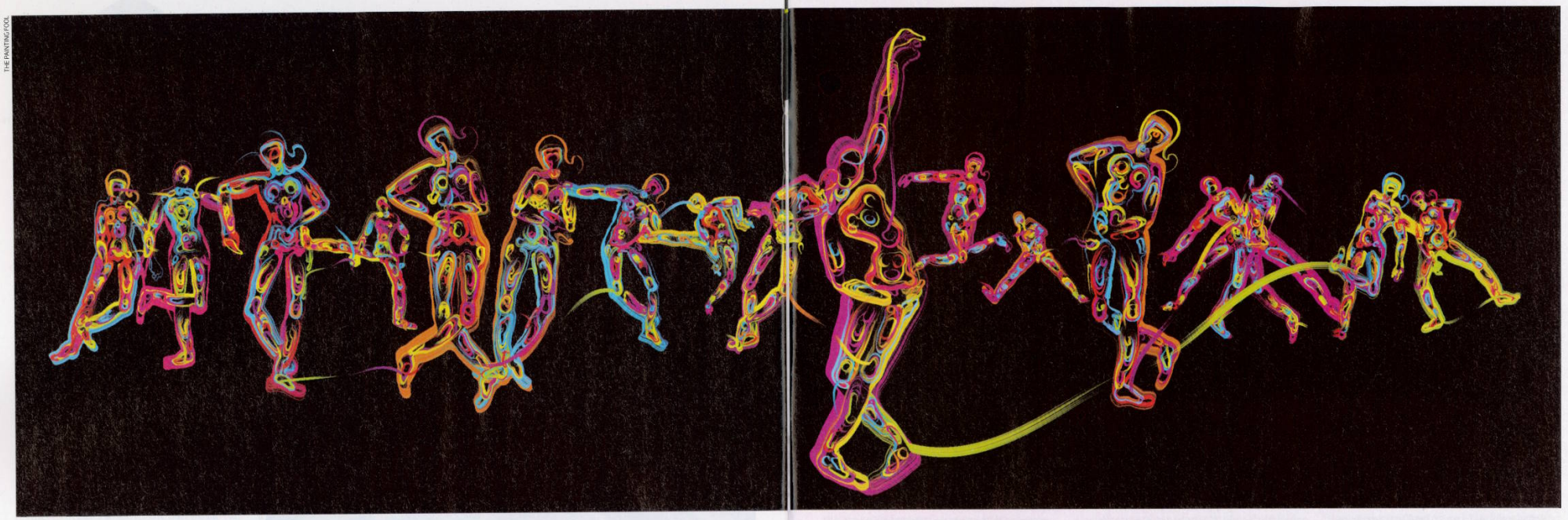

THE PAINTING FOOL

Creative sparks

Does it really take a human to make a masterpiece? **Catherine de Lange** sizes up the artificial artists forcing us to change our ideas about creativity

IN A loft overlooking the rooftops of one of the buzzing artistic neighbourhoods of Paris, France, Simon Colton is carefully unfurling one giant painting after another. I have waited some time to see these, and am unsure what to expect. To dislike them would be a disappointment, but easy. If I think these paintings are any good, however, then I might have to reconsider my own creative talents. In fact, they might even challenge my understanding of what it means to be human.

The thing is, these paintings are not the work of an ordinary artist. Nor of Colton, who is a computer scientist based at Imperial College London. Instead, they have been created by a piece of software that can seek artistic inspiration and, arguably, has a rudimentary imagination. Called the Painting Fool, it may have been designed by Colton, but its artwork is its own.

It sounds unlikely that any computer, unguided by the human hand and eye, could create artwork with any feeling or resonance. How could it be creative without having experienced the world? Now, as I take a first glimpse at the paintings, will I be forced to reconsider? Could software, which has no shared experience with my own, create a painting that touches me?

The Painting Fool is one of a growing number of computers which, so their makers claim, possess creative talents. Classical music by an artificial composer has had audiences enraptured, and even tricked them into believing a human was behind the score. Artworks painted by a robot have sold for thousands of dollars and been hung in prestigious galleries. And software has been built which creates art that could not have been imagined by the programmer. "It scares a lot of people," says Geraint Wiggins, a computational creativity researcher at Goldsmiths, University of London. "They are worried it is taking away something special from what it means to be human."

While some animals such as crows and monkeys have displayed traits that could be labelled as limited creativity, we are the only species to perform sophisticated creative acts regularly. If we can break this process down into computer code, where does that leave human creativity? "This is a question at the very core of humanity," says Wiggins.

To some extent, we are all familiar with computerised art. Software that is used to create or manipulate art is ubiquitous, but these are mere tools for a human artist. The question is: where does the work of a person stop and the creativity of the computer begin?

Consider one of the oldest machine artists, Aaron, a robot that has had paintings exhibited in London's Tate Modern and the San Francisco Museum of Modern Art. In some respects, then, Aaron passes some kind of creative Turing test – its works are good enough to be exhibited alongside some of the best human art and people spend good money on them.

Aaron can pick up a paintbrush with its robotic arm and paint on canvas on its own. Impressive, perhaps, but it can never break free from the tightly controlled rules it has been given by its programmer, the artist and founder of machine fine art, Harold Cohen. So I remain unconvinced that Aaron is much more than a tool to realise Cohen's own creative ideas. Colton also dismisses the machine as "rather limited" because "it still only creates one kind of artwork: people in a room with pot plants".

Colton is keen to make sure the Painting Fool doesn't fall foul of the same criticism,

> "The machine will wake up in the morning and look at newspaper headlines for source material"

Composed and painted by a computer – can it be enjoyed and lauded by a human being?

and so has sought to give it as much autonomy as possible. Although the software does not physically apply paint to canvas, it simulates many styles digitally, from collage to paint strokes. One of the first paintings Colton shows me is a touching portrait of a young, fragile-looking girl with porcelain skin and long brown hair. I am impressed that a computer could capture such subtleties, until Colton tells me the software just applied its own painting style to photographs of the girl.

That sounds like cheating to me, but Colton assures me that was an early work. Today, the Painting Fool only needs minimal direction and can come up with its own concepts by going online for source material. "I don't even give it the notion of a person or a topic," says Colton. "It will wake up in the morning and look at the newspaper headlines." The software runs its own web searches and trawls through social media websites such as Twitter and Flickr. The idea is that this approach will let it produce art that is meaningful to the audience, because it is essentially drawing on the human experience as we act, feel and argue on the web.

In 2009, Colton and graduate student Anna Krzeczkowska asked the Painting Fool to ›

produce its own interpretation of the war in Afghanistan, based on a news story. The result is a striking juxtaposition of Afghan citizens, explosions and war graves. "This piece struck a chord with me, and shows the potential for the software to add poignancy and intentionality to its paintings," says Colton.

The Painting Fool is now beginning to display a kind of imagination too, creating pictures from scratch. One of its original works, part of a series that Colton called *Four Seasons*, depicts fuzzy panels of simple landscapes (see image, below). I think it looks rather mechanical.

Comparable to Bach

Having said that, I am swayed by Colton's argument that my reaction arises from my double standards towards software-produced and human-produced art. After all, he says, consider that the Painting Fool painted the landscapes without referring to a photo. "If a child painted a new scene from its head, you'd say it has a certain level of imagination, even if it's just a little bit," he points out. "The same should be true of a machine."

Software bugs can also lead to unexpected results. I see this for myself when Colton shows me some paintings of a chair, which came out black and white thanks to a glitch. It gives the work an eerie, ghostlike quality. Human artists like Ellsworth Kelly are lauded for limiting their colour palate – so why should computers be any different? Nonetheless, these mechanical steps towards creating new styles are barely comparable to the talents of, say, Picasso or Mozart. Or are they?

Researchers like Colton don't believe it is right to compare machine creativity directly to that of humans, who "have had millennia to develop our skills". Others, though, are fascinated by the prospect that a computer might create something as original, emotional and subtle as our best artists. So far, only one has come close.

> "After discovering the truth, one music lover told Cope he had 'killed music' and tried to punch him"

One day, David Cope was suffering from "composer's block". He had been commissioned to write an opera, but was struggling to come up with the goods. If only a computer could understand his style, he thought, and help him write new material. That idea was the starting point for what was to become one of the most controversial pieces of creative software to date. Cope came up with a program called Experiments in Musical Intelligence, or EMI. He fed in musical scores and out popped new material in the composer's style. Not only did EMI create compositions in his style, but also that of the most revered classical composers, including Bach and Mozart.

To my untrained ear, it sounds like any other classical music. I found the purported Chopin, in particular, to be rich and emotional. Audiences who heard the music have been moved to tears, and EMI even fooled classical music experts into thinking they were hearing genuine Bach. If ever there were a successful Turing test for computational creativity, that had to be it.

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If a child produced these scenes, you might say they were imaginative

Not everyone was impressed, however. Some critics, such as Wiggins, have blasted Cope's work as pseudoscience, saying his explanation of how the software works is "smoke and mirrors" leaving others unable to reproduce the results (*Literary and Linguist Computing*, vol 23, p 109). Douglas Hofstadter, at Indiana University, Bloomington, says Cope merely scratches at the surface of creativity, using superficial elements of an artist's work to create replicas, which still rely on the original artist's creative impulses.

Nonetheless, for others EMI's ability to mimic Bach or Chopin has serious implications. If it is so easy to break down the style of some of the world's most original composers into computer code, that means some of the best human artists are more machine-like than we would like to think. Indeed, when audiences found out the truth about EMI they were often outraged – one music lover allegedly told Cope he had "killed music" and tried to punch him. Amid such controversy, in 2004 Cope decided that EMI's time was up, and destroyed its vital databases.

But why did so many people love the music, yet recoil when they discovered what composed it? A study by David Moffat, a computer scientist at Glasgow Caledonian University in the UK, provides a clue. He asked both expert musicians and non-experts to assess the creative worth of six compositions. The participants weren't told beforehand whether the tunes were composed by humans or computers, but were asked to guess, and then rate how much they liked each one. Perhaps unsurprisingly, people who thought the composer was a computer tended to dislike that piece more than those who believed it was human. This was true even among experts, who you might think would be more objective in their analysis of musical quality.

Where does this prejudice come from? Psychologist Paul Bloom of Yale University has a suggestion: he reckons part of the pleasure we get from art comes from our perception of the creative process behind it. This can give it an "irresistible essence", says Bloom. This idea explains why a painting loses its value if exposed as a fake, even though we might have loved it when we thought it was an original. Indeed, experiments by psychologist Justin Kruger of New York University have shown that people's enjoyment of an artwork increases if they think more time and effort was needed to create it (*Journal of Experimental Social Psychology*, vol 40, p 91).

Similarly, Colton thinks that when people experience art, they engage in a discourse with the artist. We wonder what the artist might have been thinking, or ponder what they are trying to tell us. With computers producing art, this speculation is cut short – there's nothing to explore. But as the software becomes increasingly complex, finding those greater depths in the art may become possible. That's why Colton asks the Painting Fool to tap into online social networks for its inspiration: hopefully this way it will choose themes that will already mean something to us.

THOMAS STRUTH

Our enjoyment of art is influenced by the time and effort it required

Unconscious creativity

Hofstadter thinks the more complex machines become, the more easily we will accept their art – especially if they can interact more with the physical world. If robots bumped into things and had goals, successes and failures, then that might be enough. "They would be sort of pathetic and laughable and once in a while heroic," he says. "I don't think people would be uncomfortable with creatures like that writing an essay or composing a piece of music or painting a picture."

Yet the fact that machines now lack this kind of self-awareness is perhaps the most irksome element of computational creativity. How can you be creative without even being conscious? Surprisingly, it is not a computer scientist who talks me out of this reaction, but a neuroscientist. Our brains work creatively even when we aren't consciously thinking about it, says Arne Dietrich at the American University of Beirut in Lebanon. Just think back to a time when the solution to a problem you had forgotten about just popped into your head. "We know that there are several different types of creativity – some of them are conscious, some of them unconscious," he says. "Creativity can happen when you try effortfully, or it can happen in your sleep."

In any case, Dietrich believes that the creative brain might work much like software. Neuroscientists suspect that creativity is essentially about discovery, rather than anything mystical. "It's a mechanical process in the brain that generates possible solutions and then eliminates them systematically," Dietrich says. He believes our tendency to dismiss computational creativity as inferior to our own comes from an ingrained dualism in human culture: "We are over-evaluating ourselves and underestimating them. As a neuroscientist, I tackle the brain as a machine, and I don't see machine creativity as different." Suddenly, the idea that the human brain has a unique claim to creative talents seems a limited perspective.

Back in Paris, Colton continues to show me painting after painting, all signed by the Painting Fool. Some of the work genuinely speaks to me. One of my favourites, called *The Dancing Salesman Problem*, features colourful human figures dancing on a black background (see main image, page 42). Again, the software did not base its composition on existing pictures. The dancers are painted in long, flowing strokes, so they appear full of movement: they contort into beautiful poses, and the bright colours bring the scene to life. The work could never be to everyone's taste, but I would have stopped to look at it in a gallery, and I don't mind that it was created by a machine.

I have come to appreciate that computers can create subtle and original artwork. Will others accept that idea? The trick, says Colton, is to stop trying to compare computer artists to human ones. If we can embrace computer creativity for what it is, and stop trying to make it look human, not only will computers teach us new things about our own creative talents, but they might become creative in ways that we cannot begin to imagine. They are creating a whole new form of art with the potential to delight, challenge and surprise us.

Will that take something away from being human? "It's not taking away anything at all," says Wiggins. "It's helping us to understand how things work. And when you understand how things work they tend to become more amazing, not less so." ■

Catherine de Lange is a writer based in London.

To see more examples of software-produced artwork, visit newscientist.com/gallery/painting-fool