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Review

Darwin's nose: The revival of physiognomy at Stanford University

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Abstract

Physiognomy is the ancient "art" of detecting the character of a person in his (or her) face that goes back to the writings of Aristotle (384 – 322 BC). However, as the negative judgement of Captain Robert FitzRoy with respect to Charles Darwin's face (and hence his suggested "weak character") revealed, this practice is, in its original version, not reliable. In February 2018, i.e., 150 years after Charles Darwin's book *The Variation of Animals and Plants under Domestication* (1868), and his experimental design on the analysis of facial expressions were published, a remarkable "Stanford-study" authored by Yilun Wang and Michal Kosinski appeared in the *Journal of Personality and Social Psychology*. In this computer-based Research Paper (an analysis of more than 35,000 images), the authors document that, on average, gay men have more feminine faces than straight counterparts, and typical lesbians display more masculine features than heterosexual women. Wang and Kosinski's results were corroborated in a paper published early 2018 in *the Journal of Homosexuality.* Hence, there is a "kernel of truth" hidden behind the idea of physiognomy, which was revealed beyond any doubt in the "Stanford-paper" discussed in the present contribution.

Keywords: physiognomy, homosexuality, Darwinism, Aristotles

Introduction

One hundred and fifty years ago, the British naturalist Charles Darwin (1809–1882) published his second book devoted to the "Species Question". Under the title *The Variation of Animals and Plants under Domestication,* Darwin released two volumes, which comprised nearly 900 printed pages (inclusive of 43 Figures) [1]. In this text, the author summarized his collected facts and data on variability in domesticated organisms (pigeons, dogs, cats, crop plants etc.), and outlined his theory of heredity, which Darwin called "pangenesis". However, this book, which was, like *On the Origin of Species* [2], based on his five-year-long trip as gentlemen companion on the HMS Beagle, would never have been written if Darwin had failed to become the "suitable gentleman" on board.

When the "energetic young man" applied in 1831 to Captain Robert FitzRoy (1805–1865) (Figure 1), his chances of being hired were slim, due to the shape of Darwin's nose, which, according to the English Captain, indicated a lack of determination. This officer of the Royal Navy believed in physiognomy, i.e., the "art" of identifying the character of a person based on the shape of his (or her) face. Darwin's third daughter, Henrietta Litchfield (1843–1927), later pointed out that captain FitzRoy had "made up his mind that no man with such a nose could have energy". Fortunately, however, "his brow saved him", so that he was offered the job [3].

As detailed in biographies on the biologist and geologist Charles Darwin, the young traveler suffered from sea-sickness so that, during the five years of his trip to South America, he repeatedly thought of ending his life by jumping into the cold ocean waters. Nevertheless, throughout his career as an independent scientist back in England, Darwin published, despite long-term illness, 16 important scientific books devoted to geology, evolution, psychology, botany and plant physiology. In addition to this enormous output, he was the author of numerous journal articles and wrote hundreds of letters to friends and colleagues. Hence, we may conclude that FitzRoy's judgement of Darwin's personality, based on the shape of

his face, was completely wrong. In other words, physiognomy, as practiced during the 19th century, was a pseudoscience without a convincing factual basis.

Conflicting results concerning face-reading

Physiognomy can be traced back to the writings of the Greek philosopher Aristotle (384–322 BC), who published a text entitled *Physiognomonics* [4]. Much later, a monograph of the Italian polymath and playwright Giambattista della Porta (1535–1615) formally established this discipline. In 1586, this scholar published a remarkable book, *De Humana Physiognomonia Libri IIII*, wherein he made the claim that "our character and personality are written on our faces" [4]. Despite these texts (with illustrations), there is consensus among psychologists and biologists that physiognomy, in its original version, is to a large extent based on superstition.

What is the current "state of the art" in this interdisciplinary area of evolutionary bio-psychology? For instance, among many contradictory articles, a report exists that indicates that facial width-to-height-ratio in men may be an indication of a tendency to aggressive behavior [5]. Unfortunately, most of these studies were more or less unconvincing, due to limited sample sizes, the possibility of alternative explanations to the empirical findings and other weaknesses [6].

This situation changed in February 2018 (exactly 150 years after the publication of Darwin's second *Species Book*) with a remarkable research paper authored by Yilun Wang and Michal Kosinski from the Graduate School of Business at Stanford University in California (USA). Under the headline *Deep neural networks are more accurate than humans at detecting sexual orientation from facial images,* Wang et al. [7] summarized their detailed analysis extracted from more than 35,000 facial images. The authors focused on an intimate trait of men and women: sexual orientation, i.e., the question whether a person is erotically attracted to adult individuals of the same or the opposite gender (i.e., gay [which includes lesbians] vs. straight people). Since, according to the current literature, same-sex-orientation in men is, in most cases, pre-determined at birth and not modifiable by society, its occurrence has been attributed to prenatal processes. Due to this apparent "inborn nature", it has been suggested that same-sex-orientation may be in some way "written into the faces" of gay (and lesbian) people, who represent, in all ethnic groups investigated so far, ca. 1 to 3 % of the corresponding population [8, 9].

This "face-identification-hypothesis" was corroborated by a 2014-study of Valentova et al. [10]. The authors analyzed samples of 40 gay and 40 heterosexual adults and discovered that, on average, gay men are characterized by a "mosaic of both feminine and masculine faces". However, as detailed by Wang and Kosinski [7], this study is not convincing, due to the small sample size and other issues. Although the subsequent report by Skorska et al. [11] yielded similar results (i.e., significant differences in facial morphology between straight men/women, and between homo- vs. heterosexual men), the authors of this study point to a number of limitations in their analysis.

Gay-liberation at Stanford University

What was the novel approach by Wang and Kosinki ? [7]. First, they used modern computer vision algorithms to test their face-recognition hypothesis (deep neural networks, DNN). Second, they recorded a total of 130,741 images of 36,630 of men and 170,360 images of 38,593 women (aged 18 to 40 years); their sexual orientation (gay or hetero) was determined by what kind of partners they were looking for on a US-dating website (same or opposite sex). Third, they extracted, from this enormous data set, features from 35,326 facial images and entered them into a logistic regression with the goal of classifying sexual orientation. In addition, they analyzed the accuracy of human judges with respect to erotic attraction in men and women towards other people.

The results of this study are remarkable: First, Wang and Kosinski [7] discovered that gay faces (men and women) are, on average, gender-atypical. Specifically, gay men were found to be characterized by longer noses, narrower jaws and larger foreheads than heterosexual men; the opposite results were found for lesbian women. In addition, gay men had lighter skin, less facial hair and displayed a gender-atypical (more feminine) expression/adornment and grooming style. Using a single image of a given person, the Wang and Kosinski method managed to correctly distinguish between homo- and heterosexual men 81 % of the time, and 71 % of the time for women. This was far better than assessments by humans, who yielded accuracies of 61 % for men and only 54 % for women (the 50 %-value represents pure chance); the authors confirmed these results by generating an independent data-set. Using five facial images per individual, the DNN-based accuracy increased to 91 % (men) and 83 % (women), respectively [7].

How can these results be interpreted? The well-supported "prenatal hormone-theory" of sexual orientation predicts a correlation between the general appearance of the face and erotic attraction (homo vs. hetero). According to this concept, same-gender orientation results from an under-exposure of male (or over-exposure of female) fetuses to male steroidal hormones (androgens, such as testosterone). Since these hormones are, at least in part, responsible for the development of sexual dimorphism (male vs. female body shape/facial features in heterosexuals) they could be expected to cause a gender-atypical facial morphology in gays and lesbians [12-14].

Accordingly, homosexual men should have, on average, more feminine faces than straight men, while typical lesbians should tend to display more masculine features. The "Stanford-Study" of Wang and Kosinski [7] corroborates this prediction of the "prenatal hormone theory" and provides solid evidence for the (controversial) hypothesis that homo- and heterosexual men show differences in

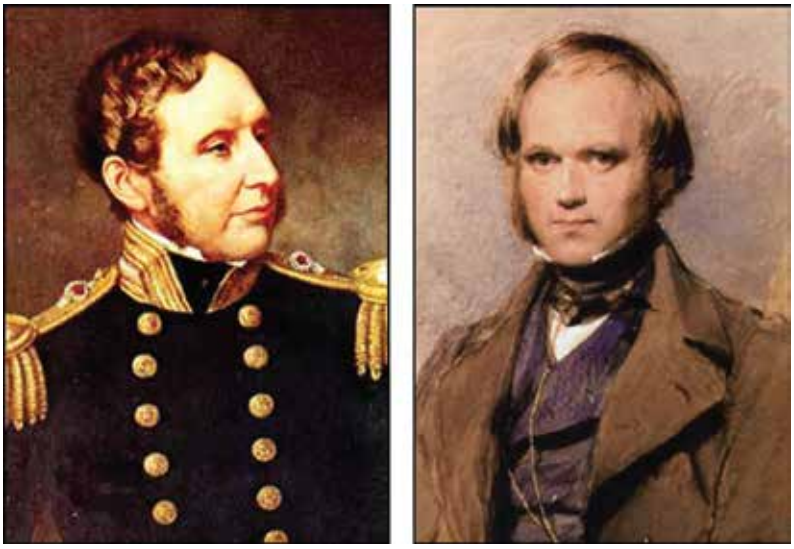

Figure 1. Two straight men whose characters are not written in their faces: Robert FitzRoy (1805–1865) and Charles Darwin (1809–1882). Both scientists were married and the biological fathers of several children.

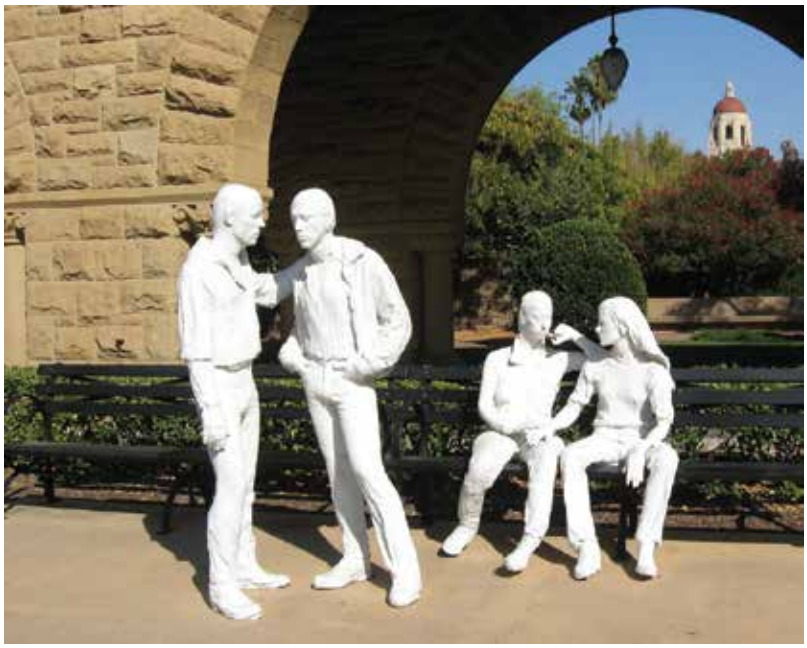

Figure 2. Photograph of the Bronze sculpture *Gay Liberation at Stanford University* (California, USA), designed by the American artist George Segal (born 1934) (November 2017).

facial features.

Wang and Kosinski [7] stress that their much more comprehensive data set was not carried out to stigmatize gay people, who should be accepted as they are, and in no way discriminated against. At the end of their article, they [7] write that "The results reported in this paper were shared, in advance, with several leading international LGBTQ-organizations." Coincidentally, a research paper published *online* in the January 2018-issue of the pro-LGBTQ *Journal of Homosexuality* corroborated their findings. In a key sentence, Robertson et al. (2018) wrote that their results "showed evidence of a more feminized facial phenotype in gay men compared to heterosexual men" [15].

In my opinion, solid scientific facts, as those published by Wang and Kosinski [7], will contribute to the liberation of gay people in societies were they are still stigmatized, usually on religious grounds. Since "being gay" appears to be an inborn feature (at least in men), every open-minded person will understand that this minority within the corresponding population must be accepted as it is, without any bias or pre-judging. In this sense, the sculpture *Gay Liberation* at Stanford University (Figure 2) may be interpreted as a symbol for the "revealing" study of Wang and Kosinski. This comparative analysis provides strong support for the "prenatal hormone theory" (as well as the fraternal birth order-related "maternal Y-immune-response-concept" [16]) to explain the multiple biological bases of homosexuality [7].

Conclusions and outlook

What does the present essay indicate with respect to the evaluation of physiognomy as a "scientific discipline"? As pointed out above, the classical "Aristotle-della Porta"-version of this "art" [4], stating that our character and mental capabilities are completely written down in our faces, has been proven wrong. FitzRoy later committed suicide, whereas Darwin remained a dedicated scientist until his death. Based on their facial features (Figure 1), their contrasting fates are definitively not predictable.

However, a "kernel of truth" is hidden behind this old philosophical idea. This applies to the evolved male-female-distinction (sexual dimorphism), and to the homo-(hetero)-orientation in gay people, compared to the average (straight) men/women (who represent the vast majority in human populations). In both cases, facial features may reveal differences between the sexes and gay/straight-people. As detailed by Wang and Kosinski [7], computer algorithms (DNN) are much more accurate at detecting minor facial differences in variable collectives of men and women, compared to human judges.

Biological variability in populations of domesticated organisms was one major topic in Darwin's 1868 book [1]. As mentioned above, variability is a key feature in all living beings that are socially organized [17]. Accordingly, the results published by the British naturalist 150 years ago are relevant to the Stanford-study discussed here [7]. Incidentally, also in 1868, Darwin designed his first experiments to understand how human beings interpret facial expressions in conspecifics, and in a variety of animal species (dogs, cats, apes etc.) [18]. His experimental design was of such great value that, in 2012, researches at Cambridge University (UK), re-investigated Darwin's first studies in this area of human behavioral biology [18]. This subject area is closely related to physiognomy, a discipline that originated with the Greek philosopher Aristotle [4], and led, in 2018, to the "revealing" "gay-vs.-straight-face-analysis" of Wang and Kosinski [7].

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