



**The Center for Compassion and Altruism
Research and Education**
Studying How Compassion
Manifests in the Brain

THE
STANFORD
CHALLENGE

Seeking Solutions, Educating Leaders

“If you want others to be happy, practice compassion. If you want to be happy, practice compassion.”

His Holiness the Dalai Lama

The Center for Compassion and Altruism Research and Education

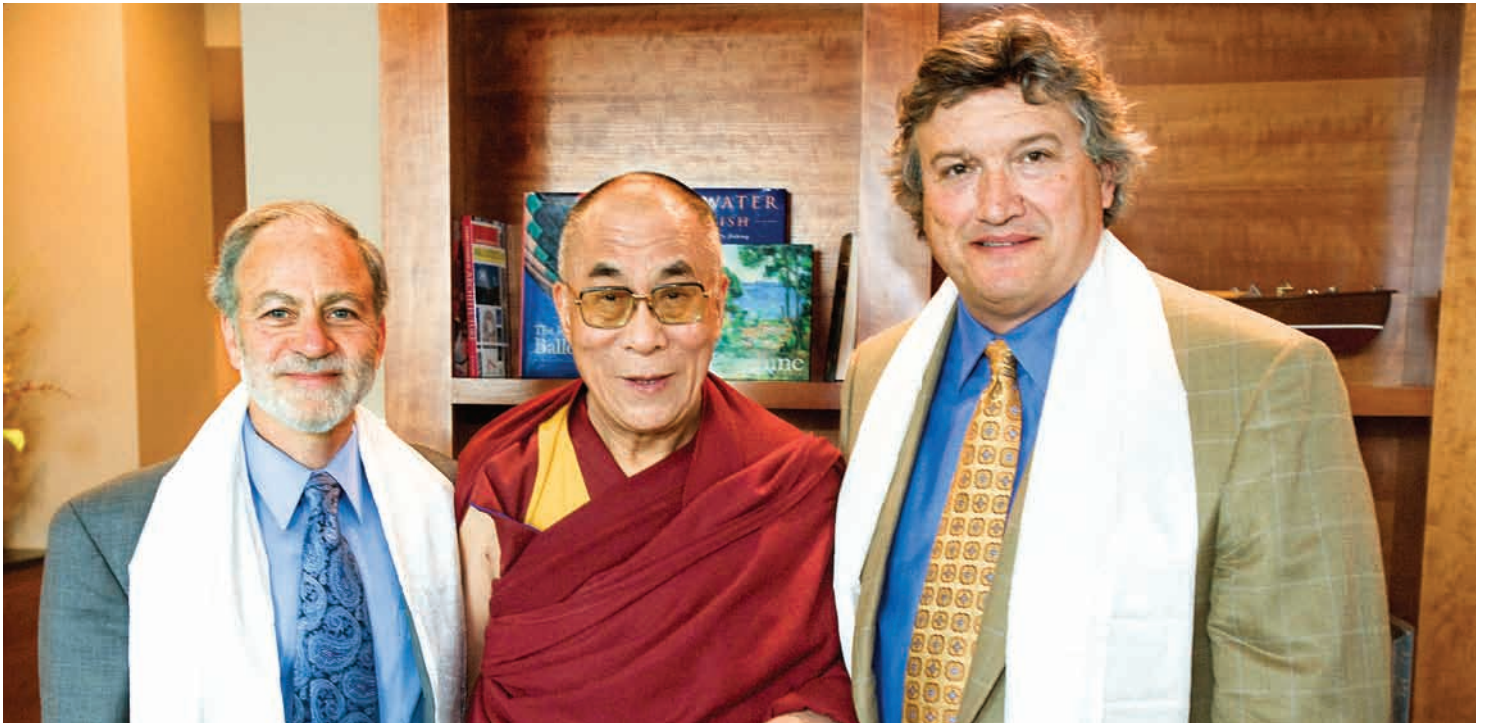
Studying How Compassion Manifests in the Brain



Scientists have made great strides in understanding and treating pathologies of the human mind, thanks to recent advancements in medical and cognitive sciences. They have, until recently however, largely avoided examining behaviors such as moral cognition, altruism, and compassion because it is extremely difficult to objectively measure and quantify complex brain mechanisms. Comprehending why or why not humans exhibit compassion or altruism would require a unique collaboration between scientists, who study the brain using objective measures, and practitioners of meditation, who study the mind using first-person subjective observation, as in the Buddhist and other contemplative traditions that have a long history of investigation into the nature of mind.

The Center for Compassion and Altruism Research and Education (CCARE), a program of the Stanford Institute for Neuro-Innovation & Translational Neurosciences (SINTN), has taken on the mission of not only scientifically studying the neural, mental, and social basis of compassion and altruistic behavior, but also exploring testable cognitive and affective training exercises through which individuals and societies can learn to employ these complex behaviors.

Merriam-Webster's Collegiate Dictionary, Eleventh Edition, defines compassion as the sympathetic consciousness of others' distress together with a desire to alleviate it.



HIS HOLINESS THE DALAI LAMA MET WITH GARY STEINBERG, MD, PHD, THE BERNARD AND RONNI LACROUTE—WILLIAM RANDOLPH HEARST PROFESSOR OF NEUROSURGERY AND THE NEUROSCIENCES (LEFT), AND JAMES DOTY, MD, CLINICAL PROFESSOR OF NEUROSURGERY AND FOUNDER/DIRECTOR OF CCARE, TO DISCUSS CCARE AND THE CONCEPT OF RIGOROUS SCIENTIFIC STUDY OF COMPASSION AND ALTRUISM IN THE CONTEXT OF SECULAR, UNIVERSAL ETHICS.

BACKGROUND

The roots of CCARE can be traced to a historic visit by His Holiness the Dalai Lama to Stanford University in October 2005, hosted by Philip A. Pizzo, MD, dean of Stanford University School of Medicine and the Carl and Elizabeth Naumann Professor, and the Rev. Scotty McLennan, Stanford's dean for religious life. The Dalai Lama and other contemplative scholars engaged in a dialogue with scientists—representing such diverse fields as neuroscience, psychology, and medical science—on a range of questions pertaining to human suffering, especially depression, and the problems of craving and addiction. This discourse resulted in the recognition that a deep engagement between science, especially the cognitive science disciplines of neuroscience and psychology, and Buddhism and other contemplative traditions could make significant contributions toward a deeper understanding of many important aspects of the human mind and emotion.

Based on his own interests and recognizing the historic nature of this conversation between scientists and the Dalai Lama, James Doty, MD, a Stanford professor of neurosurgery, entrepreneur, and philanthropist, proposed the establishment of a center for the scientific study of compassion and altruistic behavior and provided the seed funding. A portion of this funding was used to invite Thupten Jinpa Langri, PhD, a noted contemplative scholar and translator to the Dalai Lama, to Stanford as a visiting scholar. Subsequently, Langri was invited to join CCARE as principal contemplative scholar and as a member of its executive committee. Thus, CCARE came into being—under the leadership of Doty, and with strong encouragement and support from Gary Steinberg, MD, PhD, director of SINTN and chair of the Department of Neurosurgery, and William Mobley, MD, PhD, the John E. Cahill Family Professor.

WHY STUDY COMPASSION?

Compassion is a natural quality of the mind. It is a mental state focused on others' pain or suffering and is coupled with a wish or aspiration to see their suffering alleviated. The overarching goal of the CCARE studies is to determine whether individuals can be taught to be more compassionate and altruistic, which we believe has the potential to create long-term happiness. Studying the neural components engaged in compassion may have implications for a variety of domains of human experience, including applications for health and basic wellness, as well as for broader societal issues.



MARK TUSCHMAN PHOTOGRAPHY

CHADE-MENG TAN, “JOLLY GOOD FELLOW” AT GOOGLE, SAYS HIS GIFT TO CCARE WAS MOTIVATED BY A DESIRE TO PROMOTE WORLD PEACE, WHICH “CAN ONLY HAPPEN WHEN PEOPLE HAVE INNER HAPPINESS AND INNER COMPASSION.”



MARK ESTES PHOTOGRAPHY

CCARE BENEFACTOR AND ACCURAY CHAIRMAN **WAYNE WU** WAS INSPIRED BY ITS GOALS AND BY THE DALAI LAMA'S SUPPORT OF THE CENTER.

BENEFACTORS OF CCARE

Soon after James Doty, MD, provided the initial funding for the creation of CCARE, he and key personnel from Stanford met with the Dalai Lama to discuss the center and the concept of the rigorous scientific study of compassion and altruism in the context of secular, universal ethics. As a result of this meeting, His Holiness contributed to the endeavor, this donation being the largest personal donation he has ever given to scientific research. He also agreed to participate in a scientific symposium focused on compassion and altruism that will be held at Stanford University in October 2010.

Two San Francisco Bay Area philanthropists, Chade-Meng Tan and Wayne Wu, have also made generous gifts to CCARE.

OBJECTIVES OF CCARE

The goal of CCARE is to create a community of scholars and researchers, including neuroscientists, psychologists, neuroeconomists, and contemplative scholars. Drawing from these different disciplines, investigators at the center will strive to gain a deep understanding of compassion and its associated human behaviors in all their richness. An important aspect of CCARE will be to critically engage with Buddhist and other contemplative traditions that contain a rich mental taxonomy and, more importantly, clearly delineate mental cultivation techniques aimed at developing and enhancing specific qualities of the human mind and heart.

The vision for CCARE is to:

- Use rigorous scientific methods to define the neural basis for compassion and altruistic behavior
- Serve as a major hub for a scientific study of compassion and altruistic behavior both nationally and internationally
- Create tools to allow individuals to potentiate feelings of compassion and altruism
- Encourage and support collaborative research on compassion among a variety of disciplines
- Disseminate research findings on an international scale using a number of media forums

Our earliest experiments would include in-depth studies of the biobehavioral and neural circuit expressions of subjects experiencing compassion. This would involve experiments on adepts, who have engaged in many hours of deliberate cultivation of compassion, as well as normal subjects. Among others, visual stimuli can be used to engage subjects' attention and focus on objects likely to evoke compassion. The aim is to use brain imaging techniques such as functional magnetic resonance imaging (fMRI) to understand the complex brain mechanisms that underlie compassion and are activated when a person feels compassion. We will also examine the effects of a specifically designed compassion training program on normal subjects. This is intended to help explore the question of which compassion associated neural circuits may be more amenable to training and cultivation. In addition, we will examine mechanisms underlying altruistic giving, utilizing established neuroeconomic techniques to determine the neural bases of such behavior and the factors that influence altruistic behavior.



THUPTEN JINPA LANGRI, PHD, NOTED CONTEMPLATIVE SCHOLAR AND ENGLISH TRANSLATOR TO THE DALAI LAMA, IS VISITING RESEARCH SCHOLAR AT CCARE AND MEMBER OF THE CENTER'S EXECUTIVE COMMITTEE. HE DEFINES COMPASSION AS "COMPLETELY DIFFERENT FROM PITY AND DEVOID OF ANY HINT OF BEING PATRONIZING OR ASSUMING A SENSE OF SUPERIORITY. IT IS BASED UPON THE SIMPLE RECOGNITION THAT SOMEONE ELSE'S SUFFERING IS AKIN TO ONE'S OWN SUFFERING, AND IT ENTAILS THE WISH THAT THIS PERSON OR BEING BE FREE OF PAIN AND SORROW."

COMPASSION MEDITATION

Compassion presupposes the connection of the individual to another as a result of the latter's suffering. Compassionate people, such as Mother Teresa and the Dalai Lama, spontaneously feel a connection to anybody they meet. This connection can be cultivated through a major Buddhist contemplative practice, compassion meditation.

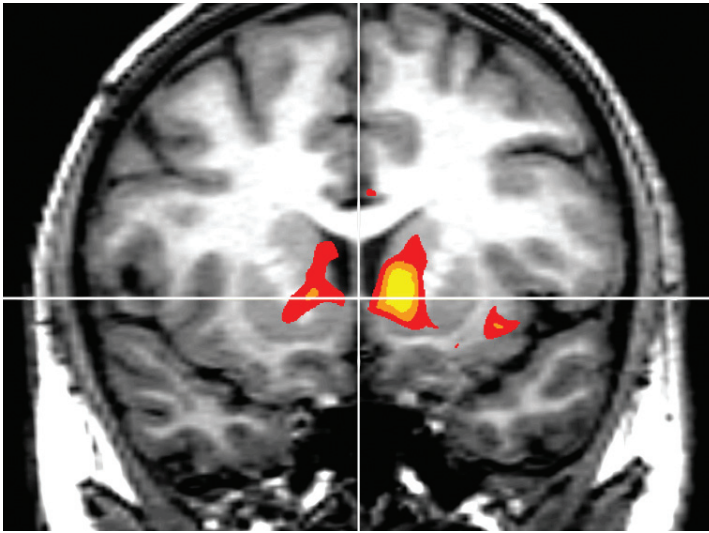
While neuroscientists have been researching the health and psychological benefits of mindfulness meditation, compassion meditation remains largely unexplored. Compassion-based techniques are designed to help overcome prejudice and facilitate greater connection with and empathy for others. These techniques thus might have a substantial impact both on individuals—through the reduction of stress, increases in emotional awareness, and sense of well-being—as well as society—by promoting a deeper appreciation of others and thereby increasing harmony.

The core of compassion meditation involves focusing first on a loved one and wishing for that person to be relieved of pain and sorrow, and then extending this to strangers, adversaries, and even the entire sentient world. This is based on initially developing greater sensitivity to one's own suffering, the causes of that suffering, and the wish to be free of suffering. A more advanced practice (tonglen meditation) involves visualization of giving happiness and joy to others and taking suffering and unhappiness from others and dissolving it into a white orb of light at one's heart. These practices are thought to engender compassionate attitudes and behaviors toward others, and can be cultivated through practice.

As investigators begin work on research projects sponsored by CCARE, they will at first utilize a comprehensive protocol for compassion cultivation training, developed by Thupten Jinpa Langri, PhD. Though drawn from classical Buddhist compassion meditation practices, this protocol distills the essential training in a manner compatible with secular, universal ethical principles, and does not involve in any way specific beliefs of any religious tradition.

COMPASSION CULTIVATION PROTOCOL

For the purpose of studying the effects of deliberate cultivation of compassion, Langri has developed a meditation protocol specifically for the cultivation of compassion—a genuine wish for others, ideally for all beings, to be relieved of suffering. It may be used as a six- or eight-week course, comprising a two-hour instruction, discussion, and guided group meditation session, complemented by a 20- to 30-minute follow-up daily meditation at home. The protocol is based on a standard compassion meditation practice in the Tibetan Buddhist tradition. It is a step-by-step approach that progressively moves from dealing with our habitual tendency toward indifference for the neutral and dislike toward our adversaries to generating an affective state that wishes all beings, including our foes, to be relieved of suffering. This protocol has been specifically developed to be used by people from diverse backgrounds—ethnic, religious, and cultural. In designing this protocol, careful attention has been paid to ensure that the practices presented in it are not linked to any metaphysical belief system.



BRIAN KNUTSON

IN THE FMRI IMAGE ABOVE, SPECIFIC AREAS OF THE BRAIN ARE ACTIVATED, INCLUDING THE NUCLEUS ACCUMBENS AND CAUDATE NUCLEI. THESE AREAS OF THE BRAIN HAVE BEEN SHOWN TO BE RELATED TO ANTICIPATION OF PLEASURE AND PAIN. BRIAN KNUTSON, PHD, ANTICIPATES THESE SAME AREAS WILL BE RECRUITED DURING THE EXERCISE OF COMPASSION, WHEN THE BRAINS OF THOSE ADEPT IN COMPASSION MEDITATION ARE SCANNED.



MARK ESTES PHOTOGRAPHY

AFFECT IS ONE OF FOUR COMPONENTS OF COMPASSION. JEANNE TSAI, PHD, USES A VARIETY OF RESEARCH METHODS TO COMPARE PEOPLE'S AFFECT (EMOTIONS, MOODS, AND OTHER FEELING STATES) WITHIN AND ACROSS CULTURES. TSAI'S PROJECT WILL EXAMINE WHETHER RECEIVING COMPASSION CULTIVATION TRAINING WILL RENDER AN INDIVIDUAL MORE COMPASSIONATE.

RESEARCH PROJECTS

CCARE's executive committee has initiated six major research projects on compassion and altruism. These include:

- Two basic science research experiments aimed at understanding the neural underpinnings of the experience of compassion and other associated mental states
- Two projects that relate to understanding the efficacy of deliberate compassion training and its effects in specific areas—including empathy, prosocial behavior, overcoming prejudices, and generating a deeper sense of connection with others
- A project examining how people's perceptions of compassion and heroism converge
- The application of a revolutionary technology to probe the neural circuitry believed to be associated with compassion

Neural Correlates of Compassion in Buddhist Adepts and Novices

Led by noted Stanford psychologist and neuroscientist Brian Knutson, PhD, the goal of this research is to characterize neural correlates of components of compassion in volunteers with extensive training in compassion meditation ("adepts") and meditation-naïve age- and gender-matched volunteers ("novices") using fMRI.

The researchers anticipate being able to localize critical neural components involved in the exercise of compassion. These studies will establish an fMRI protocol that can be extended to other adepts (e.g., from other countries and traditions), and which could be used to assess the efficacy of compassion training. In addition, the studies will build bridges between Buddhist theory and neuroscientific findings.

Does Meditation Increase Compassion? A Psychological Research Study

In previous studies, Stanford psychologist Jeanne Tsai, PhD, found that subjects who took mindfulness meditation training showed increased compassionate behavior compared to a control group not given any training, but similar to a group that took an improvisational theater class. In this study, she will examine whether compassion meditation will increase the different components of compassion more than no training, an improvisational theater class, and a mindfulness meditation class. The improvisational theater class will serve as a control course—like the meditation courses, the improvisational theater class is social and teaches students a new skill.

Based on previous findings, Tsai predicts that participants in the compassion meditation class will be more compassionate than those in the improvisational theater and mindfulness meditation classes, while those receiving no training will register the least compassion.



NEUROECONOMISTS WILLIAM HARBAUGH, PHD (CENTER), AND JIM ANDREONI, PHD (LEFT), AND PSYCHOLOGIST ULRICH MAYR, PHD, HOPE TO HELP CHARITIES DEVISE WAYS TO MITIGATE THE POTENTIALLY NEGATIVE RESPONSES TO SOME KINDS OF CHARITY BY SOME RECIPIENTS. THEY PREDICT THEIR RESEARCH WILL PROVIDE NEURAL EVIDENCE OF THE IMPORTANCE OF LETTING RECIPIENTS OF CHARITABLE HELP KNOW THAT THEY WILL HAVE A CHANCE TO GIVE BACK TO OTHERS SOMETIME IN THE FUTURE.

Is It Better to Give or to Receive? A Neuroeconomic Research Study

Although every charitable act involves a recipient and a giver, almost all scientific work on altruism has so far focused on giving. This research, being undertaken by William Harbaugh, PhD, and Ulrich Mayr, PhD, of the University of Oregon, Jim Andreoni, PhD, of UC San Diego, and James Doty, MD, is designed to provide a neural explanation for what goes on inside the brains of beneficiaries of charity. Knowledge about how recipients feel about receiving help can guide more effective and more genuinely altruistic methods of giving.

This experiment is designed to determine whether recipients of charity care about how they became eligible for the aid and how much the aid to them costs others. The investigators have devised an fMRI experiment to compare areas and intensity of neural activation in response to the source of charity. If the neural data corroborate behavioral data gathered in earlier studies, the results may significantly change the calculus for donors who want their charity to be effective and generous, in the sense of truly helping the recipients.

A Multimodal Study of the Neural Correlates of Experiencing Admiration and Compassion

Admiration for virtue and compassion for social and psychological pain constitute highly complex mental phenomena, probably unique in their full form to adult humans, and important for social and moral functioning. In this study, Stanford's Josef Parvizi MD, PhD, and Mary Helen Immordino-Yang, EdD, of University of Southern California will use fMRI BOLD signals to determine the neural correlates and functional dynamics of the brain regions involved with admiration and compassion. Interestingly, examining relationships between BOLD and neuronal electrophysiological activity during the feeling of admiration and compassion will



PHILIPPE GOLDIN, PHD, STUDIES THE EFFECT OF MINDFULNESS MEDITATION AND COGNITIVE BEHAVIORAL THERAPY ON EMOTIONAL REACTIVITY, EMOTION REGULATION, ATTENTION REGULATION, COMPASSION, AND QUALITY OF FAMILY INTERACTIONS.

result in important methodological contributions, correlating participants' subjective reports and time-synched neural recordings will mark a new advance in studying the complex, distributed patterns of neural activity that underlie the subjective psychological experiences of admiration and compassion—arguably pinnacle achievements of the human mind.

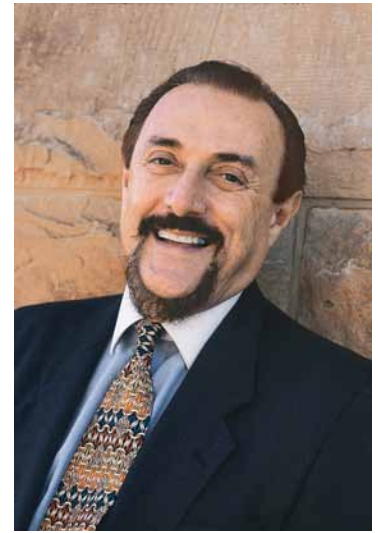
Investigating the Differential Psychological Mechanisms of Compassion versus Emotion Intelligence Training

The goal of meditation training is to increase psychological flexibility, reduce habitual response patterns, and enhance insight into how the mind functions. In general, meditation practices are associated with an increased ability to focus attention, decrease in frequency and potency of irrelevant or distracting thoughts and behaviors, enhanced mental stability, physical and mental relaxation, stress reduction, and psycho-emotional stability. While studies have examined the behavioral effects of meditation, few have investigated psychological mechanisms that might explain how and why specific meditation practices work.

Stanford research scientist Philippe Goldin, PhD, in collaboration with Doty and Chade-Meng Tan at Google University, have designed a study to investigate the differential mechanisms of compassion (CT) and emotional intelligence training (SIY) on Google employees at Google University. Examining how SIY and CT differ in their impact on anxiety, wellbeing, prosocial behavior, and work performance, and their differential impact on emotional reactivity, emotion regulation, and compassion, will deepen our understanding of mechanisms underlying these distinct contemplative training programs. Findings from this study will allow us to refine our models of how these programs work, shed new light on the malleability of emotion and emotion regulation processes, and provide a more substantial empirical foundation for the application of SIY and CT to clinical populations.



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NITA WINTER

KARL DEISSEROTH, MD, PHD, TREATS PATIENTS AND DEVELOPS MOLECULAR AND CELLULAR TOOLS TO REENGINEER BRAIN CIRCUITS. OPTOGENETICS, A TECHNOLOGY DEVELOPED IN HIS LAB, CAN BE USED TO CONTROL THE BEHAVIOR OF GENETICALLY ENGINEERED MICE WITH MILLISECOND PULSES OF LIGHT THAT TURN NERVE CELLS ON AND OFF.

PHILIP G. ZIMBARDO, PHD, (ABOVE RIGHT) STANFORD PROFESSOR EMERITUS OF PSYCHOLOGY, IS INTERESTED IN THE LINKS BETWEEN HEROISM, ALTRUISM, AND COMPASSION.

Convergences Between Heroism, Compassion, and Altruism

Stanford professor emeritus of psychology Philip G. Zimbardo, PhD, in collaboration with Doty, will conduct several surveys to probe the perceptions that regular citizens have about heroism, altruism, and compassion. Related experiments will focus on the behavioral precursors of defying unjust authority and becoming a whistle-blower hero. He will also examine heroism in ex-gang members.

One survey will study perceptions people have of the nature of actions described as altruistic and/or heroic when practiced by policemen, firefighters, military personnel, or ordinary citizens. A content analysis of those acts will establish people's definition of heroism by specific behaviors.

In one experiment, subjects will be asked to force performers to endure a hostile work situation. In a companion experiment, others will view videos from the first study. Subjects in both studies will have opportunities to either disobey the researchers' instructions or report their practices, i.e. exhibit whistle-blower heroism. Can the subjects' courage be predicted based on their scores on measures of empathy, compassion, and altruism?

Ex-gang members in Los Angeles and Oakland who have risked their lives and taken a heroic stance against other gangs will be interviewed. A documentary film will be produced based on this project.

Neural Networks of Social Compassion and Nurturing: Optical Deconstruction of Altruistic Behavior

Stanford psychiatrist and bioengineer Karl Deisseroth, MD, PhD, has invented a new field called optogenetics, combining optics and genetics to probe mammalian neural circuits at the high speeds (millisecond timescale) needed to understand brain information processing. Deisseroth and Doty propose to use this technology to study the neural basis of social compassion in the mammalian brain. The goal is to define the causal neural codes underlying the most fundamental of mammalian social behaviors.

The investigators will use the optogenetic tools to see if they can switch on the social behavior associated neural networks in mutant mice with altered social behavior. They will also analyze changes in the mice's social approach, social novelty, and social communication.

DESIRED OUTCOMES

The insights we may gain through our work could help devise methods that allow humans to increase their compassion and empathy, to limit suffering, and to expand the ability to make good choices, such as those that help enhance greater understanding of each other and greater cooperative behavior. The ultimate goal of CCARE is to use research advances to create tools that allow humans to become more compassionate and to engage more readily in altruistic behaviors toward themselves and others. We desire to empower people to live richer, more meaningful lives characterized by generosity of thought and action — in essence to lead compassionate lives.



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