**Independently Designed Major: Contemplative Neuroscience**

Contemplative[1] neuroscience is an emerging discipline that combines the scientific third-person investigation of brain and behavior with the subjective first-person investigation of mind and consciousness. The goal of this dialogue is twofold. First, it seeks to cultivate a holistic, embodied understanding of mind; second, it aims to use these insights in the research and development of techniques to cultivate human well-being (Emory University, n.d., "About Our Center").

Science studies the mind from the "outside-in," synthesizing a rigorous empirical understanding from physiological measurements and third-person observations. Specifically, psychology examines the mind by observing human behavior, while neuroscience probes the relationship between mind, behavior, and neural structure. Additionally, the scientific method is embraced by researchers and contemplative practitioners alike as the best means to test theories about the nature of mind (Houshmand et al., 1999). Buddhist contemplative practices, in contrast, investigate the mind from the "inside-out." Systematically refined over thousands of years, these practices "concentrate, broaden and deepen conscious awareness" in order to reliably and directly observe mental phenomena (Kabat-Zinn, 2003; Roth, 2008, p.19). Notably, contemplative practices also introduce methods of cultivating positive mind-states such as compassion and equanimity (Emory University, n.d., "About Our Center"). Many prominent scholars believe that these contemplative methods yield legitimate insights, provide valuable tools for training the mind, and constitute the next frontier for the mind sciences (Varela et al., 1991; Wallace, 2018; Wright, 2017; see Appendix A).

I propose this Independently Designed Major because of my conviction in the promise of this emerging discipline and because CC's existing majors cannot adequately encompass this cross-disciplinary dialogue. Although psychology and neuroscience elucidate empirically observable aspects of mind, they do not emphasize two crucial aspects of contemplative neuroscience: first-person investigation of mind, and methods for cultivating beneficial mind-states. Similarly, the study of religion at CC delves into a wide variety of philosophical traditions but does not emphasize the study of Buddhist contemplative methods, which constitute the primary contemplative source in this field. Thus, contemplative neuroscience at CC will draw mainly from psychology, neuroscience, and the Buddhist contemplative tradition, but will also include courses from biology and sociology to situate this burgeoning dialogue in a broader societal context.

[1] Please note: in the context of religious studies, the word "contemplative" encompasses a wide variety of practices and philosophies. In this proposal, however, "contemplative" specifies Buddhist thought or practices. This is because Buddhist practitioners constitute the main voice in the ongoing dialogue between contemplative traditions and the mind sciences (Brown University, n.d., "The Rationale Behind Contemplative Studies"). I will use "contemplative" in this latter sense, as it is the accepted terminology in this emerging field.

**History of the Field and Current Integration**

Contemplative neuroscience has grown from encounters in the last 40 years between Western scientists and contemplative practitioners. These encounters contributed to the field in two main ways. First, a dialogue between cognitive neuroscientist Richard Davidson and His Holiness the 14th Dalai Lama inspired the earliest research linking meditation to neuroplasticity. Challenged by the Dalai Lama's question of why neuroscience should study neuroses but not positive qualities such as compassion, Davidson and fellow researchers investigated the neural mechanisms of meditation. In addition to finding evidence for the plasticity of affective processing (Davidson et al., 2000), they produced the first meditation study published in the *Proceedings of the National Academy of Sciences.* This study linked increased gamma oscillation—brain activity related to neuroplasticity—to the neural activity of experienced meditators (Lutz et al., 2004). This discovery helped to usher in an era of serious interest in the efficacy of contemplative practice. Second, these dialogues between scientists and contemplatives spurred the integration of mindfulness into clinical medicine. Jon Kabat-Zinn, M.D., a physician and student of Zen Buddhism, created the Stress Reduction Clinic at UMass Memorial Hospital (Kabat-Zinn, 2011). The clinic promotes what is now called Mindfulness-Based Stress Reduction, or MBSR, which remains the gold standard for its effectiveness in bolstering mental health and demonstrating observable neurological alterations (Kabat-Zinn, 2003; see also Grossman et al., 2003 [meta-analysis]; Davidson et al., 2003).

These ventures have blossomed into a discipline that shows promise for rewarding interdisciplinary research. While the earliest encounters between scientists and contemplatives consisted of scientific "validation" of contemplative practices, an open-minded exchange has evolved in which contemplative traditions are not only valued for their contributions to secular health, but also for their potential to expand the horizons of the mind sciences. Though behavioral and physiological measurements can illuminate a great deal about the mind, they lack a rigorous and replicable method for studying mental phenomena directly. This is where contemplative traditions come in. While such traditions lack the means to investigate the structural and neurochemical bases of mind, their well-honed methods for systematically training awareness and attention make reliable first-person observation of mental phenomena possible (Wallace, 2004; 2018). Importantly, this interdisciplinary dialogue succeeds because of a shared attitude. Both the scientific and Buddhist traditions place paramount importance on testing things for oneself rather than relying on mere belief. The Dalai Lama himself stated that if discoveries in contemplative neuroscience contradict existing tenets of Buddhist philosophy, then the philosophy must be revised (Houshmand et al., 1999). This shared, open-minded, and rigorous pursuit of truth unites third-person and-first-person investigations under one collaborative banner.

The rapidly growing interest in contemplative neuroscience is reflected in the development of numerous university-based research centers, other research and educational organizations, medical school programs, and undergraduate majors, minors, and focus areas. Please see Appendix A.

**Developing My Interest in Contemplative Neuroscience**

My own interest in contemplative neuroscience stems from independent research, academic study, healthcare work, and travel abroad. Since freshman year of high school, I have read extensively about Buddhist practice, philosophy, and its dialogue with Western science, in addition to practicing meditation. At the core, Buddhism appeals to me because its teachings on suffering and the cessation of suffering seem to transcend religious and secular lines. Additionally, I took a Buddhism course at a different university (titled, "Science, Religion, and the Pursuit of Happiness in Traditional Asian Thought") that introduced me to the academic study of religion and its intersection with science.

Working as a pharmacy technician at a major hospital allowed me to experience how modern science and contemplative qualities complement each other. In 6 months of full-time work, I witnessed how vital neurochemical approaches, such as prescription medication, are to human health. In everyday employee-patient interactions, I also observed that qualities cultivated by contemplative practices—such as presence, deep listening, humor, and compassion—were crucial to patients' happiness and healing. I wondered, as many healthcare professionals are starting to do, whether integrating contemplative practices in medical training could be an essential counterpart to neuropharmacological interventions.

My inquiry into Buddhism culminated in three months of living in Nepal. While there, I studied and practiced at Namo Buddha, a Buddhist monastery near Kathmandu, and participated in daily rituals around Boudhanath Stupa. The kindness, humor, and ease displayed by Buddhist monks and lay-practitioners alike led me to reflect on whether Buddhist practices may indeed correlate with human well-being. After CC, I intend to continue studying Buddhism in Nepal. After that, I envision pursuing a career in medicine or a graduate degree in neuroscience, psychology, or religion.

Contemplative neuroscience is extremely relevant to 21$^{st}$ century medicine. Effective healing requires straddling two worlds: the world in which humans are consist of tissue and electrical impulses, and the world in which humans are living beings who love, strive, and inevitably, suffer. Medical practitioners must possess not only the skills to relieve pain anatomically and neurochemically, but they must also be able to provide refuge for patients by applying concepts rooted in contemplative practices, such as compassion and equanimity.

While I intend to engage in service throughout my four years at CC, I also aim to examine intellectually how scientific and spiritual approaches complement each other, as they do within a Contemplative Neuroscience IDM. Accordingly, I am taking classes required for medical or graduate school admission outside of those included within this major's framework. See "Designing the Contemplative Neuroscience Major."

**Contemplative Neuroscience: Potential Thesis**

As evidenced by the growing number of research centers and programs, contemplative neuroscience is more than a theoretical dialogue. It functions concretely in several ways to produce research and other academic projects. During the course of my own reading, I have identified four main areas that encapsulate most projects and research in this discipline:

1. Science "validates" some effects of contemplative practices
    a. For example: increased self-reported well-being (Grossman et al., 2004), heightened activity in brain areas associated with positive affect (Davidson et al., 2003), or improved scores on tests of cognitive functions such as attention span (Jha et al., 2007)
2. Science "validates" some tenets of contemplative philosophy
3. Contemplative practices inform new paradigms or questions for scientific research
4. Within research projects, first-person data from trained contemplatives informs or complements interpretation of third-person data

I'm drawn to a contextual, overarching question that underpins all of these avenues of inquiry. Unlike neuropharmacological interventions, contemplative practices at the core of MBSR and similar health interventions did not originate in the West. In fact, the philosophical framework (Buddhism) that birthed many of these practices teaches a conception of reality that directly contradicts values such as individualism and materialism. Currently, contemplative practices are being analyzed, adopted, and altered inside a very different philosophical paradigm than the one in which they originated.

I'm curious about how modern goals for utilizing contemplative practices (whether privately OR in a clinical setting) differ from the traditional role such practices play in a Buddhist context. Might a different intention in implementing contemplative practices lead to an outcome completely different from—*or even counter to*—these practices' original philosophical function? In an undergraduate major, this question could be examined via a meta-analysis or literature review. This project would examine what questions in this field are deemed worthy of scientific research, what questions are NOT pursued, intended applications for research, and how these applications compare to the purpose of contemplative practices within a traditionally Buddhist framework. In lieu of pursuing this broader question, I'd also be interested in conducting a research study that utilizes first-person, real-time reporting of mental activity to inform interpretation of EEG data (as performed in Lutz et al., 2004) or a study that investigates whether a secular or religious presentation of a contemplative practice alters its efficacy. Regardless, all of these projects demand a thorough understanding of psychological research methods, contemplative philosophy, and neuroanatomy, which this major would provide.

**Designing the Contemplative Neuroscience Major**

The first and most prominent undergraduate program in the field of contemplative neuroscience is Brown University's major in Contemplative Studies. Established in 2014, Contemplative Studies at Brown investigates the phenomenological, philosophical, and scientific bases of contemplative experiences (Brown University, n.d., "The Rationale Behind Contemplative Studies"). Students pursue either a Humanities or Sciences track that provides an intensive grounding in the humanistic or scientific underpinnings of contemplative practices, while also ensuring a firm foundation in whichever discipline is not the main focus (Roth, 2008).

The Sciences track contains 12 courses: 7 science-based, 2 humanities-based, 2 cross-disciplinary, and 1 devoted to thesis. Acceptable science coursework includes psychology (research design, computational methods, cognition, social psychology), neuroscience (neural systems, neuroscience methods), biology (biochemistry, physiology), and public health (social determinants of health, health interventions). Students *must* take one statistics course and one course with laboratory experience. The humanities requirement allows coursework in religion (contemplative traditions and practices) and philosophy (self, happiness, ethics, dialogue between religion and science). Cross-disciplinary courses integrate scientific and humanistic perspectives, which the thesis then synthesizes in a culminating project. This curriculum remains the guiding framework for most undergraduate programs in this field (Brown University, n.d., "Our History and Mission"; Komjathy, 2017).

The interdisciplinary major I propose is modeled assiduously upon the Sciences track of Brown's Contemplative Studies major, with small adjustments for differences between Brown and Colorado College. CC does not offer courses that explicitly synthesize contemplative and scientific perspectives, but it does have an extremely robust neuroscience and psychology department, an unusual depth of Buddhism coursework for a smaller college, and generous, dedicated faculty who are well-equipped to lend their skills and expertise to this pursuit. Ultimately, the Contemplative Neuroscience IDM will integrate the scientific investigation of mind (biology, psychology, and neuroscience) with the Buddhist contemplative tradition and situate this discourse within a broader societal context.

For the purposes of graduate or medical study, I am supplementing classes in this major with additional coursework in the following areas: general chemistry (pre-med requirement), organic chemistry (pre-med), biochemistry (pre-med), psychology (pre-med and/or graduate studies), and faculty-mentored psychological research (pre-med and/or graduate studies).

**Appendix A:**

Contemplative Neuroscience Organizations and Programs

**University-Based Research Centers:**

- Stanford University (*The Center for Compassion and Altruism Research and Education*)
- Harvard University (*Mind/Brain/Behavior Interfaculty Initiative*)
- Emory University (*Center for Contemplative Science and Compassion-Based Ethics*)
- University of Oxford (*Oxford Mindfulness Center*)
- University of Virginia (*Contemplative Sciences Center*)
- University of California Berkeley (*Greater Good Sciences Center*)
- University of California Los Angeles (*Mindful Awareness Research Center*)
- University of Wisconsin-Madison (*Center for Healthy Minds*)
- University of Michigan (*Program in Creativity and Consciousness Studies*)
- University of Ottawa (*Academy for Mindfulness and Contemplative Studies*)
- University of Colorado Boulder (*Contemplative Resource Center*)
- University of Southern Maine (*Bertha Crosley Ball Center for Compassion*)
- Oregon State University (*Contemplative Studies Initiative*)
- Naropa University (*Center for the Advancement of Contemplative Education*)
- West Chester University (*Center for Contemplative Studies*)

**Other Research and Educational Organizations**

- The Mind & Life Institute
- The Contemplative Studies Project of New York (*CSPNYC*)
- The Santa Barbara Institute for Consciousness Studies (*SBI*) and Center for Contemplative Research (*CCR*)
- The Center for Contemplative Mind in Society (*CMind*) and Association for Contemplative Mind in Higher Education (*ACMHE*)
- The American Mindfulness Research Association (*AMRA*)
- The Compassion Institute
- The Institute for Noetic Sciences (*IONS*)

**Medical School Programs**

- Brown Warren Alpert Medical School (*Concentration in Integrated Health and Contemplative Practice*)
- Stanford Medical School (*Contemplation by Design Initiative*)
- Harvard Medical School (*Mind-Body Studies*)
- Brigham and Women's Hospital (*Osher Center for Integrative Medicine, partnered with Harvard Medical School*)
- University of Pennsylvania (*Penn Mindfulness Program*)
- University of Virginia School of Nursing (*Compassionate Care Initiative*)

- University of California San Diego (*UCSD Center for Mindfulness*)
- University of California San Francisco (*Osher Center for Integrative Medicine*)

**Undergraduate Programs and Initiatives:**

- Brown University (*Contemplative Studies; major*)
- University of Michigan (*Jazz and Contemplative Studies; major*)
- University of Virginia (*Health and Well-Being; minor*)
- Syracuse University (*Mindfulness and Contemplative Studies; minor*)
- Rice University (*Contemplative Studies; focus*)
- University of Redlands (*Contemplative Education; focus*)
- University of North Carolina, Asheville (*Contemplative Inquiry; certificate*)
- New York University (*MindfulNYU; campus initiative*)
- Texas Christian University (*Contemplative Studies; campus initiative*)
- Dartmouth College (*Contemplative Studies; conference*)
- University of San Diego (*Contemplative Studies; upcoming program*)

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INDEPENDENTLY DESIGNED MAJOR

**IDM Application (Part 3 of 4)**
Plan of study

The plan of study should be submitted as part of a student's IDM application. It may be submitted in paper format to the IDM office (Dr. Aaron Stoller, 230bTutt Library) or scanned and emailed with signatures to astoller@coloradocollege.edu. **The plan of study includes two parts: this fillable course grid (below) and an annotated list of courses (described on the second page of this document).** When constructing your course grid, please pay close attention to the major requirements listed on the IDM website.

**Student name:** _____ **IDM title:** Contemplative Neuroscience

**IDM course grid**

Please list your intended schedule at-a-glance. The grid should include those courses you previously completed and will count toward the IDM, as well as any new courses you intend to take that will count toward the IDM.

| Academic year | Block | Course number | Course Title | Grade Track | Units |
|---|---|---|---|---|---|
| 2019-2020 | 8 | RE200 | Topics in Religion: Politics, Religion & the Secular | Letter Grades | 1.0 |
| 2020-2021 | 1-2 | PY202 | Research Design | Letter Grades | 2.0 |
| 2020-2021 | 5 | RE170 | Buddhism | Letter Grades | 1.0 |
| 2020-2021 | 8 | MB131 | Introduction to Molecular and Cellular Biology | Letter Grades | 1.0 |
| 2021-2022 | 1-2 | PY299 | Neuroscience | Letter Grades | 2.0 |
| 2021-2022 | 5 | HK204 | Introduction to Human Anatomy | Letter Grades | 1.0 |
| 2021-2022 | 6 | RE101 | Introduction to Religious Studies | Letter Grades | 1.0 |
| 2022-2023 | 8 | RE371 | Seminar in Buddhist Practice | Letter Grades | 1.0 |
| 2022-2023 | 1 | RE405 | Independent Study | Letter Grades | 1.0 |
| 2022-2023 | 4 | PY433 | Neuropharmacology | Letter Grades | 1.0 |
| 2022-2023 | 6 | SO246 | Sociology of Health and Medicine | Letter Grades | 1.0 |
| 2022-2023 | 7 | GS400 | Senior Thesis I | Letter Grades | 1.0 |
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Total units: 14.0

**Contemplative Neuroscience: Coursework**

The proposed major contains 14 units, thesis included. Below each course title is a brief description of class topics and their relevance to the Contemplative Neuroscience IDM. All courses are offered yearly unless otherwise indicated.

** indicates courses I have already completed.*
*** indicates courses I have enrolled in for 2021.*

- Biomedical Perspective: Aligned with the Sciences track of Brown University's Contemplative Studies major, these courses examine the biological, psychological, and neurological bases of mind, along with pertinent research methods (7 units).

    - ****MB131: Introduction to Molecular and Cellular Biology** | *CH107
        - Explores cell structure and function in context of cellular interactions, with emphasis on experimental methods. Provides crucial background for understanding neuron-neuron interactions.
    - ***PY202: Research Design** [2 units] | *PY100
        - Fosters critical analysis and skilled implementation of human-focused research through an understanding of inferential statistics and experiment design.
            - Psychological Research Competency: delves deeply into key theories and methods underpinning the practice of human-based research.
    - **PY299: Neuroscience** [2 units] | *PY100
        - Critically evaluates the neurological underpinnings of mind, including gross anatomy, physiology, and neuropharmacology.
    - **HK204: Introduction to Human Anatomy** | PY299
        - Examines the physical structure of the human body: nervous, circulatory, digestive, and skeletomuscular systems. Cadaver-based lab course.
    - **PY433: Neuropharmacology** | *PY202 + PY299
        - Examines cellular, network, systems, and behavioral pharmacology in the interest of integrating varied scientific perspectives on neural activity

- Contemplative Traditions and Modern Integration: These courses examine Buddhism, the foremost contemplative tradition in this interdisciplinary dialogue, as well as the modern societal context in which it is understood and studied (6 units).

    - **RE101: Introduction to Religious Studies**
        - Critically examines the contemporary study of religion, with emphasis on the many interdisciplinary paradigms through which religion is defined and contextualized.

- Religious Studies Competency: this course provides a detailed foundation in diverse methods and perspectives used to analyze religion; it also elucidates the theories underpinning these methods.

- ***RE170: Buddhism**
  - Explores the foundations of Buddhist philosophy and practice; essential for understanding the traditional contexts in which some meditative practices originated.
- **RE371: Seminar in Buddhist Practice** | *RE170 | next offered Spring 2022
  - Builds upon RE170 to thoroughly investigate practices or themes within a specific Buddhist tradition. Includes detailed discussion of Buddhist psychology. ***NOTE**: RE170 and RE371 are necessary to provide sufficient grounding in the Buddhist tradition as context, but do not go into adequate depth regarding key topics for this major (see Independent Study below).
- **RE405: Independent Study / Senior Thesis Preparation** | RE372
  - Synthesizes background from RE170 and RE371 to inform a focused examination of Buddhist philosophy of mind most relevant to thesis. Specific topic to be developed with advisor David Gardiner.
- ***RE200: Politics, Religion & the Secular** | *PS150 or COI
  - Critically examines the perception of religion in the modern secular world, especially in relation to Western ideas of toleration, ethics, and "progress." Crucial for understanding contemplative neuroscience in its overarching societal context and for reflecting on meanings of "secularity."
- **SO246: Sociology of Health and Medicine** | Sociology course or COI
  - The healthcare industry is vital to examine because it motivates contemplative neuroscience research and incorporates contemplative interventions. This class evaluates modern healthcare through the lens of social, political, and economic determinants and inequities.

- Senior Thesis (1.0 unit)
  - **GS400: Senior Thesis I** | Senior Standing
    - Synthesizes cross-disciplinary understanding to produce an integrative, original project. This course is the culmination of the Independently Designed Major.