Shared Representations

Socially situated thought and behaviour are pervasive and vitally important in human society. The social brain has become a focus of study for researchers in the neurosciences, psychology, biology and other areas of behavioural science, and it is becoming increasingly clear that social behaviour is heavily dependent on shared representations. Any social activity, from a simple conversation to a well-drilled military exercise to an exquisitely perfected dance routine, involves information sharing between the brains of those involved. This volume comprises a collection of cutting-edge essays centred on the idea of shared representations, broadly defined. Featuring contributions from established world leaders in their fields and written in a simultaneously accessible and detailed style, this is an invaluable resource for established researchers and those who are new to the field.

SUKHVINDER S. OBHI is Associate Professor in the Department of Psychology, Neuroscience and Behaviour at McMaster University, Canada.

EMILY S. CROSS is Professor of Cognitive Neuroscience in the School of Psychology at Bangor University, Wales.

CAMBRIDGE SOCIAL NEUROSCIENCE

The field of social neuroscience has seen a remarkable rise in recent decades. This series of books, written by internationally known scholars from a variety of disciplines and combining cutting-edge research and theory in the field, provides researchers and students with an in-depth introduction to key topics in social neuroscience.

Titles published in the series:

Shared Representations: Sensorimotor Foundations of Social Life edited by Sukhvinder S. Obhi and Emily S. Cross

Shared Representations

Sensorimotor Foundations of Social Life

Edited by

Sukhvinder S. Obhi

and

Emily S. Cross

CAMBRIDGE
UNIVERSITY PRESS

CAMBRIDGE
UNIVERSITY PRESS

University Printing House, Cambridge CB2 8BS, United Kingdom

Cambridge University Press is part of the University of Cambridge.

It furthers the University's mission by disseminating knowledge in the pursuit of education, learning and research at the highest international levels of excellence.

www.cambridge.org
Information on this title: www.cambridge.org/9781107690318

First published 2016

Printed in the United Kingdom by TJ International Ltd. Padstow Cornwall

A catalogue record for this publication is available from the British Library

Library of Congress Cataloging-in-Publication Data
Names: Obhi, Sukhvinder S., editor. | Cross, Emily, editor.
Title: Shared representations : sensorimotor foundations of social life / edited by Sukhvinder S. Obhi and Emily S. Cross.
Description: Cambridge, United Kingdom : Cambridge University Press, 2016. | Includes bibliographical references and index.
Identifiers: LCCN 2016025955 | ISBN 9781107050204 (hardback : alk. paper)
Subjects: LCSH: Social representations. | Social perception. | Social psychology.
Classification: LCC HM1088 .S53 2016 | DDC 302–dc23
LC record available at https://lccn.loc.gov/2016025955

ISBN 978-1-107-05020-4 Hardback
ISBN 978-1-107-69031-8 Paperback

Contents

Colour plates can be found between pages 290 and 291.

Figures

Tables

Boxes

Contributors

CATERINA ANSUINI Department of Robotics, Brain and Cognitive Sciences, Italian Institute of Technology, Genova, Italy

LARA BARDI Department of Experimental Psychology, University of Gent, Belgium

CRISTINA BECCHIO Department of Robotics, Brain and Cognitive Sciences, Italian Institute of Technology, Genova, Italy and Centre for Cognitive Science, Department of Psychology, University of Torino, Torino, Italy

CESARE BERTONE Centre for Cognitive Science, Department of Psychology, University of Torino, Torino, Italy

GEOFFREY BIRD Institute of Psychiatry, King's College London, UK

MARCEL BRASS Department of Experimental Psychology, University of Gent, Belgium

REBECCA BREWER Institute of Psychiatry, King's College London, UK

JOHN T. CACIOPPO University of Chicago, US

STEPHANIE CACIOPPO University of Chicago, US

BEATRIZ CALVO-MERINO Cognitive Neuroscience Research Unit, Psychology Department, School of Arts and Social Science, City University London and Psychology Department, Universidad Complutense de Madrid, Spain

DANA CASPERSEN Forsythe Company, Dresden, Germany

CAROLINE CATMUR Institute of Psychiatry, Psychology and Neuroscience, King's College London, UK

ANDREA CAVALLO Centre for Cognitive Science, Department of Psychology, University of Torino, Torino, Italy

MICHEL-PIERRE COLL School of Psychology, Université Laval, Center for Interdisciplinary Research in Rehabilitation and Social Integration (CIRRIS) and Québec's Institute of Mental Health Research Center (CRIUSMQ), Canada

DAVE COLLINS Institute of Coaching and Performance, University of Central Lancashire, UK

JENNIFER COOK Department of Psychology, School of Arts and Social Sciences, City University, UK

RICHARD COOK Institute of Psychiatry, King's College London, UK

EMILY S. CROSS Wales Institute for Cognitive Neuroscience, School of Psychology, Bangor University, UK and Department of Social and Cultural Psychology, Donders Institute for Brain, Cognition and Behaviour, Radboud University Nijmegen, the Netherlands

JOHN A. DEWEY Department of Cognitive Science, Central European University, Budapest, Hungary

GUILLAUME DEZECACHE Laboratoire de Neurosciences Cognitives (LNC) – INSERM U960, Département des études cognitives, Ecole Normale Supérieure – PSL Research University, Paris

THOMAS DOLK Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Germany

TERRY ESKENAZI Laboratoire de Neurosciences Cognitives (LNC) – INSERM U960, Département des études cognitives, Ecole Normale Supérieure – PSL Research University, Paris

EMMA FLYNN Centre for Coevolution of Culture and Biology, School of Education, Durham University, UK

JESSICA A. GRAHN Brain and Mind Institute, Department of Psychology, University of Western Ontario, Canada

MICHAEL S. A. GRAZIANO Department of Psychology, Princeton University, US

JULIE GRÈZES Laboratoire de Neurosciences Cognitives (LNC) – INSERM U960, Département des études cognitives, Ecole Normale Supérieure – PSL Research University, Paris

PAUL L. GRIBBLE Brain and Mind Institute, Department of Psychology, University of Western Ontario, Canada

KRISTA GRIGAITYTE Ahmanson-Lovelace Brain Mapping Cente, Brain Research Institute, Department of Psychiatry and Behavioral Sciences, David Geffen School of Medicine at UCLA, and University of Edinburgh, Scotland

PATRICK HAGGARD Institute of Cognitive Neuroscience, University College London, UK

ANTONIA HAMILTON Institute of Cognitive Neuroscience, University College London, UK

ANDY HILL Institute of Coaching and Performance, University of Central Lancashire, UK

MARCO IACOBONI Ahmanson-Lovelace Brain Mapping Center, Brain Research Institute, Department of Psychiatry and Behavioral Sciences, David Geffen School of Medicine at UCLA, US

PHILIP L. JACKSON School of Psychology, Université Laval, Center for Interdisciplinary Research in Rehabilitation and Social Integration (CIRRIS) and Québec's Institute of Mental Health Research Center (CRIUSMQ), Canada

PETER E. KELLER MARCS Institute, University of Western Sydney, Australia

A. KINGSTONE Department of Psychology, University of British Columbia, Canada

GÜNTHER KNOBLICH Department of Cognitive Science, Central European University, Budapest, Hungary

EDWARD KRAJKOWKSI George Washington University, Department of Anthropology; Center for the Advanced Study of Hominid Paleobiology, Department of Speech and Hearing Science, GW Institute for Neuroscience and Mind-Brain Institute, US

K. E. W. LAIDLAW Department of Psychology, University of British Columbia, Canada

DANIËL LAKENS Department of Industrial Engineering and Innovation Sciences, Eindhoven University of Technology, the Netherlands

JANEEN LOEHR Department of Psychology, University of Saskatchewan, Canada

STERGIOS MAKRIS Department of Psychology, Edge Hill University, UK

HEATHER MCGREGOR Brain and Mind Institute, Department of Psychology, University of Western Ontario, Canada

GIACOMO NOVEMBRE MARCS Institute, University of Western Sydney, Australia

SUKHVINDER S. OBHI Department of Psychology, Neuroscience and Behaviour, McMaster University, Social Brain, Body and Action Lab, Canada

JANINE OOSTENBROEK Department of Psychology, University of York, UK

GUIDO ORGS Department of Psychology, Brunel University and Institute of Cognitive Neuroscience, University College London, UK

HARRIET OVER Department of Psychology, University of York, UK

MARIA-PAOLA PALADINO Department of Social Psychology, University of Trento, Italy

CLARE PRESS Department of Psychological Sciences, Birkbeck, University of London, UK

WOLFGANG PRINZ Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Germany

ELIZABETH RENNER George Washington University, Department of Anthropology; Center for the Advanced Study of Hominid Paleobiology, Department of Speech and Hearing Science, GW Institute for Neuroscience and Mind-Brain Institute, US

DANIEL C. RICHARDSON Department of Experimental Psychology, University College London, UK

E. F. RISKO Department of Psychology, University of Waterloo, Canada

LUISA SARTORI Dipartimento di Psicologia Generale, Università di Padova, Italy

THOMAS SCHUBERT Department of Psychology, University of Oslo, Norway

NATALIE SEBANZ Department of Cognitive Science, Central European University, Budapest, Hungary

FRANCYS SUBIAUL George Washington University, Department of Anthropology; Center for the Advanced Study of Hominid Paleobiology, Department of Speech and Hearing Science, GW Institute for Neuroscience and Mind-Brain Institute, US

CAMERON R. TURNER Centre for Coevolution of Culture and Biology, School of Education, Durham University, UK

COSIMO URGESI Laboratorio di Neuroscienze Cognitive, Dipartimento di Scienze Umane, Universita degli Studi di Udine, Italy and Istituto di Ricovero e Cura a Carattere Scientifico 'E. Medea', Italy

CORDULA VESPER Department of Cognitive Science, Central European University, Budapest, Hungary

KRISTINA WACLAWIK Brain and Mind Institute, Department of Psychology, University of Western Ontario, Canada

SARAH WATSON Brain and Mind Institute, Department of Psychology, University of Western Ontario, Canada

JORINA VON ZIMMERMANN Department of Experimental Psychology, University College London, UK

Preface

State-of-the-art knowledge in cognitive neuroscience has emerged largely from the systematic study of individual performance in non-social tasks. Specifically, experimental psychology and human neuroscience have successfully elucidated many of the information-processing elements and neural mechanisms involved in tasks such as visual search, perception and categorisation of objects, memory for words, numbers and objects, and goal-directed actions. Building upon this established work, a significant effort is underway to create a cognitive neuroscience of *socially situated* thought and behaviour – or, in other words, a 'social' cognitive neuroscience. A key characteristic of this endeavour is the combination of psychological and neurophysiological perspectives and levels of analysis. Socially situated thought and behaviour are pervasive and vitally important in human society. Social cognitive neuroscience is a burgeoning field that focuses on key human abilities including, but not limited to, intuiting what others are thinking, empathising with others, understanding and predicting the behaviour of others, identifying the emotions of others, and solving a task jointly with others. The establishment of dedicated journals such as *Social Neuroscience*, *Cognitive, Affective, & Behavioral Neuroscience* and *Social Cognitive & Affective Neuroscience*, as well as the increasing number of books, such as this one, concerned with the neurocognitive bases of social behaviour, is further evidence of the expansion of interest in social information processing.

A central concept in the domain of social cognitive neuroscience is the representation of information in conjunction with, and pertaining to, other people. Common everyday activities such as opening a door to allow someone through, following the gaze of a stranger on a train, moving a piece of furniture together, dancing, and conversing with a colleague, all involve representation of information about, or in concert with, other social agents. Thus, in a broad sense, representations are 'shared' not necessarily because equivalent representations are concurrently activated in two or more individuals, but rather because activated representations across individuals relate to a current task, goal, object, person or process. In this way, representations across individuals

are shared as a function of the prevailing circumstance. As such, shared representations would appear to be indispensable for a successful social life.

This book comprises a collection of cutting-edge contributions centred on the idea of shared representations, broadly defined. We are extremely fortunate to have assembled what could be considered a 'dream team' of contributors, all of whom are established and respected leaders in their fields of study. Without these outstanding individuals, this volume could not have become a reality and certainly could not have materialised into the remarkable resource that it is!

The coverage in this volume is quite broad and evolves from a consideration of basic foundations to an examination of applied research in domains such as sport, dance and music. As such, this book will be a useful resource for a wide range of readers. We asked our contributors to write their chapters so that senior undergraduate students or new entrants to the field would be able to understand the content. Inspection of the chapters confirms that contributors succeeded in achieving this goal. To make the task more difficult, we also requested our contributors to write their chapters so that established researchers in the field would find the book a useful resource for their daily work. Again, inspection of the chapters confirms that authors overwhelmingly achieved this goal. Therefore, due to the diligence of our authors, this book will appeal to a wide range of readers, from undergraduate students to established social cognitive neuroscientists and all levels of student and trainee in between.

This book is made up of six parts, each containing four to six chapters: *Foundations*, *Imitation and Mimicry*, *Thinking, Perceiving and Acting with Others*, *Understanding Others*, *Learning and Development* and *Shared Representations in Applied Contexts*.

Part I, 'Foundations', starts with a thoughtful contribution from Dolke and Prinz, who provide a cogent analysis of what constitutes a shared representation and what task co-representation actually means. Using the joint Simon effect as an example case, these authors put forward arguments for an interpretation of the effect in terms of referential coding in which simultaneous activation of event representations, regardless of the source of their activation, is responsible for interference in different Simon task contexts (i.e. individual and joint). According to this view, joint Simon effects emerge due to concurrent activation of events with shared features, and not due to a socially induced co-representation of another agent's stimulus–response (S–R) mapping.

In the second chapter in Part I, Grigaityte and Iacoboni focus on the human mirror system (HMS) and introduce the idea of the 'merged self', a state in which the intentions, actions and bodies of two interacting individuals become represented within each individual mind. With reference to electrophysiological studies in monkeys, rare single cell recordings in humans, and neuroimaging evidence, they argue that the merged self is induced via the bottom up, automatic functioning of the HMS and that this merged state could support

human capacities such as empathy. They note however that this merged self can be influenced and controlled by various forms of top-down input and that such control can be considered preparatory when it is implemented prior to engagement of the HMS, or reactive when it comes online after HMS processing has begun. A dynamic interplay between bottom-up and top-down processes then mediates the merging and unmerging of two individuals, and thereby supports a wide range of social cognition and behaviour.

Following on, in the third chapter of Part I, Graziano provides a superb account of state-of-the-art ideas about the form and function of the primary motor cortex. Situating his chapter in historical context, he argues convincingly that the motor cortex can be usefully considered as an 'action map' as opposed to a homunculus containing a dispersed and discontinuous map of the body (i.e. the textbook description of the motor cortex). Graziano's proposal emerges from consideration of microstimulation studies in monkeys in which stimulation is applied for a (longer) duration that better matches the time- course of certain behaviours. For example, microstimulation applied to the motor cortex for half a second evokes complex movements, such as defensive movements and reach to grasp movements, similar to those seen in the animal's natural repertoire. In the final part of his chapter, Graziano speculates about the links between these defensive reactions, the action map and social behaviour.

In their chapter, Coll and Jackson take us beyond action into consideration of shared representations in non-motor domains. Emphasising the overlap of personally and vicariously activated somatosensory representations, they provide an overview of numerous studies of touch and pain that have used neuroimaging, brain stimulation and behavioural methods. Overall, they present a compelling case that self-experienced sensation and the vicarious experience of sensations share common representational elements. Finally, they point out limitations in current work and advocate for a move to more ecologically valid studies of shared representations in the non-motor domain. They also suggest the tantalising prospect of using brain stimulation approaches to modulate activity in shared representations for therapeutic benefit in a range of patient groups who are afflicted by excessive or impoverished responses to personal and vicariously experienced sensations.

Rounding out Part I, Cacioppo and Cacioppo provide an illuminating discussion of methodological and theoretical considerations in social neuroscience. Starting with a fascinating historical journey, these authors quickly arrive at a contemporary metaphor for the brain that goes beyond the computer metaphor of the last century. Specifically, Cacioppo and Cacioppo suggest the brain can be likened to a mobile, broadband, connected information-processing device. They further highlight the multi-level study of the social brain and discuss methods including psychophysiological measures, functional imaging and epigenetics and gene expression. Finally, they provide five useful considerations

for researchers that will help guide thoughtful analyses of data in social neuroscience experiments.

Beginning Part II, 'Imitation and Mimicry', Subiaul, Renner and Krajkowski contribute an excellent chapter on the comparative study of imitation in non-human primates. Pointing out the lack of consensus on whether apes can imitate, they go on to define and operationalise key types of imitation, underlining that imitation is best considered a multi-faceted psychological capacity involving motor and non-motor forms. They distinguish between two types of motor imitation – 'novel' imitation of actions that have not been previously executed and 'familiar' imitation of previously executed actions. After thoughtful consideration of the extant literature, they conclude that, whereas monkeys seem to be capable of some familiar motor imitation and imitation of cognitive rules, they are not capable of novel motor imitation. This is in contrast to apes, which demonstrate both novel and familiar motor imitation. Finally, they suggest that imitation of previously executed actions may be a basic capacity shared by many animals, and is adaptive for life in the hierarchical social structures in which they live.

Moving on from consideration of non-human primates, in the second chapter in this part Oostenbroek and Over focus on cultural and developmental perspectives on notions of imitation. The authors couch their contribution in the broader literature of social learning and cultural transmission, arguing that the importance of imitation extends far beyond learning about the physical world (such as how to use tools), into ideas about how children learn about their group's cultural norms, including values, attitudes, opinions and beliefs. By reviewing the social psychology literature on how children learn about the social world by copying those around them, Oostenbroek and Over provide a compelling and elegant perspective on the utility of studying imitative behaviour beyond the motor domain to understand how we develop shared representations with others in a social world.

In the third contribution to Part II, Bardi and Brass start their chapter by explaining how motor representations can be activated via internal signals like intentions, or external signals such as the observed actions of others. Drawing on a discussion of mirror processing, the authors raise the fundamental question of how an agent can distinguish between an intentionally activated motor representation and an externally activated one, and further how the agent can control activated motor representations such that they do not imitate other agents all the time. This need for self–other control mechanisms forms the main focus of the chapter and Bardi and Brass provide compelling evidence that the areas involved in the control of imitation, namely, the anterior medial prefrontal cortex (aMPFC) and the right temporoparietal junction (rTPJ) overlap with areas associated with theory of mind, mentalising and agency attribution. The authors unpack the likely roles of these brain areas in component

processes underlying self–other control with a central idea being that higher order cognitive functions are intimately linked to more basic sensorimotor mechanisms of self–other processing. They close their chapter with a call for more research to better understand this seemingly crucial social cognitive brain network, including an examination of whether the network is in fact domain specific or domain general.

In closing Part II, Obhi provides an integrative account of the possible links between mirroring as studied in action observation and automatic imitation tasks, on the one hand, and more naturalistic social mimicry on the other. He notes that social mimicry, the tendency to copy the bodily movements of an interaction partner, is most often studied by social psychologists, whereas it has mainly been cognitive neuroscientists who have studied the mirror system in laboratory-based action observation and imitation tasks. As a consequence, the link between these two research domains has not been systematically studied. Obhi then provides an overview of recent experiments that have attempted to shed light on whether social mimicry, action observation and automatic imitation 'tasks' share common mechanisms. Using a task analysis, he suggests that caution should be taken when equating laboratory-based imitation tasks and more natural social mimicry. He ends the chapter with speculation on whether social mimicry might usefully be considered an (unconscious) process of action selection, and suggests that future work should focus on how converging inputs interact to produce mimicry.

Part III, 'Thinking, Perceiving and Acting with Others', introduces research examining the cognitive mechanisms underpinning our interactions with others in a social context. Laidlaw, Risko and Kingstone begin this part with a chapter focused on innovative approaches to studying social attention. They explain how the field of social attention is grounded in traditional visual attention research, and call into question whether tried-and-tested laboratory approaches for studying attention enable us to capture important subtleties and nuances involved in how we attend to others in the real world. To overcome these limitations, they discuss how new paradigms evaluating looking behaviour in more realistic social settings shed light on the importance of gaze for acquiring social information and controlling what information is communicated to others. Their contribution builds a strong case for deeper consideration of the 'social' component of social attention, and clearly articulates considerations for future work in this domain.

In the next chapter, Vesper and Sebanz provide a comprehensive overview of the cognitive mechanisms underlying joint action. Sebanz was one of the first researchers to experimentally examine how we coordinate our actions with others, and this contribution reviews the seminal contributions made by her team and others in an attempt to elucidate how it is that two or more people can perform all manner of complex actions together with relative ease. They

highlight several mechanisms that support interpersonal coordination, with a focus on the importance of prediction (by both interaction partners) in helping to smooth motor coordination between individuals. Their piece also touches on how joint action research informs verbal communication, development of joint action, as well as human–robot interactions, thus widening the scope for how basic joint action research can apply to related domains.

From joint action, we shift attention to joint perception, with the third piece in this part authored by von Zimmerman and Richardson. In this chapter, the authors challenge the notion that perception is a solitary endeavour, and explore evidence documenting how social forces impact how we interact with the world and respond to incoming perceptual information. They describe ground-breaking work from their laboratory that demonstrates how participants' eye movements when looking at positive, negative or neutral pictures change when they think an interaction partner is looking at the same pictures compared to when they think their interaction partner is looking at a different set of symbols. This work underscores how visual perception is susceptible to what others around us are looking at, and the impact of social influences on basic perceptual processes.

The fourth contribution to this part returns to how we coordinate our actions with others, this time focusing on the antecedents and consequences of interpersonal synchrony. Lakens, Schubert and Paladino review empirical evidence that supports two complementary theoretical proposals: that individuals spontaneously synchronise their behaviour during social interactions, and that when we synchronise our movements with others, we experience stronger social bonding. Taken together, this work builds a compelling case for the interpersonal synchrony establishing or reinforcing social connections between individuals.

The final piece in Part III touches upon ideas introduced in several of the other chapters in this part to examine a special case of joint action: musical ensemble performance. In this piece by Keller, Novembre and Loehr, we learn how successful musical performance requires performers to coordinate their actions across a number of different aspects, including musical dimension, timescale, sensory modality and mode of interaction. Returning to the title of the entire volume, the authors build a compelling case for just how vital shared representations across each of these aspects is during musical performance, and examine behavioural and brain data to show how real-time interpersonal coordination is achieved by performers embodying action outcomes related to the self, others and the ensemble as a whole.

Part IV, 'Understanding Others', begins with a thoughtful contribution from Hamilton, who takes an action-centred perspective, in her words 'a motor chauvinist view', on the functioning of the mirror system. In particular, Hamilton focuses on understanding what, if anything, makes the human mirror system

different from the motor system involved in object-directed action, the object motor system. She provides a detailed comparison of these systems in terms of cortical localisation, goals and kinematics, behavioural priming and familiarity, and training and concludes that the mirror system is different from the object motor system primarily because it responds to for observed and executed actions. She asks whether this single distinguishing aspect is sufficient to warrant very different claims about the functional significance of the two systems. In the last part of the chapter, she cycles back to the idea of motor chauvinism and outlines the social responding account of mirror system function, which holds that the system serves response generation above all else.

The following chapter, by Press, focuses on the observed biological tuning of the mirror response in humans. Citing a range of evidence, Press highlights that the mirror response is typically greater for human stimuli than for inanimate stimuli, and seems to be particularly influenced by the form and kinematics of the observed movement. She goes on to suggest two functional implications of this enhanced mirroring for human actions, including the greater likelihood of imitating human rather than robot actions, as a means of skill learning, and potentially greater involvement of the motor system in the perception of human actions compared to robot actions. Press points out that biological tuning is less likely to differ based on discrepancies in higher order inferential processes such as mental state attribution, since evidence for the involvement of mirroring in this function is lacking. The chapter concludes by suggesting that mirroring is a specific example of a domain-general process that links perceptual and motor systems in the service of action control.

In the next chapter dealing with understanding others, Dewey and Knoblich draw upon a diverse range of evidence to address three main themes. First, they consider the effect of action experience on the representation of actions made by the self and others. They emphasise the possible role of mental stimulation on prediction of (self and other) action effects. Second, they consider how action affordances affect the representation of space in relation to self and other. The authors argue that, just as the presence of objects affords actions, so too does the presence of other social agents. They provide evidence that humans spontaneously take the motor capabilities of co-actors into account when working on joint tasks, which results in the construction of joint affordance maps that represent the range of motor possibilities for all agents in a particular action scenario. Third, they go on to consider the fundamental question of how we distinguish self from other. They highlight the importance of multisensory integration of haptic, proprioceptive and visual information in maintaining a sense of body ownership. Finally, they consider the role of motor and external sensory information in the construction of a sense of agency.

Ansuini, Cavallo, Bertone and Becchio discuss the proposition that intentions can be understood from observing the actions of others. Citing the