

THE ROLE OF EVOLUTIONARY EXPLANATIONS IN CRIMINOLOGY

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ABSTRACT

Criminology is widely accepted to be an interdisciplinary subject. However, evolutionary approaches are conspicuous by their absence in mainstream criminological contexts. Although the reasons for this theoretical lacuna are no doubt varied, we argue that the time is apposite for a measured consideration of the role of evolutionary explanations in criminology. By drawing on the idea of vertical integration and through recognition of how different theories are typically pitched at different levels of analysis we describe how evolutionary approaches might be integrated with mainstream criminological theories. The integration of evolutionary approaches with strain, control, and developmental approaches are given specific consideration. We illustrate how this integrated perspective can inform our understanding of one substantive area in criminology, the nature of punishment. We conclude that the growing literature in evolutionary forensic psychology and recent developments in the application of evolutionary theory to human behavior provide a valuable opportunity for criminologists to broaden their theoretical horizons and more fully consider how evolutionary approaches may contribute to their discipline.

Key words: Evolutionary behavioural science, levels of analysis, evolutionary criminology

INTRODUCTION

Criminology is widely accepted to be an interdisciplinary subject (e.g., Newburn, 2007). Because it focuses on a specific topic, or set of topics – crime and responses to crime – rather than being located within a particular domain of inquiry (like psychology, sociology, or political science), criminologists inevitably draw on a diverse range of academic disciplines in the development of criminological theory. However, without denying McLaughlin and Newburn's (2010a, p. 2) assertion that criminology is "a field of inquiry where people from a variety of intellectual and scholarly backgrounds come together to engage in research and deliberation" the theoretical endeavors of criminologists have been heavily dominated by sociological approaches. Although others have noted the relative neglect of psychological theories (e.g., McGuire, 2004; Weber, 2010) and biological factors (e.g., Walsh, 2009a; Wright & Boisvert, 2009), we want to draw attention in this article to the almost complete absence of evolutionary approaches within criminological theory. Although there are a few notable exceptions (e.g., Brannagin, 1997; Ellis & Walsh, 1997; Walsh, 2006; Walsh, 2009a) evolutionary approaches are conspicuous by their absence in mainstream criminological contexts. For instance, in an analysis of 19 introductory criminology textbooks published after 2000, less than half made any reference to evolution, evolutionary theory, or evolutionary psychology (Durrant, 2010). This neglect is exemplified in a recent, cutting-edge 500 page survey of criminological theory (McLaughlin & Newburn, 2010b), including 13 chapters devoted to "new approaches", in which there is no indexed reference to any evolutionary approaches at all. Although the reasons for this theoretical lacuna are no doubt varied and, reasonably enough, reflect the sociological training of most criminologists (Walsh & Ellis, 2004) we argue that there are at least four good reasons why the time is apposite for a measured consideration of the role of evolutionary explanations in criminology.

First, evolutionary approaches have become, to a significant extent, incorporated within mainstream psychological science. This is illustrated in the plethora of textbooks devoted to evolutionary psychology, the growing representation of evolutionary ideas in introductory psychology textbooks (e.g., Cornwell, Palmer, Guinther & Davis, 2005) and the rapid growth in research publications that draw on evolutionary ideas (Durrant & Ellis, in press). In short, although evolutionary psychology has not quite revolutionized psychology in the manner envisioned by Buss (1995), and there remains a healthy critical literature on evolutionary approaches in the behavioral sciences (e.g., Buller, 1995; Lloyd, 1999), there is also a rich body of general theory and empirical research that can be drawn upon by criminologists. Second, despite their absence from mainstream criminological contexts, evolutionary approaches have been fruitfully employed to explain a diverse range of criminological phenomena: from aggression, violence and homicide (Archer, 2009; Daly & Wilson, 1988; Duntley & Buss, 2011; Sell, 2011), to theft (Kanazawa, 2008), drug use (Durrant, Adamson, Todd & Sellman, 2009) punishment (Peterson, Sell, Tooby & Cosmides, 2010), and rehabilitation (Ward & Durrant, 2011a). In other words, alongside a substantive body of general theoretical and empirical research there is also a rich research literature on evolutionary approaches to crime and antisocial behavior that can be exploited. Third, there is also a growing recognition that a pluralistic approach to applying evolutionary theory to the behavioral and social sciences – one that recognizes the importance of human behavioral diversity and cultural processes – provides the most appropriate framework for advancing our understanding of the evolutionary underpinnings of human behavior (Brown, Dickins, Sear & Laland, 2011; Dunbar, 2006; Durrant & Ward, 2011; Gangestad & Simpson, 2007; Ward & Durrant, 2011b). This, more pluralistic perspective, we suggest, may afford better opportunities for integration with mainstream criminological approaches. Finally, although as Barak (2010) notes, “integrative criminology” is not a new development and may mean different things to different people, there appears to be a growing recognition of the importance of integrated theories of crime and punishment that meaningfully incorporate biological, psychological, and sociological variables (e.g.,

Agnew, 2005; Barak, 2010; Muftic, 2009; Walsh, 2009a). A consideration of our evolutionary history, we suggest, should form part of these integrative efforts.

Our aim in this paper, then, is to clarify the role of evolutionary explanations in criminology with a focus on how evolutionary approaches can be best integrated with mainstream criminological approaches. We first provide a brief outline of what can be termed *Evolutionary Behavioral Science* – an integrative perspective that encompasses the main approaches to applying evolutionary theory to human behavior (see Brown et al., 2010; Ward & Durrant, 2011b). We then explicitly discuss the role of evolutionary explanations in criminology. By drawing on the idea of vertical integration and through recognition of how different theories are typically pitched at different levels of analysis we describe how evolutionary approaches might be integrated with mainstream criminological theories. The integration of evolutionary approaches with strain, control, and developmental approaches are given specific consideration. We then illustrate how this integrated perspective can inform our understanding of a substantive area in criminology, the nature of punishment. Although we do not endorse the idea that the incorporation of evolutionary approaches will effect a revolution in criminological theory, we do believe that if criminology truly aspires to be an inter-disciplinary subject matter then the neglect of evolutionary theory can no longer be sustained.

EVOLUTIONARY BEHAVIOURAL SCIENCE

Evolutionary explanations have a long, albeit controversial, history in the social and behavioral sciences (see Degler, 1991; Plotkin, 2004). Darwin (1859, 1871) clearly recognized that the principles of natural and sexual selection could be just as effectively employed to explain the characteristics of humans as they could other animals. In the 1970s, the emergence of sociobiology placed these insights within the framework of the Neo-Darwinian synthesis with one of its chief advocates, E. O. Wilson (1975, p. 4), claiming that sociobiology would “unify the natural and social sciences under the conceptual umbrella of evolutionary theory”. The enormous controversy surrounding

sociobiology (see Segerstrale, 2000 for an insightful history) effectively distanced evolutionary minded social and behavioral scientists from using this particular label; however, since the 1980s there have been three main theoretical approaches for applying evolutionary theory to an understanding of human behavior: human behavioral ecology, evolutionary psychology, and gene-culture co-evolutionary theory (Gangestad & Simpson, 2007; Winterhalder & Smith, 2000). Although, as we note below, there are some important differences in these three approaches they are united in their agreement that the subject matter of the social and behavioral sciences can be fruitfully analyzed from an evolutionary perspective.

Human behavioral ecologists, who typically focus their studies on hunter-gatherer populations or small-scale societies, assume that the hallmark of human behavior is its remarkable flexibility and that humans have the evolved capacity to adaptively adjust their behavior to different cultural and ecological contexts (Winterhalder & Smith, 2000). Evolutionary psychologists also accept that humans demonstrate considerable phenotypic plasticity and that both social and ecological environments play an important role in the genesis of behavior. However, whereas human behavioral ecologists tend to focus on behavior as the main unit of analysis, evolutionary psychologists direct their attention to the evolved psychological mechanisms that underpin behavior. In short, evolutionary psychologists assume that humans have a large number of specialized psychological mechanisms, or modules that have evolved to solve adaptive problems in our ancestral past (see Buss, 2008; Confer, Easton, Fleishmann, Goetx, Lewis, Perilloux & Buss, 2010). The third main approach for studying human behavior within an evolutionary context is known as gene-culture co-evolutionary theory (Henrich & McElreath, 2007; Richerson & Boyd, 2005). Central to this perspective is the view that culture has played a crucial role in the evolution of our species. It is assumed that the capacity for culture is an evolutionary adaptation that has been selected for in our ancestral past. However, once in place, the capacity for cultural learning opens up the opportunity for cultural evolution to occur as specific beliefs, values, ideas and practices

are retained and transmitted (non-genetically) to subsequent generations. Cultural practices, it is assumed, are influenced by evolved psychological predispositions but they can, in turn, provide selection pressures that may change gene frequencies and thus influence human genetic evolution. The classic example of this is the evolution of lactose tolerance which is viewed as a genetic response to a cultural history of dairy farming (Richerson & Boyd, 2005). A recent variant of this approach, known as niche construction theory, suggests an additional system of inheritance as animals (especially humans) also transmit niches or constructed environments to subsequent generations that can then, in turn, shape genetic and cultural evolution (Laland, Odling-Smee, & Myles, 2010).

Our discussion of the different evolutionary approaches to understanding human behavior has been necessarily brief (see Brown et al., 2011; Durrant & Ward, 2011; Ward & Durrant, 2011 for more details); however, three main assumptions can be identified that might form the basis for evolutionary behavioral science. The first assumption is simply the recognition that humans are one species of primate whose physical and psychological characteristics have evolved through the processes of natural and sexual selection. Thus, these characteristics can be understood in light of our evolutionary history and can be placed in the broader comparative context of primate, mammalian, and animal evolution. Second, it is assumed that humans possess a number of both domain general and domain specific psychological mechanisms that allow us to talk sensibly about an evolved human nature, while recognizing the tremendous capacity for behavioral flexibility that generates significant human diversity. Third, the human capacities for language, cultural learning, cumulative cultural evolution and niche construction must be accepted as essential components of our evolutionary history that significantly affects evolutionary processes and, ultimately, human behavior. Not all evolutionary minded social scientist will necessarily agree with these assumptions (especially the third one) (see Brown et al., 2011 for a discussion), but we believe that they are consistent with the core features of the Neo-Darwinian synthesis and

incorporate recent theoretical developments that have expanded the scope of evolutionary processes (e.g., see Jablonka & Lamb, 2005). We also acknowledge that many social scientists remain skeptical of the scientific value of evolutionary explanations for human behavior in general and there is a laundry list of standard criticisms that include the idea that evolutionary accounts are untestable, unfalsifiable, genetically deterministic, reductionistic, and ideologically unsound. However, we think that, while recognizing the complexity of applying evolutionary theory to human behavior, these criticisms generate more light than heat and they have been adequately addressed in a range of recent publications (see Confer et al., 2010; Durrant & Haig, 2001; Durrant & Ward, 2011; Ketelaar & Ellis, 2000). Indeed, we argue that the key question is not *whether* evolutionary theory is relevant to an understanding of human behavior, but exactly what place or role they have to play within the social and behavioral sciences.

EVOLUTIONARY BEHAVIOURAL SCIENCE AND CRIMINOLOGICAL THEORY

Levels of analysis

A useful starting point for considering the role of evolutionary explanations in criminology is Tinbergen's (1963) influential account of the different types of explanation provided by biologists when accounting for the specific characteristics of organisms. Tinbergen noted four different, but compatible types of explanation that are typically provided. First, biologists provide explanations in terms of the evolutionary *function* of the trait in question. In short, they ask how the characteristic of interest promoted survival or reproductive success and thus was favored by natural selection relative to less advantageous characteristics. The second type of question concerns the evolutionary *history* (or phylogeny) of the characteristic: how has the trait in question evolved over time from earlier forms? The third type of question is directed at the

ontogeny of the trait or characteristic. In other words, how does the trait *develop* during the lifetime of the organism? Finally, biologists are interested in unraveling the important *proximate mechanisms* (whether physiological, psychological, or social) that underlie the characteristic of interest. In sum, if we are to have a complete understanding of a given characteristic or trait, Tinbergen (1963) argued that we need to address all four types of explanation.

Although this framework provides a useful way of distinguishing between different types of explanation, it needs to be fleshed out a little in order to be of more use for social scientists. Of particular relevance is the greater importance of social and cultural processes in explaining human behavior. Although social learning is important in other species, and various cultural traditions have been identified in other animals (e.g., Whiten & van Schaik, 2007) arguably the human capacity for cumulative culture evolution is unparalleled (Richerson & Boyd, 2005). Cultural learning and the products of cultural evolution (from specific values, norms and beliefs through to such inventions as writing, agriculture, and the internet), therefore, play a more central explanatory role in the human social and behavioral sciences. Culture can be conceptualized as an important proximate explanation for human behavior as well as an important input into developmental processes. We also suggest that "cultural-historical" explanations can be viewed as an important type of distal explanation in the social and behavioral sciences. Although the similarities between cultural evolution and biological evolution remain a matter of dispute (see Mesoudi, Whiten & Laland, 2006 and commentaries) it is clear that just as humans have an evolutionary history, so too do human social groups have cultural histories that provide important inputs into developmental and proximate processes.

Tinbergen's framework speaks to the different types of explanation that are offered for different characteristics, but we also need to acknowledge two other important types of relationship between explanations in the social (and natural) sciences. The first concerns what can be termed "part-whole" relations. The natural sciences are

predicated on a hierarchical view of nature in which lower order systems are embedded in higher order systems. Thus, for biological systems, cells are parts of organs which reside in organisms that are embedded in social groups that can be located in specific ecological contexts. For social scientists, psychological processes are parts of individuals who reside in social groups embedded in communities or neighborhoods that are part of the wider society. Criminologists are well versed in this distinction and much integrative theoretical work in criminology concerns the linking of macro-level (typically communities and societies) with micro-level (typically individuals and social groups) explanations (e.g., Muftić, 2009). The second type of relationship that we need to appreciate is one that is referred to as "supervenience" and which most obviously accounts for the relationship between mental processes and their physical instantiation in the brain (Sterelny, 1990). For instance, the capacity for self-control or self-regulation relies on important set of processes that can be described in psychological terms (e.g., impulse control, delay of gratification) but also *supervene* on well studied neural systems that reside in the pre-frontal cortex (Ratchford & Beaver, 2009). The psychological and physical accounts here provide (with some qualifications) different ways of describing the *same* processes. In Table 1 a framework for understanding these different types of explanation is provided, arrayed from more distal (e.g., evolutionary) to more proximate (e.g., psychological and social processes) explanations, with examples drawn from criminological theory (see also McGuire, 2004, p. 31 for the different "levels of description" in criminological theory).

As Barkow (2006) has argued, the concept of "vertical integration" can assist us in understanding how explanations at different levels of analysis may *relate* to each other. Explanations drawn from different levels of analysis are not typically in direct competition with each because they typically provide alternative, but compatible accounts of the phenomena of interest. It makes no sense, for instance, to say that a theory that focuses on proximate neurobiological underpinnings of self-control is better than an approach which focuses on developmental factors or evolutionary history,

although explanations at a given level of analysis may be more *salient* for addressing specific research questions (see Durrant & Ward, 2011). It is important, however, that explanations drawn from different levels of analysis are conceptually compatible or consistent with each other. Therefore, in general terms, we should expect evolutionary approaches in criminology to complement and enrich non-evolutionary explanations rather than replace them.

In order to provide a clearer understanding of the role of evolutionary explanations in criminology it is useful to consider the main strands in criminological theorizing and their possible relationships to evolutionary explanations. In the following section we examine relevant linkages with arguably the three most important theoretical “traditions” in criminology: anomie/strain theories, control theories, and social learning/developmental perspectives. Our account of these three criminological perspectives and their relation to evolutionary approaches is necessarily limited and we simply highlight possible points of connection that can be more thoroughly explored in subsequent research. We also appreciate that these three perspectives hardly exhaust the repertoire of criminological theory and there is substantial scope to offer linkages between evolutionary theory and other perspectives.

Strain theories

One of the fundamental underlying premises of the various forms of strain theory is the idea that adherence to social norms that preclude criminal and antisocial behavior can be taken for granted and thus it is norm violations in the form of criminal offending that needs to be explained. For classic strain theorists, such as Merton (1938) and Cohen (1955), it is the failure to achieve monetary success and social status that ultimately leads to crime as offenders seek culturally valued goals through illegitimate means. More recently, Messner and Rosenfeld (2007) have emphasized the particular nature of American culture that elevates the importance of monetary success, and thus creates incentives for crime in individuals who are – for social-structural reasons – “locked out”

of this American dream. Although clearly strains impact on individuals, classic strain theory can be best viewed as a “macro-level” theoretical perspective that focuses on the role of social-structural (society level) and cultural-historical (i.e., American cultural values) factors. Agnew’s (2005, 2006) general strain theory also incorporates macro-level factors but significantly broadens the scope of strains that might lead to crime and, importantly, pays particular attention to the psychological impact of strains and their particular developmental contexts, thus integrating macro and micro level variables. There is now an extensive empirical and theoretical literature on strain theory, and our discussion has clearly brushed over some important nuances, but essentially what unites various forms of strain theory is the idea that individuals may respond to a failure to achieve legitimate and valued goals through criminal and antisocial behavior.

The notion of social status provides a good starting place for understanding points of connection between strain theory and evolutionary approaches to crime and antisocial behavior. As Walsh (2009a, p. 136) notes, “Anomie/strain theory shares its deep interest in status striving with evolutionary psychology and views status concerns as fundamental motivating factors behind much of human behavior, both deviant and conforming”. For evolutionary psychologists, as Walsh (2009a) points out, the motivations underlying status striving can be understood in terms of their evolutionary function. A large body of literature has, for instance, demonstrated that in most social species status or social rank is positively correlated with reproductive success (Barkow, 1989; Ellis, 1995). The same outcome also appears to hold in human populations (Barkow, 1989; Hopcroft, 2006). The importance of status striving, however, differs for males and females in predictable ways. Because of fundamental differences in parental investment, males of most mammalian species can increase their reproductive success through sexual access to multiple females; the reproductive success of females, however, is more closely tied to their capacity to raise viable offspring. Thus, so the argument goes, although social status is still important for females, there has been stronger selection on status striving in males because they can increase their reproductive success by obtaining higher status

and dominance over other males (Buss, 2008; Puts, 2010). It follows that males who are thwarted (for whatever reason) from obtaining social status may be particularly motivated to engage in criminal behavior if that is the only route available to them. We may also expect that young males are particularly motivated to seek status as competition between men is heightened during late adolescence and early adulthood (Daly & Wilson, 1988; Puts, 2010). This evolutionary account provides a plausible distal explanation (in terms of evolutionary function and history) for the criminological phenomenon that is of particular interest to strain theorists: the high rates of offending among socially (and financially) disadvantaged young men.

The picture is, however, somewhat more complex than this. Importantly, status in human societies can be cashed out in different ways. Consistent with classic strain theories and the recent work of Messner and Rosenfeld (2007), particular cultural norms and values may translate what counts as social status in particular social environments and cultural-historical contexts. Indeed, as Henrich and Gil-White (2001) argue, although status in humans is partly related to social dominance, consistent with most mammalian species, it is also linked with the prestige that can be obtained through the development of particular skills or expertise (see also Cheng, Tracy & Henrich, 2010). This more inclusive evolutionary conception of status provides interesting points of connection with the criminological literature that highlights how, for some individuals, criminal offending may provide opportunities for autonomy, respect, (e.g., Bourgois, 1995) and a sense of mastery in the display of criminal expertise (Ward & Maruna, 2007). In other words, fundamental motivations underlying status may, in particular social and cultural environments that provide limited opportunities for legitimate outlets, result in increased risk for offending as offenders seek universal human goals through means that society deems to be inappropriate (i.e., criminal offending).

Control theories

Control theories form a second important traditional approach in theoretical criminology. Conventionally, two main forms of control dominate the theoretical literature: social control and self-control. For social control theorists, crime and antisocial behavior become more likely when "an individual's bond to society is weak or broken" (Hirschi, 1969, p. 16). Thus individuals who internalize pro-social norms and values and who form strong and enduring attachments to others are less likely to engage in criminal offending. Sampson's (Sampson, Raudenbush & Earls, 1997) notion of "collective efficacy" places the importance of social bonds within a broader community context by noting that communities which demonstrate high levels of social cohesion and willingness to enforce social norms experience lower levels of crime and antisocial behavior. Within a developmental context, Sampson and Laub (2005) also highlight the importance of social bonds and how they can explain patterns of offending over particular life-history trajectories. For self-control theorists the important source of control can be found not with an individual's social bonds, but within the individual themselves and their capacity to regulate or control their behavior (Gottfredson & Hirschi, 1990). For Gottfredson and Hirschi (1990) this capacity for self-control lies at the heart of criminal offending: individuals who are better able to control the temptations afforded by criminal opportunities are simply less likely to offend. Recent formulations of self-control theory also provide linkages with social control theories by highlighting how the capacity for self-control is partly determined by the relative costs of offending which are in turn influenced by individuals' social bonds with others (Gottfredson, 2011; Hirschi, 2004). Control theories are best viewed as proximate explanations for offending, although they also include important developmental components. Self-control theories focus on the psychological level of analysis while social-control theories typically focus on the role of immediate social groups (e.g., the family), neighborhood or community factors, and the wider society.

From an evolutionary perspective, all organisms are motivated to pursue reproductively relevant resources such as food and mates and there is good evidence to

suggest that the neurobiological underpinnings of reward-seeking behavior are relatively similar across a wide variety of species (Berridge & Kringelbach, 2008). However, organisms also need to regulate the pursuit of rewards with reference to specific environmental contexts. The desire to assuage hunger, for instance, needs to be restrained if a predator is present and the pursuit of sexually receptive females may need to be checked in the presence of socially dominant conspecifics (i.e., other males). Although the capacity for self-control, broadly construed, is common among different animal species, it may be especially important for humans (Eastwick, 2009). Because humans are a long-lived, highly social species that relies heavily on culture (Baumeister, 2005) and has the ability to consider a diverse range of relevant goals (including abstract and symbolic ones) even though they may be located far into the future (Leary & Buttermore, 2003), the capacity for effortful self-regulation may be especially important. In short, the capacity for self-control or self-regulation can be considered an evolutionary adaptation, perhaps emerging in its modern form as recently as 40,000 to 50,000 years ago (Eastwick, 2009). It is not surprising from this perspective that self-control is one of the more important proximate predictor of crime and antisocial behavior as it has evolved, in part, to regulate those behaviors that, although strongly motivated, also can result in adverse future consequences including the risk of social sanctions. Consistent with sex differences in parental investment, discussed above, we should also expect important gender differences to emerge in the capacity for self-regulation as, on average, men have more to gain in reproductive terms from the pursuit of immediate rewards. A recent meta-analysis of gender differences in impulsivity suggests that, consistent with this view, males demonstrate greater reward-seeking, less capacity for effortful control, and less sensitivity to punishment (Cross, Copping and Campbell, 2011). Within the context of human evolution, the relationship between self-control and social control are also important. If one of the important functions of self-control is to regulate behavior in a way that conforms to local norms and values we should expect that attachment to pro-social institutions and environments in which social norms are more robustly enforced (i.e. those that demonstrate high rates of collective efficacy) should

result in greater capacity for self-regulation and therefore less antisocial and criminal behavior.

Criminologists typically appreciate that there is a fundamental tension between strain and control theories of criminal offending. The former assumes that crime and antisocial behavior are departures from "normal" behavior brought on by various strains; the latter are predicated on the idea that humans are "naturally" selfish and thus it is the avoidance of crime and antisocial behavior that need to be explained (in terms of various forms of self and social control). An evolutionary perspective provides a potential rapprochement to these two, seemingly opposing, viewpoints: survival and reproductive success in humans as a long-lived, highly social, pair-bonding (yet polygynous) species whose offspring are profoundly dependent has favored a complex suite of motivations and self-regulatory mechanisms that manifest as both the selfish striving for reproductively relevant resources and the need for self-constraint and adherence to group norms. To put this point crudely, criminal behavior is both normal and to be expected (as control theorists would argue), but so, too, is the disinclination to engage in norm violating behavior. Understanding how these various factors play out depends on a range of factors including the particular developmental context that individuals find themselves in.

Social learning and developmental theories

Broadly construed, the social learning tradition has a long history in criminology, exemplified by Sutherland's (1947) differential association theory and Akers (1995) Social learning Theory. In the last few decades one of the most prominent trends in criminological theory has been the rise in importance of developmental theories of crime that build on, but substantially expand, the work of Sutherland, Akers and others. One important feature of recent developmental theories is their attempt to broaden the range of relevant variables to include biological, psychological, social, and cultural factors (e.g.,

Agnew, 2006; Farrington, 2010; Moffitt, 1993). Space precludes anything like a thorough review of these approaches, but some of the important key elements can be readily teased out (see Farrington, 2010). First, it is accepted that there is a considerable degree of continuity in antisocial behavior from childhood to adulthood that can be linked to a reasonably well identified set of biological, psychological and social risk factors that include genetic factors, prenatal experiences, adverse family environments, peer relations, and community contexts. Second, a relatively small group of individuals are responsible for a disproportionate amount of serious criminal offences. Third, antisocial and criminal behavior becomes significantly more prevalent during adolescence, but then declines during adulthood, generating the age-crime curve familiar to criminologists. Fourth, antisocial and risk-taking behavior during adolescence tends to be generalized in nature and involves a diverse range of activities including drug use, heavy drinking, risky sexual behavior, reckless driving, property offending, auto-theft and violence. And, finally, desistance from offending is often related to important life-events such as getting married, having children, or obtaining stable employment.

Developmental criminologists have provided wide-ranging, theoretically integrated explanations for these various findings as illustrated in the models offered by Farrington (2010), Moffitt (1993) and Sampson and Laub (2005). These findings can also be understood within the evolutionary context of human development. Broadly speaking, we can view the human life cycle, from birth to death, as the product of evolution by natural selection (Stearns, Allal & Mace, 2008). Because developing organisms face different adaptive challenges at different stages of their life history we should, therefore, expect that the proximate mechanisms that underpin human behavior to be calibrated to specific developmental contexts. Considerable advances have been made in recent years concerning the physiological, psychological and social processes underlying adolescent risk-taking and antisocial behavior. Recent studies, for instance, have demonstrated that young people can accurately appraise the risk of certain behaviors (Reyna & Farley, 2006), however they may be more attracted to risk and rewarding behaviors as

indicated by heightened activity in the neural mechanisms underlying reward (Casey, Getz & Galvan, 2008). They also appear to be less able to effectively regulate behavior in part due to the incomplete maturation of brain areas underlying impulse control (Steinberg, 2007). Risky behavior in adolescence also tends to be heightened by the presence of peers (e.g., Gardner and Steinberg, 2005) and offending is more likely to occur in groups. From an evolutionary perspective these proximate processes are not arbitrary or accidental features of development but, plausibly, reflect the selection for risk-taking and intra-sexual competition during a crucial period of development in which dominance hierarchies are being established and competition over mates and mating is heightened (Walsh, 2009b).

Although the prevalence of offending peaks during adolescence there are also key individual differences in the nature and extent of antisocial behavior and its persistence during adulthood. From a life-history perspective these differences may reflect, and at an evolutionary level of analysis, alternative reproductive strategies that arise due to different developmental experiences. In short, life-history theory is an evolutionary perspective that explores how organisms allocate resources to different domains depending on their evolutionary history and their particular developmental context (Kaplan & Gangestad, 2005). Important trade-offs include the allocation of energy into current versus future reproduction and investment into mating versus parenting effort. As a species, humans are characterized by delayed reproduction and the investment of significant parenting resources into a relatively small number of offspring. However, the relative value (in evolutionary terms) of the different trade-offs identified by life-history theory depends on specific environmental contexts. For instance, early developmental experiences characterized by parental conflict, stress, economic deprivation, and harsh and inconsistent parenting may provide key cues that indicate that the environment is inherently risky and unpredictable thus propelling individuals along a life-history trajectory that favors early reproduction and the allocation of resources into mating rather than parenting effort (Belsky, 2010; Mishra & Lalumiere, 2008). These individuals

may be particularly prone to engage in antisocial and criminal behavior as they tend to be more impulsive and present-oriented. From an evolutionary perspective, then, what Moffitt (1993) has termed "life-course persistent offenders" may reflect the unfolding of an environmentally contingent adaptive life-history strategy. Although plausible, this evolutionary life-history approach linking childhood experiences with reproductive strategies is currently best validated from studies of girls (Belsky, 2010) and recent work has provided a more nuanced analysis of how early environmental experiences may affect adaptive developmental trajectories suggesting the need for further research before this hypothesis can be uncritically accepted (e.g., see Ellis, Figueredo, Brumbach & Schlomer, 2009).

APPLYING EVOLUTIONARY BEHAVIOURAL SCIENCE

Now that we have considered how evolutionary approaches may be related to some of the key mainstream theoretical perspectives in criminology, we consider how an evolutionary approach can inform our understanding of the nature of punishment responses.

Punishment

The ubiquitous human motivation to punish norm violators has prompted a number of scholars to argue that a sense of justice, including the imposition of negative sanctions, has been selected for in our evolutionary history (Boyd, Gintis, Bowles & Richerson, 2003; Fehr & Gächter, 2002; Hauser, 2006; Richerson & Boyd, 2005; Walsh, 2000). Walsh (2000, p. 842), for example, suggests that "the human sense of justice is an adaptation in the strictest meaning of the term: that is, an evolved solution to the problems faced by our distant ancestors". There is a general consensus that the primary evolutionary function of sanctioning norm violators is to promote within group cooperation. In other words, the mechanisms underlying the motivation to punish

evolved to solve the "problem of cooperation" (Fehr & Fischbacher, 2004; Boyd et al., 2003).

The existence of widespread cooperation among non-kin (what Richerson and Boyd, 2005 term human "ultrasociality") is an evolutionary conundrum: why would individuals incur costs to themselves by cooperating and therefore benefiting other, unrelated, group members? Individuals who receive the benefits of cooperation without incurring the costs of cooperating will be at a selective advantage and thus cooperating types should be eliminated from the population. The existence of, what is termed "altruistic punishment" (Fehr and Gächter, 2002; Boyd et al., 2003), or "moralistic punishment" (Richerson & Boyd, 2005) is proposed as a solution to this problem: if enough individuals within a group are motivated to punish those that free ride on the cooperation of others, then non-cooperative individuals will be at an evolutionary disadvantage compared to those who do cooperate (and thus do not attract negative sanctions), and widespread cooperation can be sustained.

Consistent with these theoretical ideas, research using experimental public goods games has consistently found that: (1) individuals are strongly motivated to punish those that act in an "unfair" fashion even at a cost to themselves; (2) uninvolved third parties are, likewise, motivated to punish non-cooperators; (3) the amount of cooperation is significantly increased when non-cooperators can be and are punished (Fehr & Gächter, 2002; Henrich et al., 2006); and (4) groups in which sanctioning occurs will, ultimately, attract more members and demonstrate higher overall levels of cooperation than groups that do not involve sanctioning (Gurerk, Irlenbusch & Rockenbach, 2006). In sum, there is consistent evidence for the existence of, what Gintis, Henrich, Bowles, Boyd, & Fehr (2008, p. 243) term "strong reciprocity": "a propensity, in the context of a shared task, to cooperate with others similarly disposed, even at personal cost, and a willingness to punish those who violate cooperative norms, even when punishing is personally costly".

Punishment may effectively solve the problem of cooperation, but it also creates a “second-order” cooperation problem. Individuals who are motivated to punish will incur some costs of punishing and therefore individuals who do not punish will be at a relative selective advantage. There are several possible solutions to this problem. Barclay (2006) has argued that the costs of punishment are offset as individuals who are willing to punish garner reputational benefits for punishing (they are deemed more trustworthy by group members) that translate into fitness (i.e., survival and reproductive) benefits. Others have argued that the actual costs of punishing may not be especially significant. This would be the case in groups where punishers are common (and norm violators rare) because individuals would only be required to punish rarely (Boyd et al., 2003; Richerson & Boyd, 2005). Boyd et al. (2003) argue that altruistic punishment has evolved via group selectionist processes. In short, cooperative groups are more successful than non-cooperative groups, therefore increasing the frequency of cooperation. Because groups that contain more individuals who are motivated to punish are more cooperative (by reducing the number of non-cooperators), the frequency of punishers will also increase. In groups containing a large number of cooperators and punishers, the costs of punishment will be significantly diminished (especially if punishment also attracts other benefits as Barclay, 2006 suggests). For group selection to work there must be relatively stable variation among cultural groups (Richerson & Boyd, 2005). Group differences are maintained via conformist social learning (individuals learn the typical beliefs, values, norms, and practices of their group), and the punishment of norm violators. Although group selectionist accounts are viewed with skepticism by some there is good reason to believe that group selection is not only a viable evolutionary mechanism, but has also played an important role in the evolution of our lineage (Wilson & Wilson, 2007).

This brief outline of an evolutionary theory of punishment helps us to address the fundamental question of *why* humans are motivated to punish. Punishment exists because the mechanisms underlying punishment responses are evolutionary adaptations

that have been selected for because they historically conferred fitness benefits on individuals who possessed them by promoting cooperation within groups. However, although evolutionary accounts have often focused on the promotion of cooperation and the punishment of free riders, it is clear that scope of punishable acts in human societies is much broader than this. Successful groups are not simply those that have high levels of cooperation per se, but are also highly socially cohesive, relative to out-groups: individuals behave in ways that favor the in-group, adhere to group-held norms, rules and practices, and are willing in some contexts to place the interests of the group above those of the self or kin. The motivation to punish, then, can be viewed more broadly as an evolutionary adaptation (or suite of adaptations) that evolved because it increased within group cooperation and group cohesion and thus contributed to the fitness of in-groups (and, thus, in-group members) relative to out-groups.

From this perspective we should expect that some acts, such as harm to in-group members, theft, and cheating should be relatively universally punished across groups because they will reliably undermine the effective functioning of groups (Robinson & Kurzban, 2007). However, acts that are perceived to pose a threat to social cohesion/social flourishing also tend to be punished even if they result in no clear and obvious harm to others. Because punishable acts are simply those that violate certain social norms, a large and diverse range of human behaviors may become subject to sanctions. As Haidt (2007) has argued, what constitutes the human moral domain (and thus the scope of punishable acts) extends beyond the liberal Western notions of harm and justice to embrace a wide range of acts that threaten group cohesion and the effective functioning of moral communities. We should, therefore, expect the specific nature of punishable acts to vary among cultures, as through the process of cultural evolution different groups develop distinct collections of values, norms, beliefs and practices. An evolutionary perspective can thus help us to understand both similarities and differences in punishable acts in different cultural-historical contexts. However, what counts as a punishable act, and how given acts will be punished, depends on specific

social and cultural-historical contexts, highlighting the importance of evolutionary models that allows for the co-evolution of genes and culture, and providing points of interconnection with more mainstream sociological approaches to understanding punishment.

For example, a considerable body of literature is now devoted to explaining cross-national and historical differences in punishment, with a focus on understanding differences in punitiveness (see Tonry, 2007; Whitman, 2005 for reviews). No consensus has emerged on what the most important factors are. However, one prominent line of research has examined the role of society level characteristics such as political economy (e.g., Cavadino & Dignan, 2006), political systems that promote "penal populism" (e.g., Pratt & Clark, 2005), and racial heterogeneity (Ruddell & Urbina, 2004). Another direction of inquiry has focused on particular patterns of norms and values, often in combination with social-structural characteristics, and how they translate into different penal responses to criminal offending (Tonry, 2009). Norbert Elias's (1939) conception of a civilizing process, for instance, provides an account of how changing norms within European culture since the Middle Ages contributed to a decline in brutal, and public forms of punishment (see also, Pratt, 2000; Vaughan, 2000). There are also important linkages that can be made between evolutionary accounts and proximate psychological and physiological approaches to understanding punishment responses. For instance, psychological accounts of punishment highlight how norm violations invoke a set of cognitive and affective responses (instantiated in the brain) that ultimately result in the motivation to punish the individual who has committed the norm violation (see Darley, 2009; Seymour, Singer & Dolan, 2007). Plausibly these reflect the operation of evolved adaptations for punishment that have been selected for during the course of our evolutionary history.

Clearly a complete account of punishment requires an understanding of both the seemingly universal motivation to punish in terms of its evolutionary function, the proximate physiological, psychological and social mechanisms that give rise to

punishment and the social-structural and cultural-historical processes that shape the form and nature of punishment responses. Thus, it seems reasonable to assume that the motivation to punish is linked to perceptions of fairness, and in this respect, is innate. However, the specific content of norms associated with fairness, and those that spell out the nature of punishment and its severity, and duration, are culturally derived. This is not a problem for a behavioral evolutionary approach such as gene-culture co-evolution theory, where there is a stress on the important causal role of social/cultural processes in the generation of human behavior.

CONCLUSION

In their influential book, *A General Theory of Crime*, Gottfredson & Hirshi (1990, p. 275) noted that "the study of crime is too important to be diverted by arguments about theory ownership or discipline boundaries" and the need for criminology to be a truly interdisciplinary endeavor is widely recognized. However, despite the increasingly inclusionary nature of criminological theory and the more prominent role afforded psychological and biological factors in general, criminologists should not neglect the fact that humans are evolved organisms and hence an understanding of our evolutionary history has important implications for theory construction in criminology. We suggest that the growing literature in evolutionary forensic psychology, and recent developments in the application of evolutionary theory to human behavior, provide a valuable opportunity for criminologists to broaden their theoretical horizons and more fully consider how evolutionary approaches may contribute to their discipline.

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Table 1

Levels of explanation and theoretical approaches in criminology

Level of explanation	Explanatory focus	Examples of criminological theory
Distal Explanations		
Evolutionary explanations	Evolutionary history and function	Homicide adaptation theory (Duntley & Buss, 2011); and other evolutionary approaches to violence (e.g., Daly & Wilson, 1988)
Cultural-historical explanations	Cultural history and context	Southern culture of honor (Nisbett, 1993); sub-cultures of violence (Anderson, 1999)
Developmental Explanations		
Developmental explanations	Developmental processes	Integrated cognitive antisocial potential model (Farrington, 2010); social learning theory (Akers, 1985); Dual developmental pathway model (Moffit, 1993)
Proximate explanations		
Psychological explanations	Personality characteristics, affective states and cognitive processing	Self-control theory (Gottfredson & Hirschi, 1990)
Physiological explanations	Physiological processes	The "frontal brain hypothesis" (Raine, Buchsbaum, & LaCasse, 1997); and other neuropsychological models of self-control
Social explanations	The role of peer, family and school influences	Differential association theory, sub-cultural theories of delinquency
Community explanations	The role of neighbourhood and community factors	Social control theory (Hirschi, 1969), collective efficacy (Sampson et al., 1997)

Society level explanations	The role of societal level social-structural factors	Strain theory (Merton, 1938; Agnew, 2005)
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