

Science at the Crossroads

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The last few decades have witnessed tremendous advances in the scientific understanding of the human brain and the human body as a whole. Furthermore, with the advent of the new genetics, neuroscience's knowledge of the workings of biological organisms is now brought to the subtlest level of individual genes. This has resulted in unforeseen technological possibilities of even manipulating the very codes of life, thereby giving rise to the likelihood of creating entirely new realities for humanity as a whole. Today the question of science's interface with wider humanity is no longer a matter of academic interest alone; this question must assume a sense of urgency for all those who are concerned about the fate of human existence. I feel, therefore, that a dialogue between neuroscience and society could have profound benefits in that it may help deepen our basic understanding of what it means to be human and our responsibilities for the natural world we share with other sentient beings. I am glad to note that as part of this wider interface, there is a growing interest among some neuroscientists in engaging in deeper conversations with Buddhist contemplative disciplines.

Although my own interest in science began as the curiosity of a restless young boy growing up in Tibet, gradually the colossal importance of science and technology for understanding the modern world dawned on me. Not only have I sought to grasp specific scientific ideas but have also attempted to explore the wider implications of the new advances in human knowledge and technological power brought about through science. The specific areas of science I have explored most over the years are subatomic physics, cosmology, biology and psychology. For my limited understanding of these fields I am deeply indebted to the hours of generous time shared with me by Carl von Weizsacker and the late David Bohm both of whom I consider to be my teachers in quantum mechanics, and in the field of biology, especially neuroscience, by the late Robert Livingstone and Francisco Varela. I am also grateful to the numerous eminent scientists with whom I have had the privilege of engaging in conversations through the auspices of the Mind and Life Institute which initiated the Mind and Life conferences that began in 1987 at my residence in Dharamsala, India. These dialogues have continued over the years and in fact the latest Mind and Life dialogue concluded here in Washington just this week.

Some might wonder "What is a Buddhist monk doing taking such a deep interest in science? What relation could there be between Buddhism, an ancient Indian philosophical and spiritual tradition, and modern science? What possible benefit could there be for a scientific discipline such as neuroscience in engaging in dialogue with Buddhist contemplative tradition?"

Although Buddhist contemplative tradition and modern science have evolved from different historical, intellectual and cultural roots, I believe that at heart they share significant commonalities, especially

in their basic philosophical outlook and methodology. On the philosophical level, both Buddhism and modern science share a deep suspicion of any notion of absolutes, whether conceptualized as a transcendent being, as an eternal, unchanging principle such as soul, or as a fundamental substratum of reality. Both Buddhism and science prefer to account for the evolution and emergence of the cosmos and life in terms of the complex interrelations of the natural laws of cause and effect. From the methodological perspective, both traditions emphasize the role of empiricism. For example, in the Buddhist investigative tradition, between the three recognized sources of knowledge - experience, reason and testimony - it is the evidence of the experience that takes precedence, with reason coming second and testimony last. This means that, in the Buddhist investigation of reality, at least in principle, empirical evidence should triumph over scriptural authority, no matter how deeply venerated a scripture may be. Even in the case of knowledge derived through reason or inference, its validity must derive ultimately from some observed facts of experience. Because of this methodological standpoint, I have often remarked to my Buddhist colleagues that the empirically verified insights of modern cosmology and astronomy must compel us now to modify, or in some cases reject, many aspects of traditional cosmology as found in ancient Buddhist texts.

Since the primary motive underlying the Buddhist investigation of reality is the fundamental quest for overcoming suffering and perfecting the human condition, the primary orientation of the Buddhist investigative tradition has been toward understanding the human mind and its various functions. The assumption here is that by gaining deeper insight into the human psyche, we might find ways of transforming our thoughts, emotions and their underlying propensities so that a more wholesome and fulfilling way of being can be found. It is in this context that the Buddhist tradition has devised a rich classification of mental states, as well as contemplative techniques for refining specific mental qualities. So a genuine exchange between the cumulative knowledge and experience of Buddhism and modern science on a wide-ranging issues pertaining to the human mind, from cognition and emotion to understanding the capacity for transformation inherent in the human brain can be deeply interesting and potentially beneficial as well. In my own experience, I have felt deeply enriched by engaging in conversations with neuroscientists and psychologists on such questions as the nature and role of positive and negative emotions, attention, imagery, as well the plasticity of the brain. The compelling evidence from neuroscience and medical science of the crucial role of simple physical touch for even the physical enlargement of an infant's brain during the first few weeks powerfully brings home the intimate connection between compassion and human happiness.

Buddhism has long argued for the tremendous potential for transformation that exists naturally in the human mind. To this end, the tradition has developed a wide range of contemplative techniques, or meditation practices, aimed specifically at two principal objectives - the cultivation of a compassionate heart and the cultivation of deep insights into the nature of reality, which are referred to as the union of compassion and wisdom. At the heart of these meditation practices lie two key techniques, the refinement of attention and its sustained application on the one hand, and the regulation and transformation of emotions on the other. In both of these cases, I feel, there might be great potential for collaborative research between the Buddhist contemplative tradition and neuroscience. For example, modern neuroscience has developed a rich understanding of the brain mechanisms that are associated with both attention and emotion. Buddhist contemplative tradition,

given its long history of interest in the practice of mental training, offers on the other hand practical techniques for refining attention and regulating and transforming emotion. The meeting of modern neuroscience and Buddhist contemplative discipline, therefore, could lead to the possibility of studying the impact of intentional mental activity on the brain circuits that have been identified as critical for specific mental processes. In the least such an interdisciplinary encounter could help raise critical questions in many key areas. For example, do individuals have a fixed capacity to regulate their emotions and attention or, as Buddhist tradition argues, their capacity for regulating these processes are greatly amenable to change suggesting similar degree of amenability of the behavioral and brain systems associated with these functions? One area where Buddhist contemplative tradition may have important contribution to make is the practical techniques it has developed for training in compassion. With regard to mental training both in attention and emotional regulation it also becomes crucial to raise the question of whether any specific techniques have time-sensitivity in terms of their effectiveness, so that new methods can be tailored to suit the needs of age, health, and other variable factors.

A note of caution is called for, however. It is inevitable that when two radically different investigative traditions like Buddhism and neuroscience are brought together in an interdisciplinary dialogue, this will involve problems that are normally attendant to exchanges across boundaries of cultures and disciplines. For example, when we speak of the "science of meditation," we need to be sensitive to exactly what is meant by such a statement. On the part of scientists, I feel, it is important to be sensitive to the different connotations of an important term such as meditation in their traditional context. For example, in its traditional context, the term for meditation is *bhavana* (in Sanskrit) or *gom* (in Tibetan). The Sanskrit term connotes the idea of cultivation, such as cultivating a particular habit or a way of being, while the Tibetan term *gom* has the connotation of cultivating familiarity. So, briefly stated, meditation in the traditional Buddhist context refers to a deliberate mental activity that involves cultivating familiarity, be it with a chosen object, a fact, a theme, habit, an outlook, or a way of being. Broadly speaking, there are two categories of meditation practice - one focusing on stilling the mind and the other on the cognitive processes of understanding. The two are referred to as (i) stabilizing meditation and (ii) discursive meditation. In both cases, the meditation can take many different forms. For example, it may take the form of taking something as object of one's cognition, such as meditating on one's transient nature. Or it may take the form of cultivating a specific mental state, such as compassion by developing a heartfelt, altruistic yearning to alleviate others' suffering. Or, it could take the form of imagination, exploring the human potential for generating mental imagery, which may be used in various ways to cultivate mental well-being. So it is critical to be aware of what specific forms of meditation one might be investigating when engaged in collaborative research so that complexity of meditative practices being studied is matched by the sophistication of the scientific research.

Another area where a critical perspective is required on the part of the scientists is the ability to distinguish between the empirical aspects of Buddhist thought and contemplative practice on the one hand and the philosophical and metaphysical assumptions associated with these meditative practices. In other words, just as we must distinguish within the scientific approach between theoretical suppositions, empirical observations based on experiments, and subsequent

interpretations, in the same manner it is critical to distinguish theoretical suppositions, experientially verifiable features of mental states, and subsequent philosophical interpretations in Buddhism. This way, both parties in the dialogue can find the common ground of empirical observable facts of the human mind, while not falling into the temptation of reducing the framework of one discipline into that of the other. Although the philosophical presuppositions and the subsequent conceptual interpretations may differ between these two investigative traditions, insofar as empirical facts are concerned, facts must remain facts, no matter how one may choose to describe them. Whatever the truth about the final nature of consciousness - whether or not it is ultimately reducible to physical processes - I believe there can be shared understanding of the experiential facts of the various aspects of our perceptions, thoughts and emotions.

With these precautionary considerations, I believe, a close cooperation between these two investigative traditions can truly contribute toward expanding the human understanding of the complex world of inner subjective experience that we call the mind. Already the benefits of such collaborations are beginning to be demonstrated. According to preliminary reports, the effects of mental training, such as simple mindfulness practice on a regular basis or the deliberate cultivation of compassion as developed in Buddhism, in bringing about observable changes in the human brain correlated to positive mental states can be measured. Recent discoveries in neuroscience have demonstrated the innate plasticity of the brain, both in terms of synaptic connections and birth of new neurons, as a result of exposure to external stimuli, such as voluntary physical exercise and an enriched environment. The Buddhist contemplative tradition may help to expand this field of scientific inquiry by proposing types of mental training that may also pertain to neuroplasticity. If it turns out, as the Buddhist tradition implies, that mental practice can effect observable synaptic and neural changes in the brain, this could have far-reaching implications. The repercussions of such research will not be confined simply to expanding our knowledge of the human mind; but, perhaps more importantly, they could have great significance for our understanding of education and mental health. Similarly, if, as the Buddhist tradition claims, the deliberate cultivation of compassion can lead to a radical shift in the individual's outlook, leading to greater empathy toward others, this could have far-reaching implications for society at large.

Finally, I believe that the collaboration between neuroscience and the Buddhist contemplative tradition may shed fresh light on the vitally important question of the interface of ethics and neuroscience. Regardless of whatever conception one might have of the relationship between ethics and science, in actual practice, science has evolved primarily as an empirical discipline with a morally neutral, value-free stance. It has come to be perceived essentially as a mode of inquiry that gives detailed knowledge of the empirical world and the underlying laws of nature. Purely from the scientific point of view, the creation of nuclear weapons is a truly amazing achievement. However, since this creation has the potential to inflict so much suffering through unimaginable death and destruction, we regard it as destructive. It is the ethical evaluation that must determine what is positive and what is negative. Until recently, this approach of segregating ethics and science, with the understanding that the human capacity for moral thinking evolves alongside human knowledge, seems to have succeeded.

Today, I believe that humanity is at a critical crossroad. The radical advances that took place in neuroscience and particularly in genetics towards the end of the twentieth century have led to a new era in human history. Our knowledge of the human brain and body at the cellular and genetic level, with the consequent technological possibilities offered for genetic manipulation, has reached such a stage that the ethical challenges of these scientific advances are enormous. It is all too evident that our moral thinking simply has not been able to keep pace with such rapid progress in our acquisition of knowledge and power. Yet the ramifications of these new findings and their applications are so far-reaching that they relate to the very conception of human nature and the preservation of the human species. So it is no longer adequate to adopt the view that our responsibility as a society is to simply further scientific knowledge and enhance technological power and that the choice of what to do with this knowledge and power should be left in the hands of the individual. We must find a way of bringing fundamental humanitarian and ethical considerations to bear upon the direction of scientific development, especially in the life sciences. By invoking fundamental ethical principles, I am not advocating a fusion of religious ethics and scientific inquiry. Rather, I am speaking of what I call "secular ethics" that embrace the key ethical principles, such as compassion, tolerance, a sense of caring, consideration of others, and the responsible use of knowledge and power - principles that transcend the barriers between religious believers and non-believers, and followers of this religion or that religion. I personally like to imagine all human activities, including science, as individual fingers of a palm. So long as each of these fingers is connected with the palm of basic human empathy and altruism, they will continue to serve the well-being of humanity. We are living in truly one world. Modern economy, electronic media, international tourism, as well as the environmental problems, all remind us on a daily basis how deeply interconnected the world has become today. Scientific communities play a vitally important role in this interconnected world. For whatever historical reasons, today the scientists enjoy great respect and trust within society, much more so than my own discipline of philosophy and religion. I appeal to scientists to bring into their professional work the dictates of the fundamental ethical principles we all share as human beings.

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