph theory, a branch of discrete mathematics, type of mathematics, that had never been seen before. In this case, there were no pre-existing foundation rules, such as the five axioms in Euclidean geometry, and thus new knowledge was created, as from that point onwards mathematicians are looking at two types of mathematics, continuous (Euclidean geometry) and discrete (graph theory).

Still though, from another point of view, discrete mathematics can be considered to be based on past knowledge. Although at the higher level it differs from other forms of mathematics, on a simpler level it can still be looked at as the same- it uses numbers, additions, subtractions and so on. All of those things, of course, are nothing new and have been known for a long, long time, thus showing, that in essence even discrete mathematics can still be considered to be based on past knowledge.

This example tries to argue, that it is possible to create new knowledge by inventing new rules for the field, thus when in future people will be looking to trace back the knowledge chain to its start, they will be able to do so by tracing it to Leonard Euler in 1736. Although it definitely makes sense in the more advanced mathematics, examining simple mathematics shows that in the essence it uses the same old knowledge, because even when we imagine new things we do not do so just because, they are imagined for a reason, to help us understand something better,solve

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[3] Bown, William. "Euler and the Konigsberg Bridges Problem." New Scientist. New Scientist Ltd., March 30, 1991. https://www.newscientist.com/article/mg12917625-900-euler-and-the-konigsberg-bridges-problem/ , date accessed: 04.02.2020.

a problem, that is otherwise unsolvable, hence in essence it can be said, that even new inventions rely on the knowledge or rather lack of it and therefore the theory that present knowledge is wholly dependent on the past does seem correct.

Additional example, supporting the claim of mathematics being based on past knowledge is the invention of the imaginary unit, created by René Descartes in the 17th century[4], which lead to the development of a new mathematical field- complex field mathematics. Although seemingly non-reliant on past knowledge, due to the fact that the imaginary number was simply imagined, the concept of square root of negative one was already known to the ancient Greeks[5] and hence it can be argued, that Descartes relied on the knowledge presented by the ancient Greek scientists and just built on their knowledge further as opposed to creating something new.

As we can see, this topic is quite unclear, as both sides of the argument can be argued for in various cases. Mainly this is so, because the line between the new and the past is ever so sharp, it is even possible to say, that this line can't be drawn at all, because the difference is so thin, that one can't divide it accurately enough so, that all of the past is on one side and all of the new on the other. Additionally, thinking about the past and its knowledge inevitably leads to some contradiction. From one side, simple reasoning, tells us, that everything must start somewhere, nothing can just suddenly be there. However, imagining this proves to be quite a task, because to trace knowledge back to its roots would also mean to trace everything, even before the singularity, that eventually exploded in the Big Bang, but unfortunately time is such an abstract and unexplored concept, that one simply cannot go back that far.

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[4] Reeve-Tucker,Alice and Nathan Waddell. "Revolution: mathematics against dystopia - imaginary numbers in *We"* in *Utopianism, Modernism, and Literature in the Twentieth Century, (*Springer, 2013), https://books.google.lv/books?id=Z9WTJH7I3lMC&printsec=frontcover&hl=lv#v=onepage&q=imaginary%20number&f=false , date accessed: 04.02.2020

[5] Pickover, Clifford A. "A Ranking of the 10 Most interesting Numbers" in *Wonders of Numbers:Adventures in Mathematics, Mind and Meaning.* , 89, (Oxford University Press, 2003), https://books.google.lv/books?id=52N0JJBspM0C&printsec=frontcover&hl=lv#v=onepage&q&f=false , date accessed: 04.02.2020

Another fact contributing to the difficulty of examining this topic is the way in which we gain knowledge. To truly learn something we must not only intake the information, but also process and understand it as well, because otherwise we haven't really gained any new knowledge. The thing with understanding is that it all depends on how we perceive the information, which is once again based on previous encounters of who we are as a person, from our past experiences, thus, from deductive reasoning, it can be said that how we learn knowledge depends on past knowledge. However, there is the same problem as in the previous paragraph- What happens at the very beginning?

Additionally, knowledge acquisition over time is not linear and straightforward, it often overlaps with different branches of knowledge making it difficult to follow the chain of knowledge development, because in some cases, like the development of our understanding about DNA, there are so many different branches working together to develop this knowledge, that it is impossible to follow it all through and not get lost in the process.

To conclude, in the case of natural sciences, many great discoveries have been made on accident, and thus created completely new branches of fields in the science, however, even these radical fields still rely on the most basic knowledge, that we take for granted. In the case of mathematics, a new set of rules can be defined, thus creating a new branch of the science which uses and develops a different type of knowledge than before, quite different to the past knowledge acquired. However, similarly to the case of natural sciences, these new branches still rely on the basic operations used in all kinds of maths, that have been known for a long time. In both cases, there are arguments for knowledge to be dependent on the past and for knowledge to not be dependent on the past. Since it can be seen, that in some cases

present knowledge does not necessarily depend on the past knowledge, it can be said, that although it relies on past knowledge to a very significant degree, present knowledge does not wholly depend on past knowledge.