Beyond "just-so stories": How evolutionary theories led to predictions that non-evolution-minded researchers would never dream of.

The philosopher Jerry Fodor characterised evolutionary explanations for human behaviour as "inherently post hoc" (Fodor, 2007), giving examples such as "We don't all talk the same language because that would make us more likely to interbreed with foreigners" and "We talk by making noises and not by waving our hands; that's because hunter-gatherers lived in the savannah and would have had trouble seeing one another in the tall grass."

Critics of evolutionary psychology frequently describe evolutionary explanations as "just-so stories", and it is not hard to agree that they are frequently right. For example, explaining the contagiousness of yawns as an evolved mechanism to promote group vigilance (Gallup & Gallup, 2007) is clearly post hoc. Darwin (1872) wrote about the contagiousness of baboon yawns over one hundred years ago. More importantly, testing this 'group vigilance' hypothesis is practically impossible.

Evolutionary psychology is by no means alone in generating post hoc, untestable hypotheses, however. Indeed, much of the field of social psychology has been criticised as consisting of essentially unfalsifiable theories (Wallach & Wallach, 2001). My aim here is not to defend such poor science, evolutionary or other, but rather to highlight some of the many examples of how consideration of evolutionary theories can allow psychologists to generate novel, testable hypotheses about human behaviour.

While poor evolutionary psychology focuses on 'inventing' adaptive functions for observed behaviour, good evolutionary psychology uses established biological theories to predict patterns of behaviour that have not yet been investigated.

Trustworthy, but not lust-worthy

Inclusive fitness theory (Hamilton, 1964) mathematically sets out the conditions under which natural selection would favour behaviour that helps genetic relatives at the expense of oneself. *Optimal outbreeding theory* (Bateson, 1978) proposes that there is an optimal balance between the dangers of inbreeding (e.g., genetic mutations) and the costs of excessive outbreeding (e.g., mating with the wrong species) and that organisms should be sensitive to kinship when choosing a mate. Together, these biological theories lead to the evolution-minded hypothesis that people should like others who resemble themselves only in social contexts with no sexual component and should actually be averse to self-resemblance in a sexual context.

I tested this hypothesis by examining people's attitudes towards opposite-sex versions of their own faces made using computer-graphics (DeBruine, 2005). When asked to judge faces on apparent trustworthiness, people rated their own opposite-sex version as much more trustworthy than others did. However, when asked to rate these same faces on their attractiveness for a short-term, exclusively sexual relationship, such as a one-

night stand, people rated their own opposite-sex version as *less* attractive than others did. It seems that people with self-resembling faces are trustworthy, but certainly not lust-worthy.

These strikingly different effects of self-resemblance on trustworthiness and sexual attractiveness would never have been demonstrated had I not adopted an explicitly evolutionary perspective. Existing theories, such as the *halo effect* (Dion, Berscheid & Walster, 1972) actually predict the opposite: that finding a person attractive necessarily leads to ascribing other positive traits such as trustworthiness. Indeed, it was only by considering the costs and benefits of behaviour on genetic fitness as laid out in inclusive fitness and optimal outbreeding theories that I could predict the pattern of results that I subsequently found for attitudes to self-resembling faces.

Menstrual cycle and mate preferences

While an evolutionary perspective can help to predict how people will behave in general, it can also generate predictions about when and how individuals will differ. Far from implying that evolved behaviours are fixed and inflexible, evolutionary theories make many specific predictions about context-dependent responses to environmental variables.

Although we've all heard that "beauty is in the eye of the beholder", implying that attractiveness judgments simply reflect idiosyncratic and arbitrary preferences, many scientific theories of facial attractiveness emphasise high agreement among individuals (Langlois et al., 2000). Since face preferences were assumed to be relatively invariant among people in the same community, there was no reason to investigate the possibility that face preferences might change within a single individual in a context-dependent manner. Established theories of sexual selection predict precisely this.

Good genes sexual selection (Andersson, 1994) refers to selection for mate choice strategies that optimise the genetic health of offspring. However, the benefits of a mate with good genes cannot be realised unless the conception of offspring is likely. Since women's fertility varies cyclically, the importance they place on facial cues to men's genetic quality may also vary along with the menstrual cycle.

Studies have demonstrated that masculine men tend to be healthier than relatively feminine men (e.g., Thornhill & Gangestad, 2006). However, masculinity is also associated with negative traits, such as untrustworthiness and lack of interest in children. Given that health is heritable, it may benefit women to increase their preference for masculinity when they are most likely to conceive.

Ian Penton-Voak and colleagues (1999) asked women to judge the attractiveness of male faces at two different points in their menstrual cycle. They were shown five versions of a man's face and asked to choose the most attractive version. The five versions varied in masculinity, ranging from fairly masculine to fairly feminine. When women were in the least fertile stages of their menstrual cycles, they preferred more feminine

faces. However, when they were in the most fertile stage of their menstrual cycles, their preference for femininity was only half as strong.

Thus, women's preferences for facial characteristics that are known to be positively correlated with health are strongest when women are most fertile – precisely what would be predicted by sexual selection theories.

In recent years, dozens of findings related to this phenomenon have emerged. Women's preferences for healthy-looking faces, dominant-acting men, masculine-looking bodies, self-resembling faces and masculine-sounding voices all change across the menstrual cycle in ways that are better predicted by evolutionary theories than by alternative hypotheses such as mood effects (Jones et al., 2008).

Overestimation from above

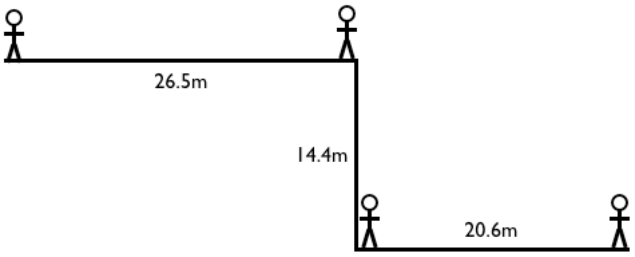
Consideration of evolutionary theory is not only useful for studies of social behaviour. Recent studies of distance perception demonstrate how evolution-minded thinking can generate novel, testable hypotheses about non-social behaviours.

People overestimate vertical distances relative to equivalent horizontal distances. For example, the distance that people perceive when standing on top of a five-storey building is equivalent to the actual height of a nine-storey building. Oriented horizontally, this same distance is perceived much more accurately.

Evolved navigation theory (Jackson & Cormack, 2007) considers the fitness consequences of different types of navigation. Because descent is much more likely to lead to falls and injury, ascending from the bottom and descending from the top result in very different potential consequences on fitness.

Evolved navigation theory leads to the hypothesis that vertical distances will be overestimated more from the top than from the bottom. Existing theories make different predictions. *Gravity theory* (Howard & Templeton, 1966) predicts that vertical distances will be overestimated more from the bottom than from the top because climbing up takes more energy than climbing down. *Foreshortening of receding horizontals* (Segall, Campbell, & Herskovits, 1966) predicts equal overestimation from the top and bottom.

Russell Jackson and Lawrence Cormack (2007) asked people to estimate the height of a 14.4 meter-tall carpark by instructing a researcher to stand as far from them as the carpark was tall. When standing at the base of the carpark, people positioned the researcher an average of 20.6 meters away. However, when standing at the top of the carpark, average estimates increased by almost 30% to 26.5 meters. Almost 90% of people overestimated the height of the carpark more when they were standing at the top than when they were standing on the ground.



This previously unknown descent illusion was predicted only by consideration of the fitness consequences of behaviour. Indeed, no one even thought to test this prediction for over 40 years until an evolutionary perspective was brought to bear on the topic. Jackson and Cormack's work neatly emphasises that consideration of evolutionary theory leads to novel, testable predictions about behaviours other than social interactions. Their work has even led to new insight into acrophobia, the fear of heights. Acrophobics exhibit an exaggerated descent illusion, recasting acrophobia as a sensible fear of pathologically perceived heights, rather than a pathological fear (Jackson, 2009).

What use is evolutionary psychology?

Fodor's criticism of evolutionary psychology focuses on the post hoc "just-so stories" that some researchers in the area proffer as explanations for behaviour. However, the real power of an evolutionary perspective lies not in generating plausible reasons for behaviour that we already know about, but in generating novel predictions about behaviours that have not yet been investigated. Responses to self-resemblance, cyclic shifts in women's masculinity preferences, and the descent illusion exemplify this type of evolutionary psychology, but are by no means the only examples of the utility of evolutionary thinking.

In *The Origin of Species*, Darwin (1859) wrote, "In the distant future I see open fields for far more important researches. Psychology will be based on a new foundation, that of the necessary acquirement of each mental power and capacity by gradation."

Rather than arguing for the establishment of evolutionary psychology as a new type of psychology, equal to and distinct from other areas such as social or cognitive psychology, I think Darwin was arguing that all of psychology may benefit from evolutionary thinking. Explicit consideration of the costs and benefits of behaviour on evolutionary fitness can guide researchers to generate novel, testable hypotheses in any area of psychology.

References

Andersson, M. (1994). *Sexual selection*. Princeton University Press.

Bateson, P. (1978). Sexual imprinting and optimal outbreeding. *Nature*, **273**, 659-660.

Darwin, C. (1872). *The Expression of the Emotions in Man and Animals*.

Darwin, C. (1859). *The Origin of Species.*

DeBruine, L. M. (2005). Trustworthy but not lust-worthy: Context-specific effects of facial resemblance. *Proceedings of the Royal Society of London B*, **272**, 919-922.

Dion, K., Berscheid, E., & Walster, E. (1972). What is beautiful is good. *Journal of Personality and Social Psychology*, **24**, 285-290.

Fodor, J. (2007). Why pigs don't have wings. *London Review of Books*, **29**(20).

Gallup, A. C., & Gallup Jr., G. G. (2007). Yawning as a brain cooling mechanism: nasal breathing and forehead cooling diminish the incidence of contagious yawning, *Evolutionary Psychology*, **5**, 92-101.

Hamilton, W. D. (1964). The genetical evolution of social behaviour, I. *Journal of Theoretical Biology*, **7**, 1-16.

Howard, I. P., & Templeton, W. B. (1966). *Human spatial orientation*. New York: Wiley.

Jackson, R. E. (2009). Individual differences in distance perception. *Proceedings of the Royal Society of London B*, **in press**. (doi:10.1098/rspb.2009.0004)

Jackson, R. E. & Cormack, L. K. (2007). Evolved navigation theory and the descent illusion. Perception and Psychophysics, **69**(3), 353-362.

Jones, B. C., DeBruine, L. M., Perrett, D. I., Little, A. C., Feinberg, D. R. & Law Smith, M. J. (2008). Effects of menstrual cycle phase on face preferences. *Archives of Sexual Behavior*, **37**, 78-84.

Langlois, J. H., Kalakanis, L. E., Rubenstein, A. J., Larson, A. D., Hallam, M. J., & Smoot, M. T. (2000). Maxims or myths of beauty: A meta-analytic and theoretical review. *Psychological Bulletin*, **126**, 390-423.

Penton-Voak, I. S., Perrett, D. I., Castles, D. L., Kobayashi, T., Burt, D. M., Murray, L. K., & Minamisawa, R. (1999). Menstrual cycle alters face preference. *Nature*, **399**, 741-742.

Segall, M. H., Campbell, D. T., & Herskovits, M. J. (1966). *The influence of culture on visual perception.* Indianapolis: Bobbs-Merrill.

Thornhill, R., & Gangestad, S. W. (2006). Facial sexual dimorphism, developmental stability, and susceptibility to disease in men and women. *Evolution and Human Behavior,* **2,** :131-144.

Wallach, L., & Wallach, M. A. (2001). Experiments in social psychology: Science or self-deception? *Theory & Psychology*, 11, 451-473.