FOCUS

WHAT IS BEAUTIFUL?

PHOTO: KATRIN BINNER, MPG

Understanding beauty: what we perceive as beautiful is highly individual and is sometimes a point of contention. Whether in music, the fine arts, or the animal kingdom: researchers like Melanie Wald-Fuhrmann investigate the meaning of beauty across various disciplines and, in doing so, find truly objective criteria for a subjective experience.

DOES THAT SOUND GOOD ?

TEXT: JULIA MEYER-HERMANN

Some melodies move us, others do not. Is this purely a question of taste? Is it defined by experience and culture? Or does the beauty of music exist somewhere deeper, perhaps in our genes? Researchers at various Max Planck Institutes are approaching the phenomenon of musical beauty from very different perspectives.

What do Stefan Raab and Theodor W. Adorno have in common? Not much, at first glance. The former is a television host, music producer, Eurovision participant – a man of the mainstream. The latter is one of the most important post-war philosophers, sharp critic of the culture industry, and someone who warned against the thoughtless enjoyment of music. And yet in their own way, each wrestled with the same enigma: what kinds of music do people perceive as beautiful – and why? What are they responding to? Is it a question of taste? Or are there objective patterns to be discerned in how people experience music?

Each year, the Eurovision Song Contest demonstrates how song writers and producers attempt to satisfy the taste of millions. They experiment with chords, beats, melodies. They calculate points and odds. And yet: time and again, jury and public are divided, favorites fall short, underdogs claim victory. The taste of the masses defies planning – just as aesthetic experience appears to elude purely rational analysis.

Can Beauty in Music be Measured?

Theodor W. Adorno also posed this question, albeit from the perspective of cultural criticism. In a radio lecture titled *Schöne Stellen* (Beautiful Passages) broadcast in 1965, he analyzed a widespread behavior among listeners: many people do not listen to music as a coherent structure, but instead wait specifically for individual climaxes – for a change, a goosebump moment, a "beautiful passage." For Adorno, this expectation was an expression of a consumerist way of listening, in which music is reduced to a series of affective stimuli, instead of a serious appreciation of the structural and thematic development of the piece as a whole.

He was not the first to contemplate such phenomena. Philosophy, art, and psychology have explored the question of what people perceive to be beautiful for centuries. Immanuel Kant spoke of a "disinterested pleasure" that he claimed to be universal. For him, beauty was not based on personal preference, but rather on intersubjective aesthetic judgments. In the 19th century, Gustav Theodor Fechner, a co-founder of experimental psychology, also laid the foundation for empirical aesthetics which turned precisely these questions into the subject of scientific research. His interest: not simply to explain beauty in philosophical terms, but also to make it measurable and experienceable – through systematic questioning, comparison of stimuli, and analysis of reactions.

New interdisciplinary approaches, such as those in neuroaesthetics or music psychology, combine subjective ex-

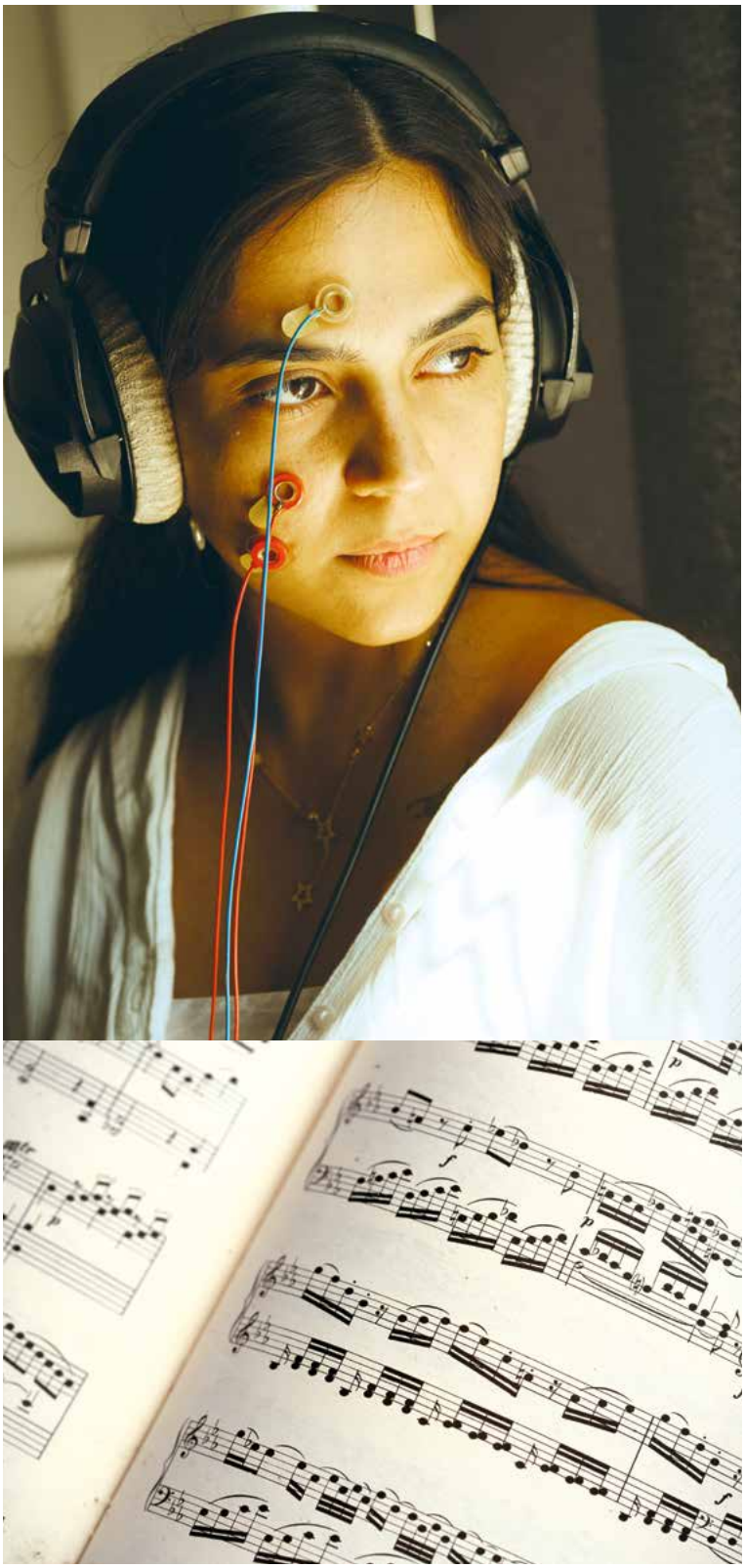

PHOTO: KATRIN BINNER / MPG (TOP); ADOBESTOCK (BOTTOM)

Analysis of feeling: physiological sensors record how an employee at the Max Planck Institute for Empirical Aesthetics reacts to music (at the very top). If a composition exhibits dynamic changes, that is, shifts between loud and soft, or striking chords, it was perceived as "beautiful".

periences with psychological data and computer-assisted voice analysis – not to break the spell of beauty, but to better understand it. At the Max Planck Institute for Empirical Aesthetics in Frankfurt am Main, a team led by musicologist and Institute Co-Director Melanie Wald-Fuhrmann is investigating what people perceive as beautiful when listening to music. In a quantitative study involving 33 participants, the research team explored the question of which musical passages are experienced as particularly moving or aesthetically striking – and why.

Wald-Fuhrmann was also inspired by Adorno's radio lecture "Beautiful Passages". "To be sure, he criticized the notion that music can be reduced to individual beautiful passages," she said. "But what's interesting is: he did that himself. He played passages, analyzed them, dwelled on them. And it was precisely this idea that I found exciting – that listeners find certain parts of a work particularly beautiful on their own, not just the whole." Wald-Fuhrmann subsequently investigated the cultural history and significance of the German expression "*schöne Stelle*". "The phrase can be traced back to the 18th century – and it's used not only in connection with music, but also with other art forms, such as novels or plays. Whenever critics discuss longer works, they don't just give an overall assessment, they also talk about specific passages that are particularly moving or striking."

In her study, she deliberately refrained from using a narrower definition. "The phrase *schöne Stelle* is a part of everyday language – so we worked on the basis that people had their own understanding of it." Her team consciously opted for individual selection by participants rather than predetermining pieces. The participants submitted pieces of music in which they personally experienced "beautiful passages" – short sections of music that they found particularly moving. These included classical pieces like Schubert's *Winterreise*, as well as music from Adele or French chansons.

While the participants listened to the music, sensors measured various physiological reactions, which can be demonstrably connected to emotional experiences. Afterward and with the help of a rating scale, the participants reported how they had experienced the individual passages – focusing on the aspects of beauty, tension, energy, feelings of well-being, interest and empathy, smiling, crying, and goosebumps. In addition, they described what made certain passages special for them – such as a sudden dynamic change, a striking chord, or a particularly powerful vocal expression. These diverse assessments formed the basis for cluster analysis. The goal of this evaluation was to identify typical patterns in experiences of musical beauty: are there reoccurring combinations of emotional reactions that can be attributed to physiological reaction patterns? And if so – how are these connected with musical features like tempo, harmony, frequency, or instrumentation?

SUMMARY

Musical beauty is demonstrated by three emotional patterns: quiet emotion, joyful excitement, and eager anticipation. "Beautiful passages" largely occur in contrast to their musical environment and trigger emotional and physiological responses.

Studies using twins show that around 54 percent of the differences in experiencing music – that is, how strongly people react to music on an emotional, physical, or social level, can be attributed to genetic influences.

Whether a voice is perceived as beautiful is less dependent on measurable characteristics of sound than on subjective perception.

Beauty in Context

The analysis revealed that subjective experiences of musical beauty fall into three sub-types that are characterized by different combinations of feelings of tension and energy: "low tension, low energy," "low tension, high energy," and "high tension, high energy." These subtypes are differentiated both by physiological reactions and musical features. "Often the beauty of a particular passage can only be fully comprehended when heard in context, particularly in relation to what came before it," explains Wald-Fuhrmann. Only when contrasted against the preceding musical movement did the effect of the passage take shape. "Music is a temporal artform, and each moment exists in relation to what has come before it and what comes after it – this was very clear in the participant's descriptions."

While the music chosen varied considerably, certain operating principles kept appearing. Regardless of whether the listener had chosen a song by Whitney Houston such as "I Will Always Love You," or an aria such as "Nessun Dorma" from Puccini's *Turandot*: sudden dynamic changes or striking chords were perceived as particularly beautiful. Passages in which the vocals came in for the first time after a long instrumental prelude were also frequently mentioned.

A further criterion for musical enjoyment is the timbre of the voice. Does it need to be smooth and pleasing – or can it also be irritating or challenging? At this year's Eurovision Song Contest, contestant JJ, representing Austria, won with the song "Wasted Love." JJ is a countertenor, and many viewers found his timbre unusual. His voice was a talking point, celebrated, irritating, moving. And it posed the question: what exactly makes a voice beautiful? →

This question is at the center of another study. Previous studies on the attractiveness of voices have largely focused on spoken voices, such as those which show, for example, that deeper voices are perceived as more pleasant in men, and higher voices as more pleasant in women. In contrast, there has been a lack of systematic research into the aesthetic perception of singing voices. It is precisely this area that forms the focus of research carried out by Camila Bruder, scientific research assistant at the Max Planck Institute for Empirical Aesthetics. Together with Senior Researcher Pauline Larrouy-Maestri, she wanted to discover what determines our preference for certain singing voices: the objectively measurable sound – or what we subjectively perceive within it?

Timbre is Not Everything

For the experiment, the researchers had 16 professional female singers sing two well-known melodies ("Don't Worry Be Happy" and "Over the Rainbow") a cappella, a total of 96 times – without text, using only the vowel "u". As part of an online experiment, these recordings were first played back to 326 American participants, who indicated how much they liked each voice on a scale of 1 ("not at all") to 7 ("very much"). Here, it wasn't the vocal performance that was being evaluated in a strict sense, but rather the subjective appeal.

In a second stage, the recordings were evaluated once again as part of a laboratory experiment with 42 German participants – this time, in addition to the online evaluation, through a detailed analysis of the acoustic properties, such as pitch accuracy, vibrato, or how breathy the voices sounded. At the same time, data on the subjective perception of the voices was gathered. The results showed that preferences varied strongly from person to person. Virtually every voice was loved by some and barely appreciated by others. Only one singer scored highly among almost all respondents.

In total, around 43 percent of the evaluations could be explained by the subjective assessment of the vocal properties – including terms such as "precise," "bright," "dark," "weird," or "excessively breathy." This means that the participants described how they perceived the sound of the voice – irrespective of whether these impressions can also be objectively measured. In actual fact, objective characteristics such as the frequency response – that is, the accuracy with which a singer was able to produce a certain pitch – or volume played a much lesser role. The most decisive factor was how a given participant interpreted a given voice – in contrast to the acoustically measurable performance of the singer. This dominance of subjective perception is also reflected in the wide range of individual judgments.

Beauty here did not lie in the sound itself, but clearly in the ears of the listeners. But how does a listener's personal impression take shape? Why are we moved by certain voices – or music in general – while others are barely affected at all? Is it all simply a matter of taste, a question of cultural education, or even genetic predisposition?

An ongoing study organized by two Max Planck Institutes and the Karolinska Institute in Stockholm is currently exploring this question. The research team, led by Giacomo Bignardi, doctoral researcher at the Max Planck Institute for Psycholinguistics in Nijmegen, Netherlands, together with researchers from the Max Planck Institute for Empirical Aesthetics, is investigating why people experience music as rewarding – and whether these differences in experience have a genetic explanation.

The focus here is not on aesthetic judgments in a strict sense, but rather the concept of "music reward sensitivity" – in other words, how rewarding people find listening to music: is an intense feeling generated? Does it inspire people to move to the music? Does it make people feel closer to others? These three reaction types – emotional, physical, and social – describe different ways in which music can trigger the reward center in our brain.

"We wanted to find out why music is such an intense experience for some people, but is largely insignificant for others," explains Bignardi. Music gives some people goosebumps because their brains react particularly strongly to emotional stimuli. Others feel an urge to move because their motor impulses are particularly susceptible to being triggered by musical rhythms. Still others experience music as a social bridge – they feel particularly connected to other people or memories when listening to certain songs. All these reactions may result from different, in some cases innate, connections in the brain. However, some people hardly respond to music at all. Why is this the case?

Using the data from over 9,000 pairs of twins from Sweden's Twin Registry, the international team of researchers investigated whether certain reactions to

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MELANIE WALD-FUHRMANN

music had a genetic explanation. The central findings: around 54 percent of the differences in experiencing music – that is, how strongly people react to music on an emotional, physical, or social level, can be attributed to genetic influences. Only the remainder can be attributed to environmental influences, upbringing, or individual experiences. Here the researchers speak of "genetic pathways", in other words, routes via which our genes can influence certain brain responses in the brain. These pathways may affect the reward system in the brain – that is, the areas that are connected with positive feelings and motivation. "There is no single 'music gene', but rather a large number of genes that result in differences in how our brains respond to musical stimuli – whether we tend to have a more emotional, physical, or social reaction," explains senior-author Miriam Mosing from the Max Planck Institute for Empirical Aesthetics.

Music researcher Melanie Wald-Fuhrmann investigates how people experience music.

PHOTO: KATRIN BINNER / MPG

It is precisely the fact that these reactions can vary so greatly that could explain why beauty in music is perceived so differently from person to person: what moves one person so deeply can be meaningless to another – not due to a lack of taste, but perhaps as a result of a genetic predisposition. But what does this mean for our understanding of musical beauty? The studies by Camila Bruder, Giacomo Bignardi, and Melanie Wald-Fuhrmann show that experiences of beauty in music are not arbitrary – but they are also not uniform. Emotional reactions, social resonance, physiological stimuli, and cultural expectations intersect here.

What a person perceives as beautiful cannot be attributed to a single characteristic – but rather to certain patterns: voices that are perceived as particularly precise or resonant often trigger positive reactions. Certain areas of the brain are reliably activated when a person is moved by music. And even genetic makeup seems to play a role in determining whether someone experiences music as meaningful. "Thanks to our findings, we can answer the age-old question of where beauty lies – in the object, in the ear or eye of the recipient – in new or more nuanced way," says Wald-Fuhrmann, who simultaneously emphasized: "Our research has not found the recipe for musical beauty – and honestly, I am very happy about that."

Thus, in the future, the next Eurovision hit, great operatic aria, or your personal favorite piece will not be the result of composers' calculations. Even if we know a lot today about musical patterns, preferences, or emotional reactions – the moment in which we are truly moved by music is out of our control. It lies somewhere between composition and the experience of the listener, between intention and interpretation. Or as Wald-Fuhrmann puts it: "Beauty is an experience – and not primarily a property."

www.mpg.de/podcasts/schoenheit (in German)