

In the National Gallery, Semir Zeki stands in front of *Venus and Mars* by Sandro Botticelli, enthusing quietly but animatedly about the hidden subtext that he sees in the figures. The gallery label tells of love conquering war, but he ignores it. In Venus's ambivalent expression and the slack pose of Mars, Zeki sees a woman unsatisfied by a disappointing lover. It is this ambiguity that draws him to the piece. "I think this is really quite beautiful," he says.

Beauty is very much on Zeki's mind, and not just because he is surrounded by stunning paintings. For much of his life, he has been investigating how humans see the world while feeding his love of fine art. Now, in his seventies, his thinning hair covered by a tweed cap, his passions are aligned. Armed with a £1 million grant from the Wellcome Trust, Zeki is a professor of neuroaesthetics, a word he coined himself. Working at University College London, he is trying to understand the "relationship between brain activity, aesthetic appreciation and artistic creativity". All three are in plentiful supply at the National Gallery, and Zeki knows the collection well. He strides purposefully in search of familiar masterpieces, speaking with a gentle passion.

We take in everything from Titian to Monet, beautiful works from different styles and centuries that provoke the same rapt attention and suspended

breaths. It is this common experience that Zeki finds so intriguing. He says: "I got a letter from a young Japanese man who said, 'I know nothing about Christian or Western culture, but when I saw the *Pietà* by Michelangelo in St Peter's Basilica, I dissolved in tears. Can you explain why?'"

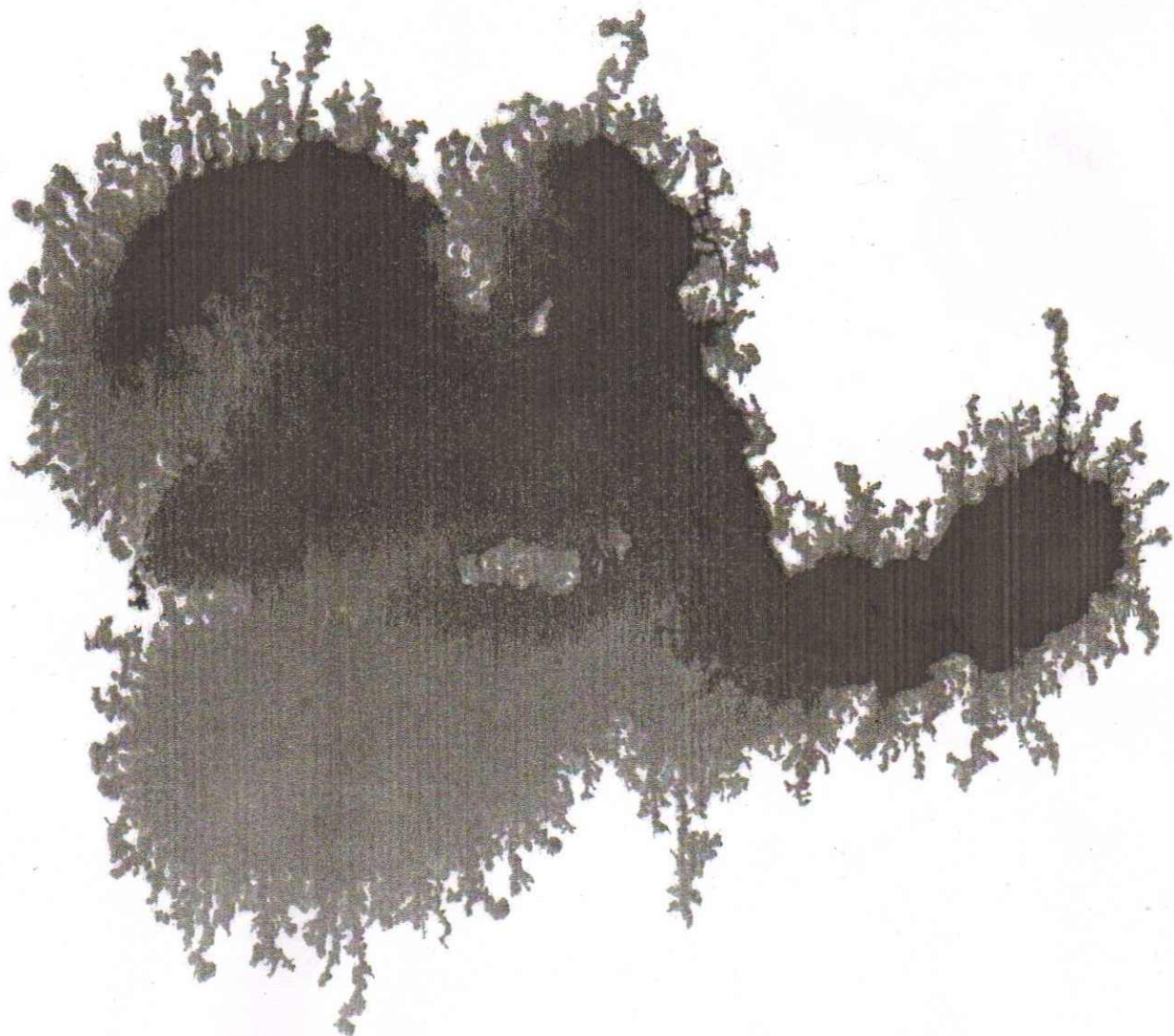
Now, Zeki believes that science is getting closer to answering that question. "Philosophers and art historians have been asking for 2,500 years what is common to all things that are beautiful," he says. "I believe they have asked this in the wrong way. The characteristics that make a painting beautiful aren't the same as those that make music or a building beautiful."

Instead, Zeki thinks that the common thread lies in the brain of the beholder. He asked 21 volunteers of different nationalities to rate paintings and pieces of music according to how beautiful they were. Later, they looked at the same pictures and pieces with their heads in a scanner, while Zeki measured the blood flow in their brains to identify the most active areas. He found one area that lit up strongly when the volunteers experienced beauty, whether it was art or music — the medial orbitofrontal cortex (mOFC), which sits just above the eyes.

Today, as we gaze upon Botticelli's brushstrokes, Zeki says: "Whenever we appreciate something,



The Hay Wain
John Constable (1821)
21,711 votes (5)
£55m (4)



and we find it beautiful, there is activity in the same part of the brain — the mOFC.” The stronger the sensation of beauty, the more excited the mOFC becomes.

Zeki’s idea shifts the seat of beauty from the object to the viewer. “This is the first and only time, as far as I know, when you can point to a common factor in everything that produces a beautiful experience,” he says. It is a wonderfully equal view of beauty, one that cares little for the connoisseurship of the viewer, the norms of their culture or the artistic merit of the work. “If you and I have different backgrounds, it doesn’t matter from this point of view,” he continues. “All that matters is that we find something beautiful. It’s a definition of beauty that embraces its subjective nature. Immanuel Kant was the first person who said if you want to understand what’s going on, don’t just look at the objective world but look at what the brain makes of it. That was a fantastic insight.”

The mOFC is not just a beauty centre. It is also involved in feelings of reward or pleasure, and in our ability to make judgments. However, it does crop up again and again when scientists scan the brains of people who are enthralled by beauty, whether in the form of paintings, buildings, attractive faces or even morally just actions.

Critics might rail against equating beauty with the firing of neurons, but Zeki has little time for criticisms about reductionism. “If you read what we said, you’ll realise we’re not saying we’ve discovered the beauty spot in the brain.” Instead, he recognises that beautiful experiences trigger bursts of activity all over the brain — a jostling network, with the mOFC as a small but constant feature at its heart.

Zeki has looked at two forms of art — paintings and music. Other mediums might yield different results. When Beatriz Calvo-Merino, also from UCL, asked people to watch videos of ballet and capoeira, a Brazilian dance-based martial art, she found that the movements they preferred triggered particularly strong activity in their premotor cortex. This part of the brain is involved in representing and planning movements. It is the location of the fabled mirror neurons, which fire when we carry out an action and when we see others doing the same. When we watch dances we like, we might be running through the same movements in our heads.

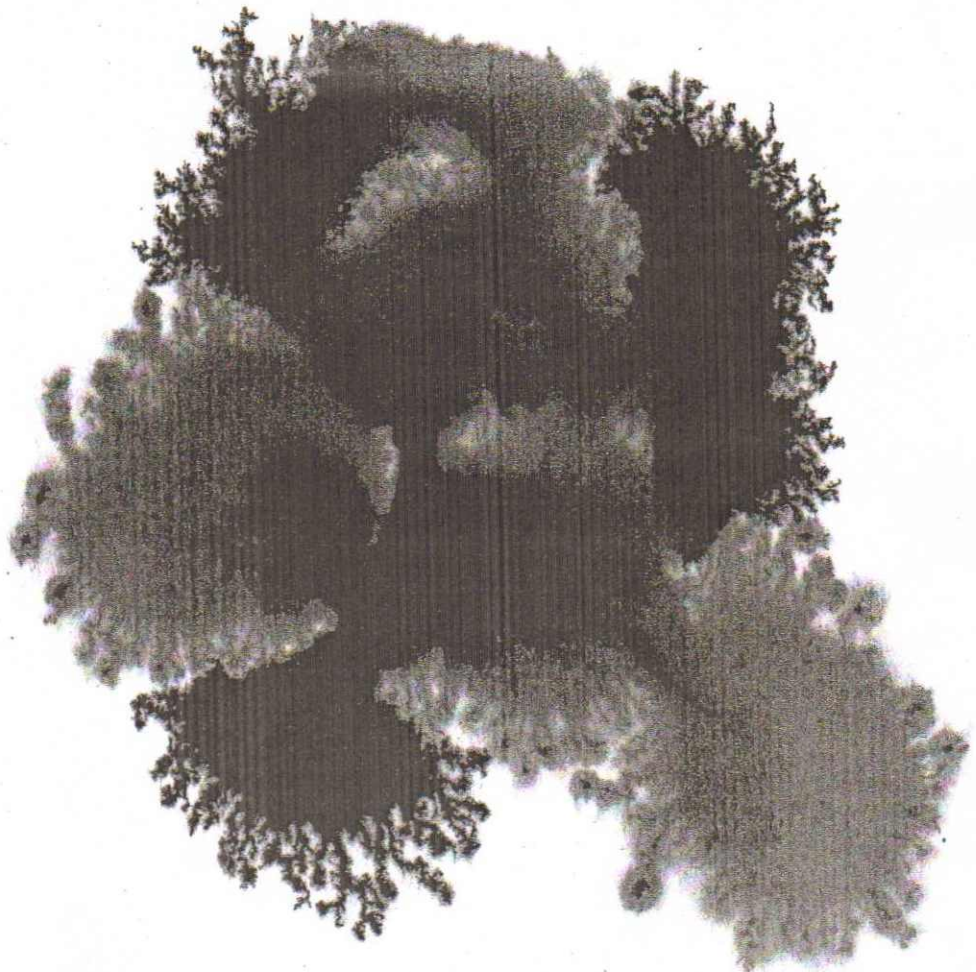
Other studies have produced a large list of brain areas whose activity corresponds to beautiful experiences. “The whole brain is engaged,” says Siân Ede, the author of the book *Art and Science*. “It isn’t a matter of saying we’ve found the bits of the brain that



A Bar at the Folies-Bergère

Édouard Manet (1882)

- 13,218 votes (4)
- £45m (3)



appreciate beauty and now we can go home. This complexity is not to be found in a simple area."

Marcos Nadal, who studies neuroaesthetics at the University of the Balearic Isles, agrees. "The mOFC is important; it's probably crucial," he says. "But when people appreciate beauty in something, there are a whole lot of processes that go on in their minds. Their attention is heightened — they concentrate and fixate more on things they find beautiful. Memory is important. People recognise stuff and attach meaning to it."

On top of that, there is a buzz of activity in the parts of the brain that deal with information from the senses, and those that are involved in emotions. All of this happens very quickly. Within a few thousandths of a second, activity from across the brain — the mOFC included — collides to produce a seemingly instantaneous feeling. The details of these processes are now becoming clear, but Zeki thinks that artists have understood them for centuries.

"They are natural neurologists," he says. "They know how to dissect our feelings through paintings or language or music." As an example he takes me to a later work by Paul Cézanne, *Landscape with Poplars*. Up close, it is a collection of parallel brushstrokes, arranged in haphazard rectangles. At a distance, a beautiful rural setting reveals itself. This is the type of

art that Zeki prefers — "cognitively unstable and open to ambiguity" — and he is in awe of the artist's ability and insight. "Cézanne said: 'I'm not interested in the finished painting because you finish it in the viewer.' He understood that if you go back, you fill in the details with your mind. How he achieves this effect is a miracle. I've tried and it's very hard. He must know a lot about brain mechanisms without knowing anything about brain mechanisms."

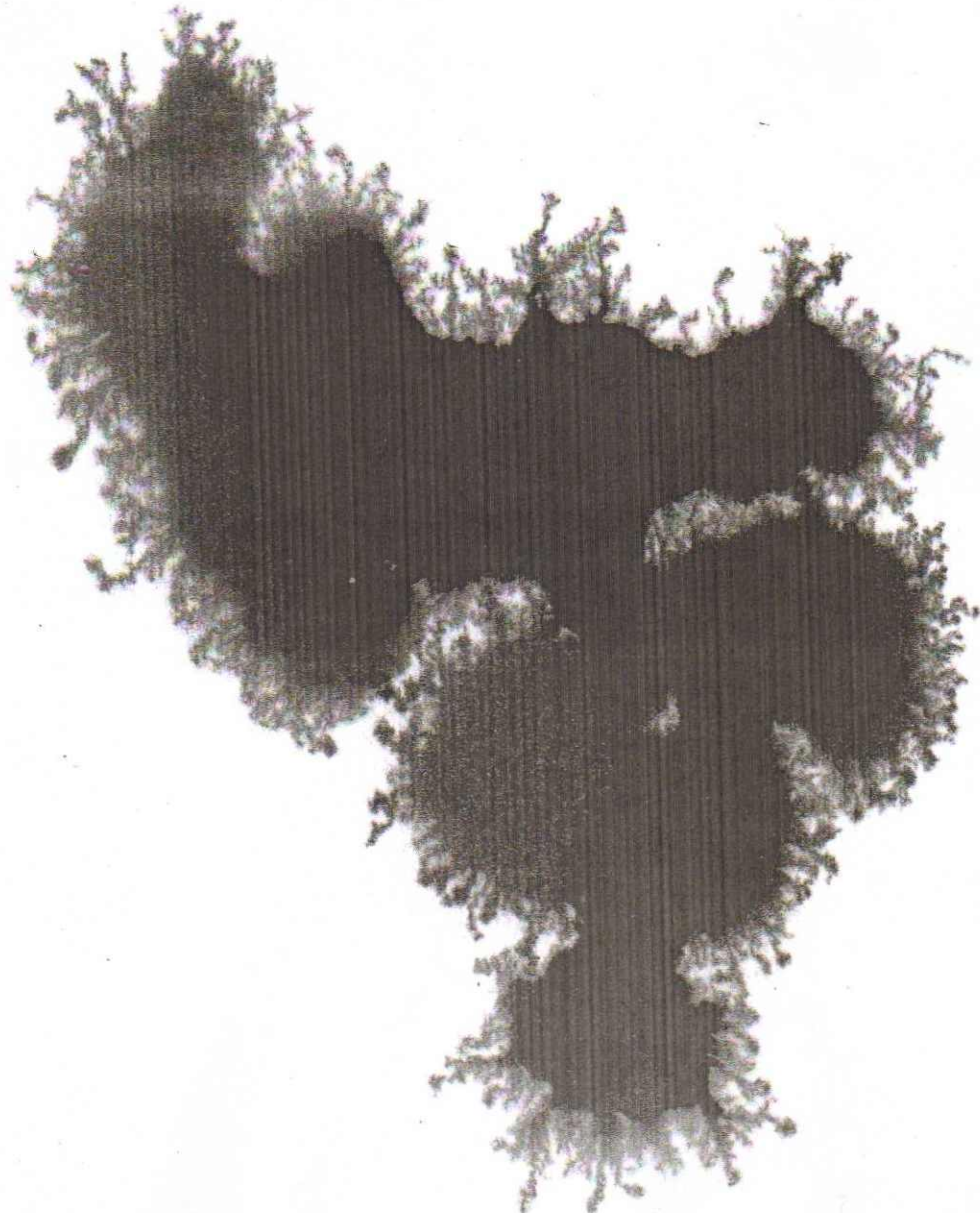
Indeed, Zeki notes that throughout the centuries, artists have explored the issues that neuroscientists are now tackling. "Mondrian asked what the essential constituent of forms is. Picasso asked how form maintains identity despite different viewing conditions. These are questions that neurologists ask, but the artists experimented on canvas."

Because of these shared interests, Zeki thinks that art and neuroscience should be bedfellows. "Artists have been extremely enthusiastic about neuroaesthetics," he says. "They are very interested in perceptual processes and how to exploit them."

Several of the students working in Zeki's lab are artists and he had a longstanding friendship with the French painter Balthus. Artists have volunteered to take part in Nadal's brain-scanning studies. "They're interested in an introspective way about what goes on in their brains when they're working," he says.



The Arnolfini Portrait
Jan van Eyck (1434)
▶ 11,298 votes (3)
▶ £60m (5)



But, says Zeki, it is a different story with art historians. Some are extremely hostile. Martin Kemp, Emeritus Professor of the History of Art at the University of Oxford, recalls an “immensely bloody seminar” at the Getty Research Institute in Los Angeles. Zeki arrived with Vilayanur “Rama” Ramachandran, another leading figure in neuroaesthetics, to discuss their research with a crowd of art historians. “It was a discussion of the deaf,” says Kemp. “It got so bloody that Rama and Semir walked out.”

The two sides seem to have incompatible goals. On the one hand, Zeki is interested in the common threads that run through beautiful works of art, which he believes have not changed much in recent centuries. “We’re asking universal questions,” he says. “We’re not interested in the influence of Venetian pigments on Roman art. When you watch *Othello*, you take the lines out of the context of the Moor of Venice, because these are universal lines.”

On the other hand, as Kemp says, art historians have their eyes on “the grit and the detail”. He says: “They want to know why a painting by Botticelli assembled in a certain way using various Renaissance devices is different, maybe better, than one by [Fra Filippo] Lippi using the same mechanisms. It’s certainly interesting to find universality, but if you

show that to an art historian, they’d say, ‘So what? It doesn’t do anything for my issues.’”

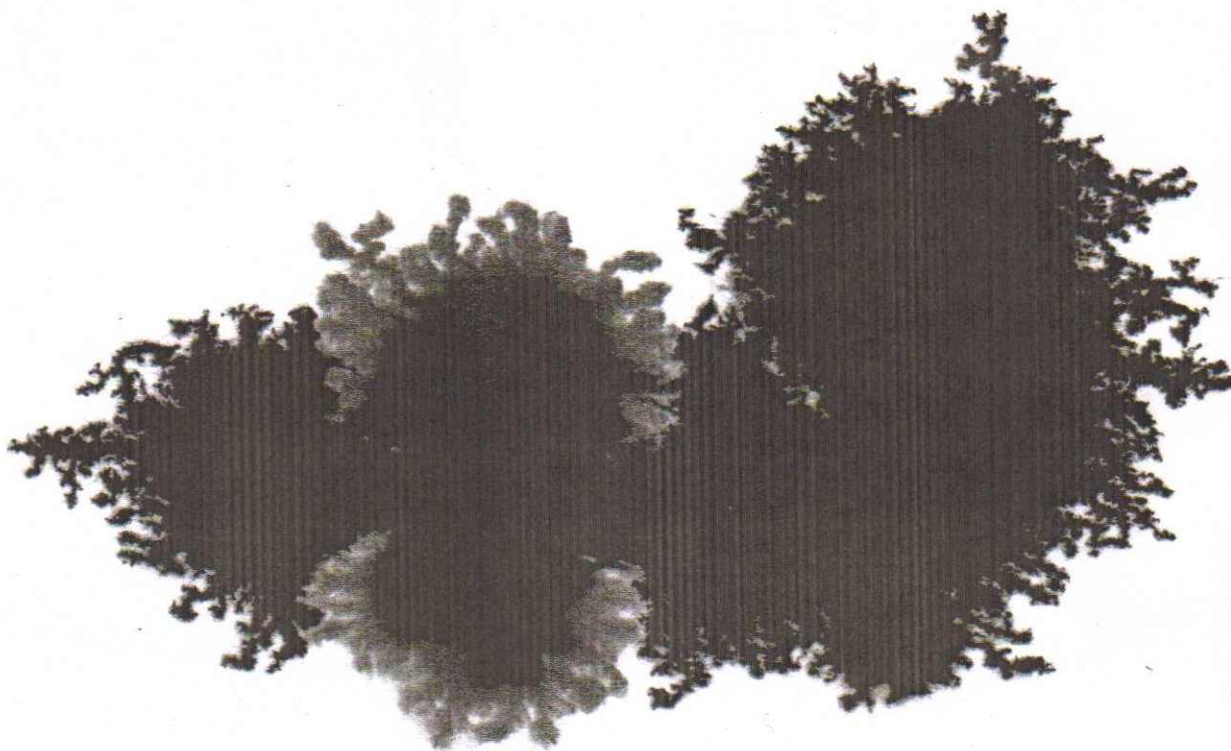
These objections are not falling on deaf ears. Some scientists who work in neuroaesthetics agree with their critics and are trying to address their complaints. “Most of us are seriously reading philosophers and art theoreticians, and we’re coming to accept mistakes we’ve made in our assumptions,” says Nadal. “We’re trying to make the questions we address with science more interesting or relevant to people in the humanities. I think neuroaesthetics can contribute something to art history and philosophy, but I think we need to get these people engaged.”

For example, in response to accusations that neuroaesthetics ignores the history and meaning of artworks, Nadal is designing experiments to see how information about a painting’s period, historical significance or symbolism will change a layperson’s experience of its beauty. In the near future, he plans to see what those changes look like in the brain. He is doing all of this in consultation with art historians.

A Danish neuroaesthetician, Martin Skov, has shown that the mOFC is susceptible to expertise and context. He found that the area fires more strongly when people see buildings that they like, but also that it fires with exceptional strength in the brains of



Mr and Mrs Clark and Percy
 David Hockney (1970-71)
 ● 8,890 votes (2)
 ● £12m (1)



professional architects. And, along with Zeki, Skov showed that the mOFC reacts differently to images depending on where people think they come from. It fires more strongly when people think of images as being beautiful, but it is especially active if they think they are looking at a gallery painting, rather than one generated on a computer. The mOFC responds universally to beautiful sensations, but the way it responds varies from person to person and context to context.

For Zeki, results such as these are part of the beauty of neuroaesthetics. "For the first time in human history, we can objectively look at subjective experiences," he says. "The idea that you have subjective experiences that are completely private is no longer true, provided that we can put you in the scanner."

Such transparency could have implications for how art is produced. "If I discover what makes your brain more active or what elements produce feelings of beauty," Zeki says, "I can produce art that better satisfies that need." Artists have been doing that intuitively for centuries, but Zeki sees a new generation of artists who take a more deliberate approach to their work. He also thinks that the neuroscience of beauty could affect how art is valued.

"I can see 30 years in the future, you could have

pictures that are valued based on preference," he says. "They tell me the art market will be up in arms. But I think it's better to sell something based on the fact that people find it beautiful rather than because someone has signed their name on to it."

This is the crux of Zeki's work. His research is rooted in an intense love of the beautiful works that he studies and a deep respect for philosophical tradition. He quotes Kant and Wittgenstein, and he supports various masterpieces at the National Gallery financially and feels sad when the gallery closes for Christmas. ("I know my friends are going to be locked up for a few days," he says.) He has exhibited his own work at the Luigi Pecci Centre for Contemporary Art, in Italy.

It is easy to summon caricatures of scientists who are out to reduce beauty to clumps of neurons firing inside cold scanners, but Zeki's approach is the opposite. Investigating how beauty affects his brain complements and enriches his love for art and music. As we leave the National Gallery, he points to his bag and says: "I always carry the *Four Quartets* by T.S. Eliot in here. When I read them, I say to myself, 'What an extraordinarily wonderful way of constructing a sentence.' But I also think how fantastic it is that the human brain can appreciate beauty. I find that beautiful, too." ●



flowers
 Vincent van Gogh (1888)
 1,603 votes (1)
 80m (6)

