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Evolutionary and Cognitive Aspects of Beauty (Attractiveness)

Abstract

The subjective nature of aesthetic experience and the different aesthetic evaluation of the same impulses raise the suspicion of many thinkers to see beauty as a matter of a percipient's individuality, and of beauty's formation through external historical and cultural influences. Authors impeach this thesis and present the questions, whether it is possible to find cognitive aspects or purposes in aesthetic judgements and in beauty perception, and if it is possible to meaningfully build cognitive aesthetics as a science about the epistemic background of beauty and art.

On the example of attraction, the mechanisms of evolutionarily universalistic approach are shown. In this case, an attractiveness evaluation can be understood as an unconscious calculating process where we evaluate sensory inputs without consciously regarding the evaluation algorithms which were acquired in the course of evolution or upbringing. At the same time, authors add the cognitive approach stressing the idea, that the attractiveness of an average object proves that it has a higher degree of correspondence with its prototype. For this reason our ideal of beauty is often conditioned by our education, individual history, and culture.

The clarification of functioning of these mechanisms enables to present a model of how both systems work together, and so provides an explanation of why there are objects which we all like and why we are sensitive to very similar impulses, but on the other hand, this could also explain why there is an individual, historical, and cultural interdependence of aesthetic values.

Keywords

Until recently, beauty belonged to those objects of which scientific examination was almost unthinkable. There was a presiding principle that beauty was something elusive, the manifestation of a subjective experience so diverse that its objective and scientifically graspable examination was almost out of the question. This is also illustrated via the Latin idiomatic expression *De gustibus non est disputandum,* which became the canon of the solution of aesthetic problems; therefore any ambitions to examine beauty from a scientific point of view were often perceived as a manifestation of intellectual tastelessness.

The subjective nature of aesthetic experience and the different aesthetic evaluation of the same impulses raise the suspicion of many thinkers to see beauty as a matter of a percipient's individuality, and of beauty's formation through external historical and cultural influences. Even if there is some correlation of aesthetic correspondence of percipients (diachronic or synchronic), it is probably culturally and historically conditioned. Due to the nature of the correspondence, it should thus be explored by history and art theory, or the social and cultural mechanisms of the formation of subjective opinions (psychology and art sociology).

But there is also a different approach to beauty. The Pythagoreans, Plato, and several medieval and Renaissance thinkers believed beauty to be an objective characteristic of a particular object, and not only a passing fad. With the Enlightenment, beauty was again in the spotlight of thinkers and intellectuals and they began to look for what beautiful objects have in common – either as their own characteristics (the English school of taste), or as a necessary organization of our own means of perception. Eventually, an individual philosophical discipline was created – aesthetics. This discipline has been understood as the theory of sensory perception – and thus as an epistemologically inferior – or lower – sensory theory of knowledge since the time of A. G. Baumgarten and Wincklemann and Kant. However, Kant's influence and the influence of his followers resulted in the belief that a clear aesthetic judgement should be free from any concepts and cognitive purposes, mainly in the last period of the Renaissance of cognitive-scientific research of aesthetic experience and its evolutionary aspects may be observed.

A basic theme of the presented study is an examination of whether it is possible to find cognitive aspects or purposes in aesthetic judgements and in beauty perception, and if it is possible to meaningfully build cognitive aesthetics as a science about the epistemic background of beauty and art. One group of aestheticians believes in the separation of cognitive moments from aesthetic experiences and judgments. Others (for example Nick Zangwill), find a link between truth and beauty and they claim that even an aesthetic judgement can be true or untrue. Other aestheticians conclude that at least one of the functions of aesthetics is cognitive itself: meaning that works of art are created, perceived, and liked by us because we can learn something through them. This approach can be found, for example, in the aesthetic theory of Noël Carroll or (although a little bit differently) in the analytically oriented Nelson Goodman. On the other hand, what can be recognized through the aesthetic experience is ambiguous and remains a bone of contention.

As the cognitive sciences developed (particularly at the end of the 20th century), a cognitively oriented approach began to be established abroad which focused on the understanding of beauty and aesthetic experience. New studies began to emerge about the biological, cultural, psychological, and mainly cognitive determinants of beauty. Works of the following authors serve as an example: Devendra Singh, Judith H. Langlois, David Ian Perrett or Semir Zeki etc. A special example of the seriousness of the cognitive exploration of beauty was the establishment of centres such as the Perception Lab at the university in St. Andrews or the NYU Cognition and Perception Lab, the Centre for the Study of Perceptual Experience at Glasgow University, or the Neuroaesthetics: Beauty is in the Brain of the Beholder project (Semir Zeki, UCL), which focused on research related to the cognitive aspects of the perception of beauty.

The main problem of contemporary scientific exploration of aesthetic experience is the connection of descriptive and process-like oriented knowledge resulting from the cognitive sciences and precise cognitive approaches with the description of a subjectively experienced phenomenal aesthetic experience with the perception of beauty and deeper understanding of the cognitive (cultural and evolutionary) structure of our perception of beauty.

One of the key questions of any exploration (not only an aesthetic one) is a clarification of the basic concepts. What actually is beauty?

Many different definitions of beauty or matters of aesthetic experience can be found in the history of philosophy. One of the best is that of F. Hutcheson from *An Inquiry Into the Original of Our Ideas of Beauty and Virtue; In Two Treatises*, who declares that "Beauty is unity in variety and variety in unity." A feeling of unity and harmony from complexity is one of the main delimitations of beauty. Beauty is often not only harmonizing and soothing but, on the contrary, it can also be stimulating and fascinating. The conviction of R. Feynman that beauty is: *"Mesmerism of complexity"* could therefore be a different but equally productive delimitation.

For many philosophers, beauty is subjective and is characteristic of a subjective (not shareable) aesthetic experience. Many therefore believe that it is ungraspable – "That is the best part of beauty, which a picture cannot express" (Francis Bacon). If this is really true, how is it possible that many of us judge various objects the same way, that there are exemplary instances of beautiful art or of beautiful objects and also the fact that when perceiving beauty we feel the same or identical emotions? The existence of fashion and beautiful art is, after all, an example that in despite of the fundamental subjective nature of aesthetic experience there is something in it that is objective and hence scientifically researchable.

What is it that we actually like? It seems that a possible solution of the aesthetic problem does not have to be an exact and generally acceptable definition of what beauty is, but rather the characteristics of the elements, features, or aspects of beautiful objects. What do beautiful objects have in common?

Undoubtedly this means that they are able to arouse the feeling of love or admiration. This feeling has two dimensions. It is either a feeling of harmony and unity arousing certain satisfaction or it is a case of attraction which encourages us to a closer

or more constant approach to beautiful objects. According to Hideaki Kawabata and Semir Zeki[1], it is related to the fact that when perceiving beauty, the centres in the medial orbitofrontal cortex of our brain are activated independently from the type of sensory stimuli (auditive, visual, etc.). The activity of this part of the brain correlates with the targeted focus of our attention, which could be the reason why beautiful objects attract our attention. On the contrary, Kawabata and Zeki have proven that objects which are perceived as ugly are connected with a higher activity in the limbi system and motor and sensory cortex. One of the consequences of this connection is that in the case of an experience with an ugly or unpleasant object, we turn our attention away from the object usually by means of turning away from its effect on our senses. Ugliness triggers an escape reaction while a feeling of admiration inspires feelings of remaining and contemplating the attraction of a beautiful object. A chemical messenger of perceiving beauty is, according to the research of J. R. Buri[2], mainly a powerful wave of neurotransmitters, such as Epinephrine, Dopamine, Phenyl ethylamine, and Endorphins.

What is the point of the perception of beauty? No doubt it is a reflection of our own states that are induced by sensory stimulation or imagination in our consciousness. The feeling of beauty or, on the contrary, ugliness, is an important conveyor about the quality of an object, but also about its potential effect on us. Ugliness and disgust emerge usually when the sensors (or imagination) are exposed to the effect of stimuli which could harm us (by their nature or due to our current state). Therefore, we strive to turn away from such objects to reduce their effect. In the case of beauty, on the contrary, we reflect the positive aspects of the affecting stimuli either in the form of a simultaneously experienced positive sensory feeling or the potential positive effects which certain objects can cause.

In this respect, the feeling of beauty can be understood as a certain attractiveness – attraction – or gravitation of attention (similar in the case of fear). Hume and Hartley dealt with the study of individual potential interpretations of the mechanisms of mental gravitation – the interpretation of associationism as a mental gravitation, as did Zeki and Ramachadran in neuroaesthetics.

The aspects of beauty, which have been studied in great detail as attractiveness, can be found in studies of physical attractiveness (either of a body or a face) linked with Darwin's reductionist conviction that the key of all beauty is sexuality. The research of Devendra Singh[3,4,5] (Waist-to-Hip Ratio) and Glenn Wilson (Bust/Waist Ratio)[6,7] speak of the fact that an overwhelming majority of men, regardless of their culture and age (from puberty until death), evaluate a woman as an attractive object if her body has a breast, waist, and hip circumference in the ratio of 1/0,7/1. The reasons for the universality of the B-W-H hypothesis are (according to R. Dawkins[8] and M. Ridley[9]) a higher probability of the woman being in a young, healthy state (with a body with these characteristics) and thus a high probability of an efficiency of energy investing in her genes in order to bring up healthy offspring[10,11,12]. Other primary signs of health and youth, which are typical of an attractive woman, are the entire figure (breast size and shape, waist, hips, slim legs and face, particularly eyes and lips) complexion, and hair quality, etc. All of these elements are evaluated as attractive by the percipient and they are symbols of young age and health[13,14,15,16].

Similarly, the signs of a man's attractiveness can be studied. The male body also has physical parameters, as in the case of women: height[17,18], square jaw, wide forehead, wide shoulders, strong arms, deltaic chest, and a waist hip ration of 1:1. Regarding the different strategies of genes creating men's and women's bodies, according to Ridley it is possible to study the different importance of physical and mental attractiveness in women's and men's preferences. While in the case of men physical attractiveness is a very important part, women more often focused on the other qualities of a partner (relation to family, successfulness, their ability to secure a partner and common offspring) although even here different priorities can be found during different periods (alpha-male preferences during ovulation, or a suitable partner for upbringing (an experienced protector) offspring in other phases of a cycle).

An important message of the abovementioned theories is that the foundation stone of the attractiveness of a body or a partner is a set of characteristics which are perceived by a percipient as a bearer of important information about the age and health condition (and social status) of a potential partner, and these characteristics are precisely assessed by our brain in the form of a subjective aesthetic judgment – as the attractiveness or non-attractiveness of that person as a partner. The emotions that we have are nowhere near as irrational as they may seem. On the contrary, they include cognitive information acquired in the course of evolution or in another way, or algorithms of processing sensory information. A typical example of a neo-Darwinian interpretation of attractiveness was a series of attempts to assess the attractiveness of scents of potential partners[19] and their correlation to the immunocompatibility of a potential partner (Human leukocyte antigen)[20], which proved that the individuals with incompatible immune systems are evaluated as unattractive or even unsuitable by our sense of smell[21].

An attractiveness evaluation can be understood as an unconscious calculating process where we evaluate sensory inputs without consciously regarding the evaluation algorithms which were acquired in the course of evolution or upbringing. These unconscious processes are reflected in the form of a feeling of admiration or disgust. The evaluation of human face attractiveness might be a typical example of such a calculating process.

According to most available research (Symons), people evaluate "attractive" faces as those which are to a large extent symmetrical and average. The prettier a face is, the closer it is to the average. The history of this fact began with the experiments of Francis Galton, who originally tried to make a prototype of a criminal offender's face by means of creating a picture (composite pictures) of detained criminals. Surprisingly, he discovered that the more average a face is, the less it reflected the features of a criminal's face and, on the contrary, it retouched individual imperfections and formed a more impressive human face. A "criminal" face created in this way was always prettier than one of any individual criminal. Galton's experiment was later supported by the research of D. I. Perrett[22,23], and later on also by Judith H. Langlois and Lori A. Roggman[24], who created a computer superposition of many human faces both from average human appearance and from faces which were considered as pretty by others. The results of the experiment proved that the new "average" faces were always prettier than the original ones, and that our mind evaluates them in relation to all observed

faces. The results of their research provoked a flurry of reactions demonstrating that attractiveness does not consist in mediocrity[25] but in symmetry (composite and digital pictures). However, G. Rhodes[26] proved that the attractiveness of composite pictures does not only lie in their symmetry.

One of the key features of an attractive face is the degree of symmetry. The symmetry of a face can be directional and fluctuating. It is becoming apparent that the lower the fluctuation asymmetry is (caused by an insufficient expression of genes) the more attractively a face is perceived. Evolutionary oriented epistemologists are convinced that a lower degree of fluctuation asymmetry reflects the developmental stability of an organism[27]. Similarly, as in the case of searching for an ideal immunopartner where a patch strategy seems to be ideal – meaning looking for an immune system which does not suffer from my imperfections but mends them (or at least increases the probability of healthy offspring) – here it can be supposed that a perfectly symmetrical face is a sign of healthy genetic equipment with a good expression of genes[28]. Beauty is then perceived as a consequence of a stabilizing selection and it can be a sign of a higher degree of heterozygosis within such partners, which also means that a reduction of risk of health defects in their offspring.

But the evolutionary oriented interpretation of the attractiveness of an average and symmetrical face is not the only interpretation. Cognitively oriented thinkers believe that the attractiveness of an average object proves that it has a higher degree of correspondence with its prototype. It seems that we evaluate the prettiest as those objects which are the most similar to the prototype, which we have created ourselves from our experienced observations. For this reason our ideal of beauty is often conditioned by our education, individual history, and culture. This not only applies to the attractiveness of a face, which often needs a period of time (and a number of experiences) to impress us, but also the so-called average prototypes of animals, cars, houses, and other objects. Similarly, it could follow that children at an early age look at faces which are evaluated by society as attractive longer than they do at other faces. On the contrary, faces which fundamentally differ from a child's usual visual environment (for example, a bearded man in an environment without the occurrence of bearded people) are evaluated by the child as unattractive or unsettling, which is reflected at the time of the observance and in other physiological manifestations[29,30].

This would seem to indicate that our mind, when evaluating beauty, compares an observed face with an ideal prototype, which we gradually create throughout our lifespan. It is natural that a child connects an average face with most often observed faces; in other words, with the faces of his/her mother or a babysitter.

In this context, Immanuel Kant assumed that although we all have an idea of beauty, in the same way as a rational idea, we form the ideal of beauty on the basis of experienced observations. The ideal is then some kind of average, or rather its representation, and therefore it is individually and culturally conditioned. According to Kant, this is the reason why men from different cultures appeal to female members of their culture because they are confronted with this kind of face most of the time. In an era of globalization due to the fact that the base of possible experience is widened and

borders are wiped out, it can be observed how public opinion is becoming transformed in matters of beauty or fashion ideal.

Maybe a combination of both mentioned approaches – evolutionarily universalistic and individual cognitive – explains why there are objects which we all like and why we are sensitive to very similar impulses, but on the other hand, this could also explain why there is an individual, historical, and cultural interdependence of aesthetic values. Fashion, art (experiencing various forms and examples of beauty), or media form our individual taste, which in a rudimental way build on the evolutionarily acquired mechanisms and algorithms of judgement.

An example of the combination of both approaches is an examination of the evaluation of the meaning and attractiveness of eyes. Marek Prokop[31] tried to uncover in his research which part of the human face is the most important and most attractive for the participants of both sexes. From the evolutionary and sociobiological reasons he assumed that the eyes in both cases would be the result, since the eyes and where we look are the most important sources of information revealing our intentions, state, and other information about the observed subject. It followed from Prokop's questionnaires that about 81.4% of participants stated the eyes in the first place as the most important part of the face. Similarly, the same responders (49.9%) stated that the eyes are the most important aspect for them when evaluating the attractiveness of a face (the mouth and eyebrows ranked in second place). Consequently, the respondents were asked to evaluate the attractiveness of a woman's eyes from photographs offered to them by Prokop, and to choose those which they found the most attractive, neutral, and the least attractive. Prokop assumed that despite individual differences, the examined persons would reach agreement and would evaluate which eyes to be the most attractive and which to be the least attractive. Prokop supposed that in spite of the fact that only women's eyes were the subject of evaluation, the preferences of the most attractive and least attractive eyes would be the same in the case of male and female evaluators. Prokop's anticipated expectations were confirmed.

An original task of the abovementioned research was to discover the attractive elements of human eyes and the area on the face around the eyes. This research included both sexes who evaluated only women's eyes. Due to evolutionary reasons, agreement was expected, although it was anticipated that due to sexual dimorphism and the different strategies of respondents, male preferences would be focused on different aspects than female preferences. Research observing the influences of dimorphism indicate that feminine features, which correlate with juvenile features of a bearer (youth guarantees fertility), are important for the evaluation of the attractiveness of a woman's face[32]. Generally speaking, the incidence of feminine features also correlates with attractiveness in the case of men's faces and eyes. The incidence of purely masculine features of a face, which are considered attractive, is relatively rare and is only linked with masculinely physically fit individuals.

Shape, size, symmetry, but also the colour of the eyes, were stated as the attractive characteristics of eyes by the respondents. The colour of eyes is often connected with their attractiveness and several studies have proven that partners often unknowingly choose mates with eyes the same colour as their fathers[33]. The validity of

this fact is questionable. But the result of research demonstrating the strong assortative preference of attractiveness of blue eyes in a partner by blue-eyed men is not questionable at all. This phenomenon could indicate the existence of adaptive behaviour which provides an increased security of paternity of blue-eyed men since the blue colour of eyes of offspring is linked with recessiveness of a given gene[34]. In our research, the colour of the eyes appeared to be interesting only in the case of verbal enumeration of important features but, as for the evaluation of the eyes themselves, this was eliminated by the black and white exposition of the pictures. Rather, the relative size of the eyes turned out to be important (bigger eyes are more attractive, which again correlates with juvenile face features) and also the size and shape of the eyebrows. The author assumed in his research that in the case of experimental research, the most attractive eyes would be characterized by a higher symmetry. This hypothesis was vindicated. Similarly, the hypothesis that in the case of experimental research, the beauty of the eyes would be determined by the eyebrows was also vindicated. The verification that the most attractive eyes would be those that were average was a problematic one. Incorrect methodology, but also the reduced samples evaluated by the respondents could be the reason.

The abovementioned research proved that the eyes are the most important element of the human face, and they are therefore also the most important when evaluating the attractiveness of a face. The respondents mentioned symmetry, size, and mainly the shape of the eyes as significant elements. This is perhaps the reason why the attractiveness of the eyes is to a great extent connected with the shape and lines of the eyebrows and with the overall context of the facial area around the eye which corresponds to a free variant of the cheerleader effect[35]. Women, in particular, are aware of this fact because the accentuation of the eyes, eyebrows, and lips is the most often and historically oldest means of increasing the attractiveness of one's own face.

But this research also showed the weaknesses of the subjective evaluation. Not only did it fail to grasp which shape of eyes is the most attractive, it also failed to determine what the relative size and symmetry of the eye itself should be versus the mutual eye symmetry, and what makes the entire context of the facial area around the eyes attractive. Soft methodology likely remains the biggest problem. People often evaluate their subjective opinions incorrectly. They either do not know how to measure their evaluation properly on the scales, they are not sure about the importance and priorities, or they even alter or misinterpret the evaluations consciously. Instead of the questionnaire method, which uses subjective evaluation from the first person perspective, it is more appropriate to use a combination of research methods: an objective form of research, such as eyetracking or the creation of heatmaps – i.e. methods that can show which parts of the visual field captured the most attention, what a participant really looks at, and what he/she was paying attention to – in combination with the questionnaire method, which takes into consideration the subjective interpretations of aesthetic experience (what a participant thinks of what captured his/her attention and why, and also of what he/she experienced in the case of aesthetic experience).

The feeling of beauty seems to be a primarily subjective experience and therefore we should focus on its subjective description. What makes it what it is, are mainly what

the subject experiences in it, how he/she perceives it, and what meaning it has for him/her. However, the degree of subjective interpretation of this feeling is quite problematic for aesthetic and emotional experience. If it is true that the feeling of beauty, emotion in general, or partly intuition are a form of complicated mathematical calculation with a veiled (hidden) algorithm and variables of solution, it is then possible that we do not properly know what, and particularly why, we like or do not like an object. Our mind offers us only the entire solution of an equation in the form of a final feeling of admiration, disinterest, or disgust. What is beyond this entire process often completely eludes us.

An analysis of the objective aspects of a visual field could help us to understand what causes the aesthetic experience, or more particularly, what and why we like an object. Neuroaesthetic and evolutionary epistemology, or evolutionary aesthetic, are meandering this way. The examination of the mathematical dependences of a visual field might be a great way to understanding the relations between the individual parts of impulses and their entire structure. It can help us find correlations between the feeling of beauty and mathematical relations of visual, auditive, or other material, which we evaluate as beautiful or impressive. The importance of the Science of Beauty project organized by Sir Michael Atiyah and Semir Zeki in autumn in Edinburgh is in the same spirit. Understanding the mathematical relations can answer only a part of the question – the question of what we like. In order to understand why we like what we like, we need an evolutionary explanation. I personally believe that beauty and a pleasant feeling are very important evolutionary tools leading an organism to appropriate behaviour or the receiving of stimuli, which are for the organism, or for its offspring, beneficial. This mechanism can be successfully applied to the explanation of the sexual attractiveness of a partner, a face, body, etc., even to the explanation of why certain stimuli (like sugars, coffee, and the like) cause a pleasant feeling and why others do not. With great difficulty it could be applied to such complex phenomena as music, abstract fine arts, or poetry, but I believe that in the upshot there are evolutionary mechanisms as well which arouse the attractiveness of such impulses in the eyes of the observing subject. Similarly, there are explanations as to why we are less critical in the case of attractive people, and why there is a correlation between the perception of beauty and good (we believe that attractive people are better than they really are, or why attractive people get ca. 12% higher bonuses than neutral or unattractive people, or lower sanctions).

A description of the subjective aesthetic experience of a subject is the third inevitable part of the research of aesthetic experience – as long as it is completed. The question of the causes of the existence of subjective experience could be one problem, but a second problem is what a subject really experiences in it. Why do we feel what we feel, and where does the meaning of the aesthetic experience for an organism which is experiencing it reside (and how does it feel?)? In what does the attractiveness of beauty in our life lie and why is it so important for us? These are all questions which encourage us to do further research.

Notes

1. Hideaki Kawabata and Semir Zeki, "Neural correlates of beauty," *Journal of Neurophysiology* 91, no. 4 (2004): 1699-1705.

2. "Love bytes: Insights on our deepest desire." Accessed July 10, 2015, http://www.psychologytoday.com/blog/love-bytes/201002/love-first-sight.

3. Devendra Singh, "Adaptive significance of female physical attractiveness: Role of waist-to-hip ratio," *J Pers Soc Psychol* 65, no. 2 (1993): 293-307.

4. Devendra Singh and Robert K. Young, "Body Weight, Waist-to-Hip Ratio, Breasts, and Hips: Role in Judgments of Female Attractiveness and Desirability for Relationships," *Ethology and Sociobiology* 16, no. 6 (1995): 483-507.

5. Devendra Singh, "Is thin really beautiful and good? Relationship between waist-to-hip ratio (WHR) and female attractiveness," *Personality and Individual Differences* 16, no. 1 (1994): 123-132.

6. Glenn D. Wilson and Anthony H. Brazendale, "Psychological correlates of sexual attractiveness: An empirical demonstration of denial and fantasy gratification phenomena?," *Social Behavior and Personality: An International Journal* 2, no. 1 (1974): 30-34.

7. Glenn D. Wilson and Anthony H. Brazendale, "Vital Statistics, Perceived Sexual Attractiveness, and Response to Risque Humor," *The Journal of Social Psychology* 95, no. 2 (1975): 201-205.

8. Richard Dawkins, *The Selfish Gene* (Oxford, New York: Oxford University Press, 2006), 253.

9. Matt Ridley, *The Red Queen: Sex and the Evolution of Human Nature* (New York: Penguin Books, 1993).

10. David M. Buss, "Sex differences in human mate preferences: Evolutionary hypotheses tested in 37 cultures," *Behavioral and Brain Sciences* 12, no. 1 (1989): 1-49.

11. Donald Symons, *The evolution of human sexuality* (New York: Oxford University Press, 1979).

12. Donald Symons, "Beauty is in the adaptations of the beholder: The evolutionary psychology of human female sexual attractiveness," in *Sexual nature, sexual culture*, ed. Paul R. Abramson and Steven D. Pinkerton. (Chicago: University of Chicago Press, 1995), 80-118.

13. Steven W. Gangestead and Randy Thornhill, "Human sexual selection and developmental stability," in *Evolutionary social psychology*, ed. Jeff A. Simpson and Douglas T. Kenrick. (New York: Lawrence Erlbaum Associates, 1997), 169-195.

14. Karl Grammer and Randy Thornhill, "Human (Homo sapiens) facial attractiveness and sexual selection: The role of symmetry and averageness," *Journal of Comparative Psychology* 108, no. 3 (1994): 233-242.

15. Todd K. Shackelford and Randall J. Larsen, "Facial asymmetry as an indicator of psychological, emotional, and physiological distress," *Journal of Personality & Social Psychology* 72, no. 2 (1997): 456-466.

16. Randy Thornhill and Anders P. Moeller, "Developmental stability, disease, and medicine," *Biological Reviews of the Cambridge Philosophical Society* 72, no. 4 (1997): 497-548.

17. David M. Buss and David P. Schmitt, "Sexual strategies theory: an evolutionary perspective on human mating," *Psychological Review* 100, no. 2 (1993): 204-232.

18. Bruce J. Ellis, "The evolution of sexual attraction: Evaluative mechanisms in women," in *The adapted mind*, ed. Jerome Barkow, Leda Cosmides and John Tooby. (New York: Oxford University Press, 1992), 267-288.

19. Devendra Singh and Mathew P. Bronstad, "Female body odour is a potential cue to ovulation," *Proceedings of the Royal Society* 268, no. 1469 (2001): 797-801.

20. Claus Wedekind, Thomas Seebeck, Florence Bettens and Alexander J. Paepke, "MHC-Dependent Mate Preferences in Humans," *Proceedings of the Royal Society* 260, no. 1359 (1995): 245-249.

21. Marc Spehr, Kevin R. Kelliher, Li Xiao-Hong; Thomas Boehm, Trese Leinders-Zufall and Frank Zufall, "Essential role of the main olfactory system in social recognition of major histocompatibility complex peptide ligands," *Journal of Neuroscience* 26, no. 7 (2006): 1961-1970.

22. David I. Perrett, *In Your Face – The New Science of Human Attraction* (New York: Palgrave Macmillan, 2010).

23. David I. Perrett and Keith A. May, "Facial shape and judgments of female attractiveness," *Nature* 368, no. 6468 (1994): 239-242.

24. Judith H. Langlois and Lori A. Roggman, "Attractive faces are only average," *Psychological Science* 1, no. 2 (1990): 115-121.

25. Audrey C. Chen, Craig German and Dahlia W. Zaidel, "Brain asymmetry and facial attractiveness: Facial beauty is not simply in the eye of the beholder," *Neuropsychology* 35, no. 4 (1997): 471-476.

26. Gillian Rhodes, Alex Sumich and Graham Byatt, "Are average facial configurations attractive only because of their symmetry?", *Psychological science* 10, no. 1 (1999): 52-58.

27. Karl Grammer and Randy Thornhill, "Human (Homo sapiens) facial attractiveness and sexual selection: The role of symmetry and averageness," *Journal of Comparative Psychology* 108, no. 3 (1994): 233-242.

28. Todd K. Shackelford and Randall J. Larsen, "Facial asymmetry as an indicator of psychological, emotional, and physiological distress," *Journal of Personality & Social Psychology* 72, no. 2, (1997): 456-466.

29. Alan Slater et al., "The role of facial orientation in newborn infants preference for attractive faces," *Developmental Science* 3, no. 2 (2000): 181-185.

30. Alan Slater, "Newborn infants prefer attractive faces," *Infant Behavior and Developmental Science* 21, no. 2 (2004): 345-354.

31. Marek Prokop, "Explanation of Beauty and Eyes-Attractiviness" (Trnava: Trnava University, 2015).

32. Michael R. Cunningham, "Measuring the physical in physical attractiveness: Quasi-experiments on the sociobiology of female and facial beauty," *Journal of Personality & Social Psychology* 50, no. 5 (1986): 925-935.

33. Anthony C. Little, Ian S. Penton-Voak, Michael D. Burt and David. I Perrett, "Investigating an imprinting-like phenomenon in humans partners and opposite-sex parents have similar hair and eye color," *Evolution and Human Behavior* 24, no 1(2003): 43-51.

34. Bruno Laeng, Ronny Mathisen and Jan-Are Johnsen, "Why do blue-eyed men prefer women with the same eye color," *Behavioral Ecology and Sociobiology* 61, no. 3 (2007): 371-384.

35. Cindi May, "The Cheerleader Effect," *Scientific American*, March 12, 2013.

REFERENCES

Buri, John R. "Love bytes: Insights on our deepest desire." Psychology Today. Accessed July 10, 2015, http://www.psychologytoday.com/blog/love-bytes/201002/love-first-sight.

Buss, David M. "Sex differences in human mate preferences: Evolutionary hypotheses tested in 37 cultures." *Behavioral and Brain Sciences* 12, no. 1 (1989). 1-49.

Buss, David M. and Schmitt, David P. "Sexual strategies theory: an evolutionary perspective on human mating." *Psychological Review* 100, no. 2 (1993). 204-232.

Cunningham, Michael R. "Measuring the physical in physical attractiveness: Quasi-experiments on the sociobiology of female and facial beauty." *Journal of Personality & Social Psychology* 50, no. 5 (1986). 925-935.

Dawkins, Richard. *The Selfish Gene. O*xford, New York: Oxford University Press, 2006.

Ellis, Bruce J. "The evolution of sexual attraction: Evaluative mechanisms in women." In *The adapted mind*, edited by Jerome Barkow, Leda Cosmides and John Tooby, 267-288. New York: Oxford University Press, 1992.

Gangestead, Steven W. and Thornhill, Randy. "Human sexual selection and developmental stability." In *Evolutionary social psychology*, edited by Jeff A. Simpson and Douglas T. Kenrick, 169-195. New York: Lawrence Erlbaum Associates, 1997.

Grammer, Karl and Thornhill, Randy. "Human (Homo sapiens) facial attractiveness and sexual selection: The role of symmetry and averageness." *Journal of Comparative Psychology* 108, no. 3, (1994). 233-242.

Grammer, Karl and Thornhill, Randy. "Human (Homo sapiens) facial attractiveness and sexual selection: The role of symmetry and averageness." *Journal of Comparative Psychology* 108, no. 3 (1994). 233-242.

Chen, Audrey C.; German, Craig and Zaidel, Dahlia W. "Brain asymmetry and facial attractiveness: Facial beauty is not simply in the eye of the beholder." *Neuropsychology* 35, no. 4 (1997). 471-476.

Kawabata, Hideaki and Zeki, Semir. "Neural correlates of beauty." *Journal of Neurophysiology* 91, no. 4 (2004). 1699-1705.

Laeng, Bruno; Mathisen, Ronny and Johnsen, Jan-Are. "Why do blue-eyed men prefer women with the same eye color." *Behavioral Ecology and Sociobiology* 61, no. 3 (2007). 371-384.

Langlois, Judith H. and Roggman, Lori A. "Attractive faces are only average." *Psychological Science* 1, no. 2 (1990). 115-121.

Little, Anthony C.; Penton-Voak, Ian S.; Burt, D. Michael and Perrett, David. I. "Investigating an imprinting-like phenomenon in humans partners and opposite-sex parents have similar hair and eye color." *Evolution and Human Behavior* 24, no 1(2003). 43-51.

May Cindi "The Cheerleader Effect." *Scientific American*, March 12, 2013.

Perrett, David I. and May, Keith A. "Facial shape and judgments of female attractiveness." *Nature* 368, no. 6468 (1994). 239-242.

Perrett, David I. *In Your Face – The New Science of Human Attraction.* New York: Palgrave Macmillan, 2010.

Prokop, Marek. "Explanation of Beauty and Eyes-Attractiviness." Trnava: Trnava University, 2015.

Rhodes, Gillian; Sumich, Alex and Byatt, Graham. "Are average facial configurations attractive only because of their symmetry?." *Psychological science* 10, no. 1 (1999). 52-58.

Ridley, Matt. *The Red Queen: Sex and the Evolution of Human Nature.* New York: Penguin Books, 1993.

Shackelford, Todd K. and Larsen, Randall J. "Facial asymmetry as an indicator of psychological, emotional, and physiological distress." *Journal of Personality & Social Psychology* 72, no. 2 (1997). 456-466.

Shackelford, Todd K. and Larsen, Randall J. "Facial asymmetry as an indicator of psychological, emotional, and physiological distress." *Journal of Personality & Social Psychology* 72, no. 2, (1997). 456-466.

Singh, Devendra and Bronstad, Mathew P. "Female body odour is a potential cue to ovulation." *Proceedings of the Royal Society* 268, no. 1469 (2001). 797-801.

Singh, Devendra and Young, Robert K. "Body Weight, Waist-to-Hip Ratio, Breasts, and Hips: Role in Judgments of Female Attractiveness and Desirability for Relationships." *Ethology and Sociobiology* 16, no. 6 (1995). 483-507.

Singh, Devendra. "Adaptive significance of female physical attractiveness: role of waist-to-hip ratio." *J Pers Soc Psychol* 65, no. 2 (1993). 293-307.

Singh, Devendra. "Is thin really beautiful and good? Relationship between waist-to-hip ratio (WHR) and female attractiveness." *Personality and Individual Differences* 16, no. 1 (1994). 123-132.

Slater, Alan et al. "The role of facial orientation in newborn infants preference for attractive faces." *Developmental Science* 3, no. 2 (2000). 181-185.

Slater, Alan. "Newborn infants prefer attractive faces." *Infant Behavior and Developmental Science* 21, no. 2 (2004). 345-354.

Spehr, Marc; Kelliher, Kevin R.; Li, Xiao-Hong; Boehm, Thomas; Leinders-Zufall, Trese; Zufall, Frank. "Essential role of the main olfactory system in social recognition of major histocompatibility complex peptide ligands." *Journal of Neuroscience* 26, no. 7 (2006). 1961-1970.

Symons, Donald. "Beauty is in the adaptations of the beholder: The evolutionary psychology of human female sexual attractiveness." In *Sexual nature, sexual culture*, edited by Paul R. Abramson and Steven D. Pinkerton, 80-118. Chicago: University of Chicago Press, 1995.

Symons, Donald. *The evolution of human sexuality.* New York: Oxford University Press, 1979.

Thornhill, Randy and Moeller, Anders P. "Developmental stability, disease, and medicine." *Biological Reviews of the Cambridge Philosophical Society* 72, no. 4 (1997). 497-548.

Wedekind, Claus; Seebeck, Thomas; Bettens, Florence and Paepke, Alexander J. "MHC-Dependent Mate Preferences in Humans." *Proceedings of the Royal Society* 260, no. 1359 (1995). 245-249.

Wilson, Glenn D. and Brazendale, Anthony H. "Psychological correlates of sexual attractiveness: An empirical demonstration of denial and fantasy gratification phenomena?." *Social Behavior and Personality: An International Journal* 2, no. 1 (1974). 30-34.

Wilson, Glenn D. and Brazendale, Anthony H. "Vital Statistics, Perceived Sexual Attractiveness, and Response to Risque Humor." *The Journal of Social Psychology* 95, no. 2 (1975). 201-205.