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RANDOM AND ARBITRARY CONTINGENCIES IN HISTORY OF SCIENCE AND TECHNOLOGY [1] – A GENERAL OVERVIEW

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ABSTRACT

In science and engineering, many unexpected arbitrary contingent factors such as pure chance, unintentional occurrences and random probability are attributed in some basic conceptual frameworks and also in their establishment. Some key historical cases will be discussed in their developments and/or establishments.

KEYWORDS: pure chance, arbitrary incidence, historical contingency, history of science and engineering, random probability, unintentional occurrences

INTRODUCTION

The arbitrary and random contingencies of pure chance do not appear clearly in scientists and engineers' official description of their works. They usually emphasize causal and rational relations in their conceptual frame works. In this sense, arbitrary and random pure chance is taken to be an outcome of not fully understanding a causal mechanism behind particular phenomena in science and engineering.

Nonetheless, the arbitrary and random contingencies are so widespread at the most fundamental level of basic frameworks in science and engineering. In this series of investigations, efforts will be made to reveal that science and engineering are based on some arbitrary and random contingencies of pure chance both in their conceptual frameworks and in their historical establishments. In this context, the arbitrary and random contingencies of pure chance are understood as unintentional incidences, random probability, unexpected occurrences and other various historical contingent factors.

Case Studies on Arbitrary and Random Contingencies

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Scientists and engineers are reluctant to arbitrary and random contingencies in justifying and establishing their line of reasoning. However, some cases on history of science and engineering imply that they have an important role on both laying down and establishing fundamental conceptual frameworks of science and engineering.

The case studies include the initial singularity of Big Bang cosmology, the natural selection in Darwinian theory of evolution, the non-causal frameworks of Copenhagen quantum mechanics, the invention of the steam engine in the early 18th Century, the cultural motivation for the sun-centered universe, the establishment of the sun-centered universe, and, finally, the marginal status of Bohmian quantum mechanics. They can be summarized as follows.

The initial singularity has absolutely no physical processes to trigger the big bang at the beginning of the universe. The big bang event itself is therefore random and arbitrary, only initiated by pure chance. This point was advocated by a steady state cosmologist such as Fred Hoyle who mocked the big bang as a pseudo-physical process.

The natural selection in Darwin's theory of evolution denies any teleology in which the evolutionary path is caused by some predetermined goals or purposes. On the contrary, the evolutionary path in the natural selection only depends on random and arbitrary pure chance. Rejecting a special status for humans, this leads to heated debates on the role of ethics in human, because the random and arbitrary evolution does not guarantee any ethically responsible humans as a final outcome.

Copenhagen quantum mechanics denies any causal relations in the sub-atomic world. Thus, an actual occurrence of quantum phenomena is solely dependent on random probability i.e. random and arbitrary pure chance. It is well-known that Einstein himself was never reconciled with this anti-causality.

The invention of the steam engine in the early 18th Century was not based on any available scientific knowledge at that time, although the era of modern science was already wide-opened through the publication of Principia (Newton, 1687). However, Newtonian modern science was totally useless in making any forms of the steam engines since the physical process of the steam engine involved heat and energy which have nothing to do with the force and acceleration in Newtonian science.

The motivation and establishment of the sun-centered universe in 1543 (Copernicus, 1939) was prompted by several historically random and arbitrary factors. These contingent factors include Renaissance Heliocentrism, the medieval principle of Occam's razor, the scientists' neglect on the absence of stellar parallax, the sudden death of Tycho Brahe, and Osiander's unexpected role on the publication of the sun-

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centered universe. These unexpected factors of historical contingencies critically contributed to the successful publication and the establishment of Copernican's sun-centered universe later.

The Bohmian quantum mechanics in 1950 has been marginalized in the physic community worldwide. Its marginality has something to do with the contingent fact that Bohm's quantum mechanics was proposed a generation later after the establishment of its counterpart, Copenhagen quantum mechanics in 1925. Because of this late announcement, Bohmian quantum mechanics has been systematically neglected both in an educational curriculum and in a research activity.

These series of investigations will reveal that, at its most fundamental level, science and engineering are actively mingled with some arbitrary and random contingencies both in their conceptual frameworks and in their historical establishments.

CONCLUSION

In science and engineering, the random and arbitrary contingencies of pure chance are essential in their conceptual frame works and also in their historical establishment. Their importance can be found in science such as astronomy, evolution theory and quantum mechanics, and also in engineering such as the invention of the steam engine.

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