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Among all the branches of science and engineering, physics occupies a unique place since it aims to study the observable universe at the most fundamental level. Over the past 100 years or so, physics research in the west, and some parts of the east, has not only led to a phenomenal understanding of the abstract underpinnings of natural processes but also to some fantastic technological innovations, of which the laser is perhaps one of the prime examples. However, India has considerably lagged behind in this scientific journey due to various reasons. One could lay the blame on lack of funding and institutional support, high levels of bureaucracy and red tape, lack of good physics teachers and perhaps many other things. Though all these reasons have surely impacted the growth of physics research in India, there are also some cultural issues that need to be looked into seriously. This is because the culture of a society or group of individuals plays a very important role in shaping its destiny. The question here is not whether India’s culture is good or bad, but whether it is supportive of physics research or not. If it is supportive, then it is perhaps just a matter of time before India starts producing excellent research outcomes since other
impediments to research that existed earlier are slowly and surely going away. But if it is not, then the path ahead is lot more challenging.

Before we get into the cultural issues, it is important to understand how physics is different from other scientific pursuits and where does India stand in this regard. It is often said that physics is applied mathematics, chemistry is applied physics and biology is applied chemistry. Though there are exceptions, the primary drive behind the study of chemistry and biology is largely to gain a deep understanding of various systems that we encounter in our day-to-day lives. However, physics is lot more abstract and aims to understand the very basis of everything that we can observe, or if we go a bit further, everything that exists. In this sense, theoretical physics is no less abstract than pure mathematics, with the only difference being that physics concerns itself with bringing reality under the framework of logic offered by mathematics.

Physics research in India is not really in a bad shape. Many scientists at various academic and research organizations in India regularly publish papers in good journals, which are also often well cited. The main problematic issue is that most of our researchers are going after the low hanging fruit and not really targeting the hard problems. It is the same scenario that we see in our Indian industries. There are several Indian companies that are globally recognized, but none of these have been able to develop a product that has made a global impact. Indians have gone on to become CEOs of top American companies, but we have not been able to create a company of that stature in
India. It is very strange that though we largely blame colonization for our downfall, it was during the later part of the colonial era that we made the most significant scientific impact.

India has a very rich cultural history with several outstanding scientific achievements being made in the ancient and medieval times. However, if we carefully observe these achievements, most of them would fall in the category of chemistry, biology, engineering and mathematics. In other words, the Indian civilization is very practical in its outlook and most of our inventions were made directly for the purpose of improving the living conditions. Even the mathematics we developed was mostly for the purpose of doing calculations. And this cultural inclination continues till today. In modern times, if we analyze the attitudes of our students at the top academic institutions, we will again find that they are also very practical in their approach, often to the dislike of their teachers. But making a mark in physics does not happen that way. Though modern physics has enabled the development of some of the best engineering applications, this was not really the primary driving force behind the basic research. The top physicists who have made a global impact over the last few centuries were primarily trying to solve the hard problems in physics.

One may argue that being practical is necessary for Indians given our poverty and poor living conditions. We cannot really afford to spend billions on basic research. Here, it is important to clarify that there are many hard problems in physics and mathematics that do not really require major monetary
support. A simple computer, dedicated hard work and conducive environment are actually more than enough. There is also no dearth of intelligence or capacity for hard work among Indians. The primary thing missing is our lack of interest in pursuing abstract problems for the mere pleasure of finding things out. One may disagree with this argument and say that we have a rich philosophical tradition where extremely abstract philosophical concepts were developed after very thorough debates and discussions. However, a careful analysis of these philosophical concepts would reveal that the primary goal of these developments was *mukti* or salvation, and not mere intellectual enquiry. In this context, Indian philosophical traditions are very different from that of the west, where a philosopher’s personal life has very little bearing on his/her intellectual pursuits or stature among other philosophers. Both the Indian and western approaches have their own merits and demerits, and can perhaps compliment each other in mutually beneficial ways.

Having said this, it is important to note that not every individual in a society strictly adheres to the overall culture. However, the overall culture does have a significant impact on the paths that each individual follows and the outcomes. For a given soil and climatic conditions, only certain kinds of plants can grow healthily.

So, what is the road ahead for physics research in India? We may or may not be able to produce an Albert Einstein or Richard Feynman in the near future, but we certainly do have the required societal framework to produce excellent research that can be directly applied for practical benefits. But for this to happen, it is
imperative for physicists to work in tandem with engineers. What is really required is a push from the government and higher authorities for people in science and engineering departments to have more interactions with each other. Proper institutional mechanisms and reward systems have to be put in place, which strongly encourage such interactions and collaborations. We often hear words like multi-disciplinary and inter-disciplinary in scientific meetings and articles, but there is very little that we are doing on the ground to promote such activities.

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