Colour Discrimination, Colour Constancy and Natural Scene Statistics *
Donald I.A. Macleod

in Normal and Defective Colour Vision
Published in print: 2003 Published Online: April 2010
DOI: 10.1093/acprof:oso/9780198525301.003.0021
Item type: chapter

This chapter relates the processes of colour vision to the characteristics of the natural environment. The reference to natural scene statistics relates the two main parts of the chapter — the first five sections concerned with colour discrimination, and the seventh section concerned with colour appearance and its transformation or constancy under changes of illumination.

The Psychological Effects of Early Institutional Rearing
Michael Rutter

in The Development of Social Engagement: Neurobiological Perspectives
Published in print: 2006 Published Online: March 2012
DOI: 10.1093/acprof:oso/9780195168716.003.0013
Item type: chapter

Institutional upbringing is seen to greatly affect psychological development in children. Despite the reduction in the negative effects of early institutional rearing observed in children subsequently brought up in a good-quality adoptive home, significant deficits stay in a small percentage of children. Institutional rearing could cause cognitive impairment only when there is global deprivation of learning experiences and subnutrition, which both could lead to diminished head growth, hence limited brain growth. Findings in this chapter suggest that adequate experiential input is critical to normal cognitive development and brain growth for the biological programming of the neural structure that underpins them. In some related studies, however, disinhibited attachment is more likely developed with institutional
rearing, even without global deprivation. The rotation of multiple caregivers during institutional care inhibits the normal development of selective attachment, an effect that is not completely removed by a subsequent upbringing in a good-quality family environment.

Why Making a Decision Involves More Than Decision Making
Bertram C. Bruce
in Comparative Decision Making
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Item type: chapter

Until recent decades, decision making was securely within the exclusive province of human behavior. This long intellectual tradition began with Aristotle, but the assumption of human uniqueness in this area, as in many others, is giving ground to other philosophical and scientific perspectives. Two divergent views of decision making exist: the Aristotelian view (“punctuation”) and a broader view (“continuity”), aimed at understanding the behavior of a much more diverse array of systems. Contrasting these raises many fundamental questions of relevance to comparative decision making, such as who the decision maker is and what it means to make a decision. Claims for human uniqueness are linked to the influence of personal and cultural history, social environment and communication, and the construction of the environments within which decisions are made. But this volume demonstrates the importance and usefulness of the broader view of decision making, which, like revealed preferences in microeconomics, focuses more on a system’s behavior than its intent.

Evolution
Lasana T. Harris
in Invisible Mind: Flexible Social Cognition and Dehumanization
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Item type: chapter

The second chapter introduces the evolutionary perspective on social cognition, emphasizing the prioritizing of survival and reproduction as basic human motives. It then describes an example of the interaction between genes and environment that directs evolution, before considering the universality of emotions as an example of the product
of evolutionary pressures shaped by social motives that stem from the basic human motives. It then addresses the how and why questions surrounding humans’ advanced social and intellectual abilities, pinpointing spontaneous social cognition and gesture and language respectively. It then explores modern environmental pressures that continue to guide human beings’ social and intellectual evolution.

The Myth of Mentalizing and the Primacy of Folk Sociology
Lawrence A. Hirschfeld

in Navigating the Social World: What Infants, Children, and Other Species Can Teach Us

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This chapter argues that mentalizing—imagining that others have thoughts and feelings and other mental states that motivate them to action—is of sharply limited utility in interpreting and predicting the behavior of others. Humans are in fact quite poor at appraising what others and indeed what we ourselves are thinking and feeling. In contrast, humans excel at interpreting and predicting behavior in terms of unseen social and cultural (nonmental) qualities. In negotiating social interactions, mentalizing is less important than attention to the contingencies of context, normative constraints on action, epistemic affordances of the cultural environment, and the group dynamics of the social milieu.

Early Social Deprivation and the Neurobiology of Interpreting Facial Expressions
Nim Tottenham

in Navigating the Social World: What Infants, Children, and Other Species Can Teach Us

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Item type: chapter

Successful social interaction depends upon the ability to accurately process expressions from the faces of others. By adulthood, our ability to recognize social signals from the faces of others is a well-developed skill. Numerous studies have shown that this skill results from a developmental process. This chapter argues that this process
relied on an early species-expected learning environment interacting with neurobiology involving the amygdala. It has been suggested that facial expressions are learned via principles of classical conditioning, and therefore, our understanding of the meaning of facial expressions in adulthood relies on associations that are formed throughout development. The chapter considers the nature of these associations in the context of both species-expected and species-unexpected early social environments (e.g., caregiver deprivation). Early social deprivation results in deviant facial expression processing because of two primary factors: deprived experience with human faces and atypical development of the neurobiology underlying facial expression processing, with particular emphasis on the amygdala. Children reared in deprived social environments are subject to both of these factors and should exhibit face expression processing behaviors that emerge in predictable, albeit atypical, ways.

Complexity and Heterogeneity in Psychiatric Disorders
Nelson Totah, Huda Akil, Quentin J. M. Huys, John H. Krystal, Angus W. MacDonald, Tiago V. Maia, Robert C. Malenka, and Wolfgang M. Pauli

in Computational Psychiatry: New Perspectives on Mental Illness
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Item type: chapter

Psychiatry faces numerous challenges: the reconceptualization of symptoms and diagnoses, disease prevention, treatment development and monitoring of its effects, and the provision of individualized, precision medicine. To confront the complexity and heterogeneity intrinsic to brain disorders, psychiatry needs better biological, quantitative, and theoretical grounding. This chapter seeks to identify the sources of complexity and heterogeneity, which include the interplay between genetic and epigenetic factors with the environment and their impact on neural circuits. Computational approaches provide a framework to address complexity and heterogeneity, which cannot be seen as noise to be eliminated from diagnosis and treatment of disorders. Complexity and heterogeneity arise from intrinsic features of brain function, and thus present opportunities for computational models to provide a more accurate biological foundation for diagnosis and treatment of psychiatric disorders. Challenges to be addressed by a computational framework include: (a) improving the search for risk factors and biomarkers, which can be used toward primary prevention of disease; (b) representing the biological ground truth of psychiatric disorders, which will improve the accuracy of diagnostic categories,
assist in discovering new treatments, and aid in precision medicine; (c) representing how risk factors, biomarkers, and the underlying biology change through the course of development, disease progression, and treatment process.

Examining the Influence of Adaptive Instructional Techniques on Human Performance for Tasks Conducted in Extremely Stressful Work Environments

Robert Sottilare and Stephen Goldberg

in Human Performance Optimization: The Science and Ethics of Enhancing Human Capabilities

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Item type: chapter

This chapter examines the potential benefits of computer-based adaptive instruction to human performance during the training of tasks usually conducted in extremely stressful work environments (e.g., law enforcement, firefighting, emergency medicine, or combat) that often include time, performance, and safety stressors. Adaptive instruction is training in which a computer-based intelligent tutoring system tailors its interaction with the learner to optimize learning and adapts the training environment (e.g., simulation) to maintain challenge level and flow. The design goal of adaptive instruction for tasks in extreme environments is to influence knowledge and skill acquisition to the point where the learner can successfully perform the expected tasks during training and then successfully transfer those skills to the work environment and perform regardless of the conditions. This chapter includes recommendations for representing and adapting work environment stressors during adaptive instruction to optimize learning and transfer of skills and is written for training developers.

Creative Solutions to Overcoming Barriers in Treatment Utilization

Wulf Rössler

in Schizophrenia: Evolution and Synthesis

Published in print: 2013 Published Online: May 2014
Item type: chapter
This chapter addresses the determinants of help-seeking behavior and methodological issues related to the assessment of needs for care. Help-seeking behavior is affected by (a) prior personal experiences in looking for assistance, (b) the social environment and the influence of significant others, and (c) the overall disease and treatment concepts of the individual. Approaches to intervention range from a general political level to more specific health care policy. Finally, strategies are discussed for improving the way in which mental health professionals can shape their personal relationships with patients and learn to respect their ideas about the causes of their disorder so as to include them in all treatment decisions. In mental health care, the relationship between patient and therapist is one of the most important treatment factors, serving as a reliable predictor of outcome, regardless of diagnosis, setting, or type of therapy used. Published in the Strungmann Forum Reports Series.

Genetic Variation Influences How the Social Brain Shapes Temperament and Behavior
Michael I. Posner, Mary K. Rothbart, and Brad E. Sheese
in The Cognitive Neuroscience of Mind: A Tribute to Michael S. Gazzaniga

There are different opinions on the concept of individual differences; some believe that experience can be solely taken into consideration to find individual differences; others, that genes play an important role in identifying the individual differences. This chapter explores how genes and social experience or environment interact to shape brain networks of control and changes in behavior. In this context, the authors present a detailed analysis of particular genes and their relation to the structure and function of specific neural networks. On the basis of their findings, they suggest that genes and experience help shape human behavior together.

Perception Viewed as a Phenotypic Expression
Dennis R. Proffitt and Sally A. Linkenauger
in Action Science: Foundations of an Emerging Discipline
This chapter describes empirical evidence for an approach aimed at examining visual perception. It proposes that visual perception is comprehended by the perceiver’s physical and biological characteristics in an effort to promote appropriate actions in the environment. Investigations also reveal that visual experience associates the visually perceived environment with continually changing purposes and the processes through which these purposes are achieved. The findings reveal that people adopt different skills and improve related expertise to perform specific tasks and achieve specific purposes. People also transform respective physical and biological characteristics to achieve certain objectives and associate perceptions with relevant physical and biological characteristics to perform specific actions.

Tempests, Poxes, Predators, and People
John C. Wingfield and L. Michael Romero

The concept of stress, both in biology and in medicine, has captivated scientists for over a century. It has been established that stress can be detrimental and can lead to disease, but the responses to stress can also be beneficial under certain conditions. Although scientists have discovered many fundamental physiological and behavioral mechanisms that comprise the stress response, most of current knowledge is based on laboratory experiments using domesticated or captive animals. Much of this knowledge has proven useful, and often medically relevant. Scientists are only beginning, however, to understand how stress impacts wild animals—by studying the nature of the stressful stimuli that animals in their natural environments have adapted to for survival, and what the mechanisms that allow that survival might be. This book summarizes, for the first time, several decades of work on understanding stress in natural contexts. The aim is twofold. The first goal of this work is to place modern stress research into an evolutionary context. The stress response clearly did not evolve to cause disease, so studying how animals use the stress response to survive in the wild should provide insight into why mechanisms evolved the way that they did. The second goal is to provide predictions on how wild animals might cope with the Anthropocene, the current period of Earth’s history characterized by the massive human remodeling of habitats on a global scale. Conservation of species will rely upon how wild animals use their stress response to successfully cope with human-created stressors.
Responses to Natural Perturbations
L. Michael Romero and John C. Wingfield

in Tempests, Poxes, Predators, and People: Stress in Wild Animals and How They Cope

Weather has profound influences on behavior and facultative physiological and endocrine mechanisms have evolved to cope with this type of environmental perturbation. Other factors, such as territory or home range quality, access to shelter and food, social status, body condition, parasite infection and injuries, all contribute to allostatic load, the daily expenditure required to go about daily and seasonal routines. Human disturbance, through exploitation of natural resources, urbanization, pollution, and global climate change, is an additional source of extreme environmental modification and it is not surprising that many organisms are struggling to cope. This chapter proposes that the concepts of allostasis, allostatic load, and allostatic overload may provide a framework to understand how individuals cope with normal environmental perturbations such as heat, cold, wind, drought, and rain.

Modulation of the Adrenocortical Response to Stress
L. Michael Romero and John C. Wingfield

Modulation of corticosteroid release in response to different environmental conditions, other than circadian variation, is not a phenomenon that has attracted much attention from biomedical scientists. After all, if the research subjects are captive (and usually domesticated) animals held in constant laboratory conditions, there is little reason to suspect the diverse ways in which corticosteroid function varies that are discussed in this chapter. Consequently, these modulatory pathways are relatively new and primarily discovered in free-living animals. However, it is precisely the exploration of how and why corticosteroid function is modulated that will help in understanding the physiological role of corticosteroids. Furthermore, many studies to date
have been truly integrative, spanning molecular and cellular mechanisms to field studies and ecology. Much of this work is just beginning and there are many questions that still need to be addressed.

Development, Environmental, and Maternal Effects
L. Michael Romero and John C. Wingfield

This chapter addresses the mechanisms involved in the environmental and maternal effects on the ability of offspring to cope with environmental perturbations. Specifically, much of this chapter is devoted to how corticosteroids can alter developmental trajectories, and how they can help mediate the transitions between different life-history stages. Corticosteroids thus alter the ultimate phenotype of the individual, presumably by serving as the direct intermediary of how the environment interacts with the genome. Corticosteroids, therefore, are major players in phenotypic engineering, or the process of adjusting phenotypes to match the environment.

Global Change
L. Michael Romero and John C. Wingfield

This chapter asks whether human activities and human-induced changes to the environment are interpreted as stressors by wildlife. The answer is a resounding yes, but with many caveats. Some changes and activities, such as pollution and hunting, can be interpreted as incredibly strong stressors. These anthropogenic changes have profound impacts on individuals and populations. Other anthropogenic changes, however, such as ecotourism and urbanization, affect animals much more subtly. Changes in corticosteroid and catecholamine release can be documented, but the long-term impacts on the individuals are far less clear. The subtle endocrine changes may not ultimately alter
an individual’s fitness. What is clear is that the stress response is an important physiological system for coping with anthropogenic changes, just as it is an important physiological system for coping with natural environmental changes.

Global Change
L. Michael Romero and John C. Wingfield

in Tempests, Poxes, Predators, and People: Stress in Wild Animals and How They Cope

Species conservation has become a major topic of discussion for the public throughout the world. Although various groups have been concerned with species survival for centuries, the attempt to apply concepts from physiology is relatively recent. The specific application of stress physiology is more recent still. This chapter presents the theoretical basis for using stress physiology, discusses some of the problems where measurements of stress physiology have been applied, and concludes with a discussion of global climate change, where the application of stress physiology has just begun but is likely to prove fruitful. Comparative stress endocrinology has a major role to play here because neuroendocrine and endocrine control systems, in conjunction with direct neural regulation, are the major links between perception of environment and morphological, physiological, and behavioral responses. Understanding these links in the context of conservation concerns will be key to resolving variation in responsiveness to changing environments.

Conclusions and the Future
L. Michael Romero and John C. Wingfield

in Tempests, Poxes, Predators, and People: Stress in Wild Animals and How They Cope

Mechanisms underlying responses to perturbations of the environment are common to all vertebrates despite extremely diverse types, frequencies, durations, and intensities of perturbations. These responses have been the focus of biomedical, agricultural, and environmental
research in relation to deleterious effects of chronic stress, but the highly adaptive behavioral and physiological responses that occur immediately following a perturbation have received much less focus. The interrelationships of cellular aspects of the stress response, including heat shock protein function, DNA repair, and mitigation of oxidative damage, remain to be explored in detail. This final chapter summarizes some of the issues that will likely be the subject of future research, with a focus on stress biology in relation to rapid planetary change. The development of new technologies and cyber-infrastructure will enable the integration of molecular, cell, and physiological responses with behavior on a scale unimaginable just a few years ago.

Mitigating Stress Response to Optimize Human Performance
James Ness and Josephine Q. Wojciechowski

in Human Performance Optimization: The Science and Ethics of Enhancing Human Capabilities

Optimizing human performance is the expression of a desired phenotype to meet the challenges of a particular task. Desired phenotypes are expressed in response to canalizing experiences such as in acclimatization to environments. Here one’s biobehavioral system adapts to the challenges of the environment to reduce physiologic strain on the system. These adaptations are within the biobehavioral system’s repertoire of expressible phenotypes and are reversible. Desired phenotypes can be maintained, facilitated, or induced by canalizing experiences. In the desire to optimize performance, the canalizing experiences are often designed to induce or prolong phenotypic expression to meet the demands of a constructed task. In these cases, the canalizing experiences, whether pharmacological or other physiologically invasive, often lead to irreversible negative health consequences. This chapter discusses the effects of canalizing experiences in terms of the strains on the biobehavioral system. The chapter advances a concept of strong environment as a means to facilitate and maintain phenotypes, which are within the phenotypic expressible repertoire. The argument is made that leveraging the biobehavioral system’s wild type rather than domesticating the system to express a supernormal phenotype yields greater agility and overall health in a population to overcome challenges.