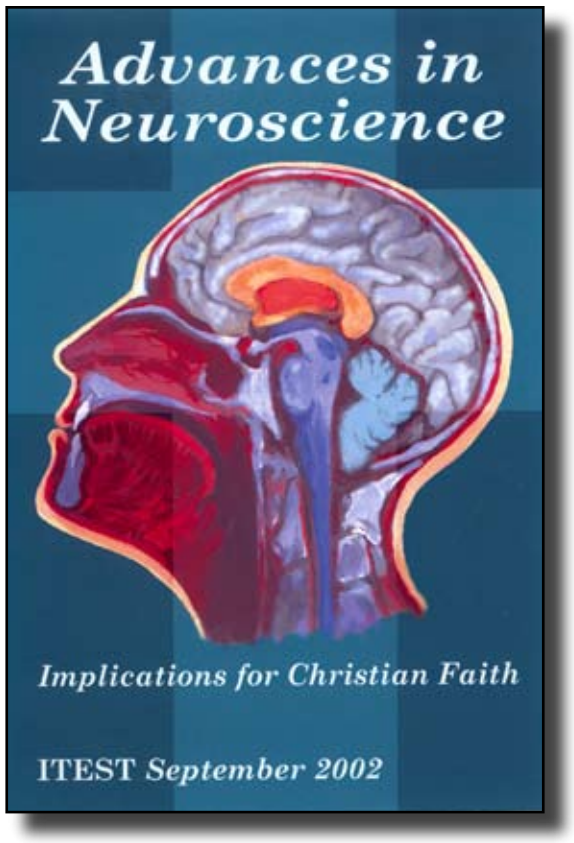

Advances in Neuroscience

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Advances in Neuroscience

Abstract:

Daily, even hourly we learn about advances in the neurosciences. From improved brain imaging technology to the rapid growth of disease-fighting pharmaceuticals, the promises of better health through the efforts of those with scientific and technological skill entice us at every turn.

Are these just false promises? Will these new advances fulfill the expectations of the many who wait for some alleviation of pain or, in the case of Alzheimer's disease, a drug that will slow the progression of the disease if treatment starts early. These are some of the questions the essayists addressed at this meeting although a wide range of topics engaged the participants.

Two of the essayists explore the moral and theological aspects of the topic, another, a physicalist, addresses the question, "Is there a God-spot in the brain?". A fourth essayist, a physician, delves into the role of learning and memory in the neurobiology of choice.

Plenary discussions follow wherein the participants and the essayists exchange ideas on a myriad of issues, among them the societal and theological implications of brain research and other neuroscientific experiments.

Amalia Issa, co-editor and essayist, details the overview of the workshop proceedings in the Foreword of the book.

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Foreword:

Searching For Truth In The Gray Matter

It is an interesting irony of the English language that both important anatomical regions in the brain and the complex issues raised about what is morally right or wrong are referred to as "gray." Advances in Neuroscience

attempts to bridge the state of scientific knowledge of the biology of the brain with the complex moral, social and theological questions raised by the "new neuroscience." Societal attention over the past decade or so has been riveted on the concerns raised by developments from the Human Genome Project. However, the discoveries resulting from advances in the neurosciences are likely to affect human beings far more profoundly in the long run. Not only do the contemporary research developments promise benefits in overcoming debilitating and tragic forms of neuropathology, but they also raise unprecedented quandaries, many of which are rooted in the age-old philosophical question "what does it mean to be human?" Exemplifying the power of the new neuroscience applications and technologies are the revolutionary novel capabilities in functional magnetic resonance imaging (fMRI), psychopharmacological agents that can alter brain chemistry and behavior, and an increased understanding of the neural circuitry involved in moral decision-making, violence and consciousness.

In September 2002, ITEST hosted a workshop, *Advances in Neuroscience: Social, Moral, Philosophical and Theological Implications*, in Belleville, Illinois. For two and half days we gathered an eclectic group of neuroscientists, ethicists, philosophers, theologians, physicians, biochemists, physicists, and others to focus on the complex scientific developments of the neurosciences, and the emerging societal consequences. ITEST has always been at the forefront of tackling the scientific issues in a variety of disciplines that interface with ethics, philosophy and theology. Therefore, it is no surprise that this topic has been broached by ITEST before in 1975 and 1986. In reviewing previous work shops, it is interesting to note that a number of the same questions raised are still relevant. However, they have taken some interesting twists and turns. To my surprise, in the 1986 proceedings, I discovered a discussion regarding how we make distinctions between animal and human consciousness and a chapter on the then fairly "new" imaging technologies of CT and PET scanning!

In this current volume, our hope is to broaden the available literature on neuroscience and morality and further the dialogue surrounding previously raised issues. This book's chapters consist of four original papers and six transcripts of animated, engaging, and intellectually tantalizing discussion.

A great deal of discussion focused on the relationship between the soul and the brain. This question has puzzled scientists, philosophers and theologians for decades. Yet it is only in the past decade and the advent of fMRI that neuro scientists have begun to attempt to empirically investigate whether religious experience is localized within specific regions of the brain. In his paper, Keith Crutcher presents some of this evidence.

Mike Wyss presents some data correlating risk-taking behaviors with the dopaminergic neurotransmitter systems in the next paper. The increased under standing of the neural circuitry and neurotransmitter systems involved in consciousness, choice and free will instigate challenges to our understanding of personhood and human nature, moral responsibility and criminality. Demonstrating that knowledge is not always power, Mike Wyss pointed out in the following discussion (Session 2) Nancy Wexler's dilemma: do we want to know the answers? Finally, he capped off his presentation with the provocative question: Is what is uniquely human shrinking too much? This ignited a lively, at times heated, debate in the plenary discussion. The theologians in particular had a field day with that issue!

My task was to focus on the ethics of neurobiological research. In the opening intervention, I chose to illustrate the recent fascinating fMRI studies on the neurobiology of morality with a thought experiment involving children and trains. That how the brain makes moral judgments can be localized and investigated using fMRI raises questions of enormous societal significance. As with any new technology, the potential for misuse or abuse of the technology would be of no small consequence.

In her contribution, Dr. Carla Mae Streeter addressed the question of how contemporary theologians are thinking about the soul, and how developments in neuroscience might enlighten or influence our current

understanding of the soul. She spoke about the different ways of knowing, and using poignant examples, reminded us that focusing exclusively on the scientific methods of knowing can be crippling to individuals and cultures.

The four papers of the essayists set the tone for the myriad themes discussed in the six plenary sessions, but they are by no means exhaustive of the richly woven discourse among the participants. The question of what differentiates human beings from animals and the meaning of free will and personal responsibility were subjects of intense deliberation.

The neurotransmitter systems associated with risk-taking behavior, and various addictions, whether deviation from moral norms can be fully explained by demonstrable brain pathology are subjects of increasingly interesting research in contemporary neuroscience. The questions raised by the evidence regarding the neurobiological basis of morality in turn raise questions that generated animated discussion and debate among workshop participants. Should we hold criminals responsible for their actions if their behaviors can be explained by neuropathological phenomena? How should society set standards regarding personal responsibility? And what about the Christian understanding of sin?

Another theme dealt with the treatment and enhancement debate. To what extent, if at all, should we intervene above the baseline? Beyond using psychopharmaceuticals for treatment of neurological disorders, should we as a society allow their use for enhancement of cognitive function or ability?

These are the thorny questions with which society will surely be contending for years to come. Listening to the animated and insightful discussions, I found myself recalling my earliest days as a graduate student. It was on a clear, crisp fall day that I first held a human brain in the Neuroanatomy lab at McGill. My thoughts that day: Whose brain had this been? What thoughts had coursed through once alive, vital neurons? What memories? An audacious idea: What if one day we could be technologically capable of retrieving memories from a dead brain? This of course is not yet technologically possible, but as demonstrated throughout this volume, the advances in neuroscience and the direction of research already raise many other once seemingly farfetched conundrums.

Perhaps the key “take-home message” comes from an observation made by several participants; science is limited in its methods, tools of measurement, and even in the types of questions it can ask. This is important to the scientific and theological search for and understanding of Truth in this arena.

In summary, the chapters of this book offer sophisticated insights and reflections regarding the moral, social, philosophical and theological considerations emerging from the developments in contemporary neuroscience. They are not meant as a comprehensive treatise of the topic, but rather as a tour of the interface of science and faith in the neurobiological terrain. As in previous ITEST meetings, we did not attempt to achieve consensus on the issues raised. The participants, however, left fortified knowing that the important questions were being considered and that there is yet much work to be done both in the scientific realm and in its interface with faith.

Finally, a theme that was present throughout the discussions was awe. After all, the approximately 1300 - 1400 grams of flesh called the human brain containing 100 billion neurons can only elicit awe. Perhaps if we as scientists, ethicists and theologians can remember often to marvel in humility at the Creator behind the creation of the brain, we will be well on our way to finding truth in the gray.

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