CITIZEN SCIENCE

From astronomy to wildflower surveys and bumblebee counts, a multitude of amateur citizen scientists are playing an important role in scientific advances, as **Caroline Roberts** discovers

When Julia Wilkinson logs on to her computer for a spot of stargazing, there's the thrill of knowing she may be about to view a part of the universe that no one has ever set eyes on before. It's a privilege, she says, and something that's very rare in this digital age.

She is one of many thousands of volunteers taking part in Galaxy Zoo, a project that involves looking at images of some of the hundred billion or so distant galaxies captured by high-powered telescopes and sky-mapping technology. The aim is to classify them by shape and other features to help astronomers decide which ones merit more intensive study. "The beauty of these projects is you need very little training. You just answer some simple questions about what you see, and the researchers get information they need to further our knowledge of how the universe was formed," says Julia.

Galaxy Zoo is just one of a growing number of citizen science projects helping scientists sift through the huge amount of data amassed by modern technology, from sophisticated telescopes scanning the universe to hidden cameras capturing extensive video footage of animal behaviour.

"Professional scientists have got themselves into a deep hole and we need help to dig our way out," says Chris Lintott, Professor of Astrophysics and Citizen Science at the University of Oxford. "We sit at our desks and receive this wondrous torrent of information but we don't know how to make the best of it. That's where citizen science comes in.

"People are used to thinking of science as something that's done by important people in white coats working in laboratories, but actually it's an everyday activity that anyone can take part in. The data sets are only going to get larger and we're not going to have a rapid increase in the number of professional scientists so we're going need help more than ever over the next decade or so."

And these projects make use of some of the human brain's unique abilities, Chris adds. We have evolved to be very good at pattern recognition, and also to notice when something deviates from a pattern – skills that have helped our species survive. "Often the best science comes from spotting the unusual but that's really difficult to do with machines."

Citizen science is far from new. Before the late 19th century there were few professional scientists and many advances have come about through the work of keen amateurs. The theories of Charles Darwin, for example, were shaped by his

SCIENCE CLASS: HOW TO GET INVOLVED

Whatever your interests, there's bound to be a citizen science project to suit you, or even your entire WI branch.

- **Freshwater Watch** asks volunteers to collect water samples from local streams, rivers and ponds and test them for pollutants. The aim is to develop a global fresh water quality database to assess the health of water ecosystems. Find out more at **freshwaterwatch.thewaterhub.org**
- **The RSPB's Big Garden Birdwatch** is one of the most famous citizen science projects with over half a million people taking part in 2015. Find out about this year's survey at **rspb.org.uk/birdwatch**
- **The Big Butterfly Count (butterflycount.org)** helps assess the health of our environment by counting the number and species of butterflies, which are especially sensitive to environmental change.
- **The Natural History Museum** runs a range of citizen science projects, such as observing orchids, searching for seaweed, deciphering handwritten historical records to make them available digitally, and monitoring bluebell flowering **(nhm.ac.uk/take-part).**
- **Probably the most bizarre,** but undoubtedly important, project is Cardiff University's Project Splatter, which collates reports of roadkill from members of the public to measure the effect traffic is having on our wildlife **(projectsplatter.co.uk).**
- **You can find out more** about Buzz Club projects at **thebuzzclub.uk**
- **The National Plant Monitoring Scheme at npms.org.uk**
- **Astronomy research,** such as Galaxy Zoo, plus a wide range of other projects can be found at **zooniverse.org**

THE BUZZ CLUB

The Buzz Club explores the world of bees and other pollinators

correspondence with amateur naturalists all over the world. But modern technology has enabled mass participation and collaboration, with many citizen science projects setting up online forums where participants can discuss their findings with others across the globe.

For Julia, the opportunity to contribute to ground-breaking astronomy has reignited a childhood passion. "I was 10 at the time of the first moon landing in 1969 and it's been an enduring memory. It was a clear night and I looked up at the moon and thought: wow, there are people up there. It really struck a chord with me. It's that desire to go out there and discover things and go where no-one else has gone before. That's something that still really excites me now."

But science wasn't pushed at her school, especially for girls, and she ended up going in a different direction. Later, raising a family meant that hobbies such as astronomy had to take a back seat.

But, since discovering Galaxy Zoo in 2007, Julia has participated in a number of other projects such as Moon Zoo, which involved scrutinising pictures of the surface of the moon. "They were stunning as they were taken from a very close orbit. You could even see the debris that the Apollo missions had left behind."

Stargazing is Julia Wilkinson's favourite new hobby

Claire Perrens charts wildflowers in the New Forest

Claire Perrens

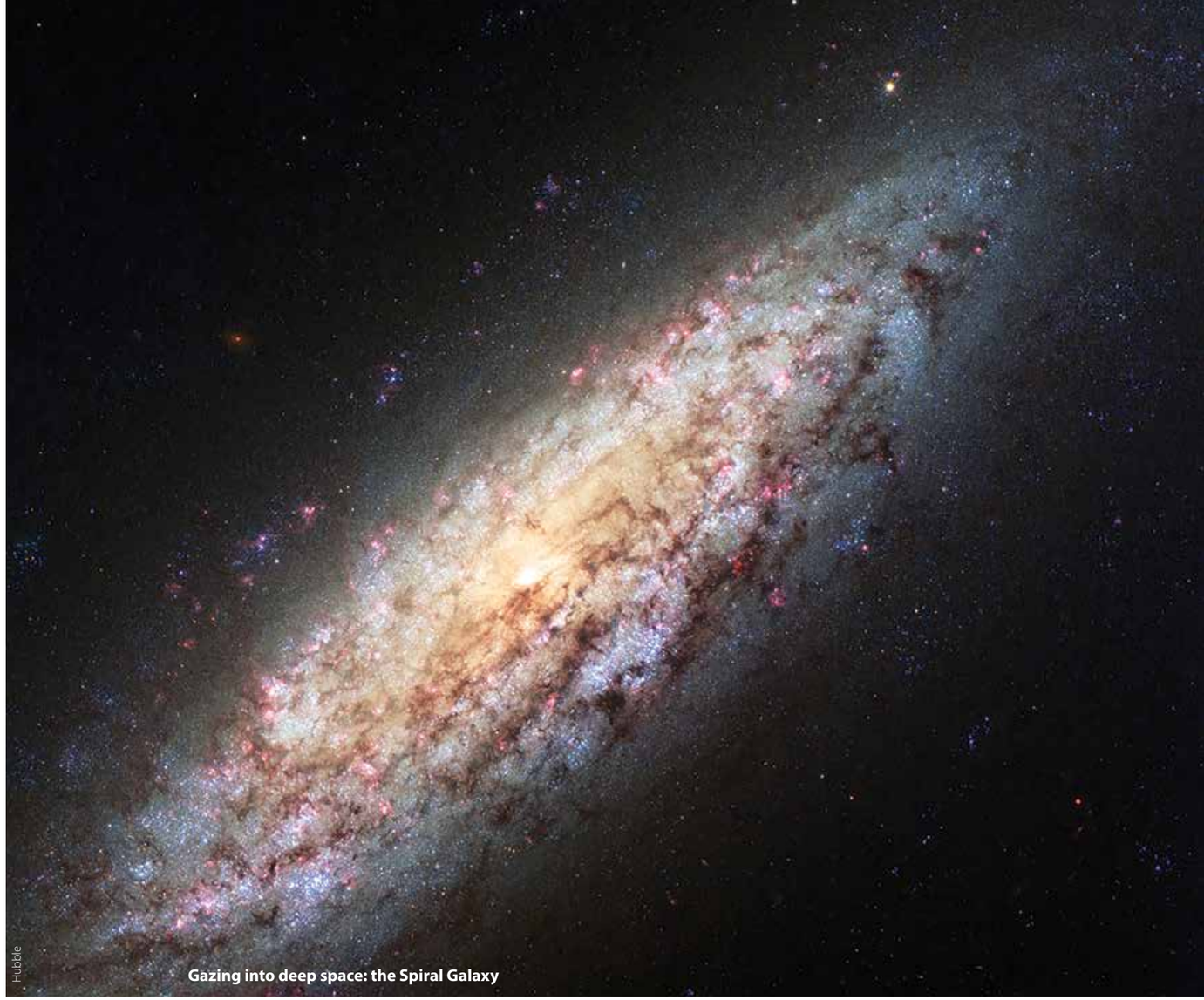
Her favourite project is Solar Stormwatch, which monitors explosions on the sun's surface. "The technical term is 'coronal mass ejections'. They have an impact on satellites and telecommunications so you need an early warning system of this space weather," she explains. The hobby has led Julia to study Open University Courses in astronomy, and she even has a garden shed full of telescopes. "My kids call it 'Mum's astro-shed'" she laughs.

The incredible popularity of Galaxy Zoo – in its first year it received over 50 million galaxy classifications by more than 150,000 people – led the founders to set up Zooniverse, an online platform hosting a suite of projects from diverse research areas for volunteers to choose from.

Chimp & See involves watching and classifying video footage of chimpanzee behaviour in the wild to help scientists discover more about how humans evolved from early hominids. Anno TATE asks volunteers to transcribe the letters and diaries of famous artists to shed more light on their creative processes. In Bat Detective, participants listen to sonar recordings and pick out bat calls against a background of insect noise, something a human ear can do but a computer can't. The aim is to find out how bat populations are being affected by the changing environment, as well as to inform the development of technology that will be able to track bats in the future. These are just a few on offer.

All of these are online projects, but there are plenty of practical projects where volunteers spend time in the field too, or even just in their own gardens. These include bird, bee and butterfly counts, surveys of wild flowers and sampling of local water sources.

Susan Jonas, a member of Hindon & the Fonthills WI in Wiltshire, participates in the Buzz Club, which brings professional scientists and amateurs together to find out more about bees and other pollinators. Last summer, she took part in Bees 'n Beans, a University of Sussex project looking at how effectively bees are pollinating plants. It involved growing beans from seed, leaving some open to pollinators, hand pollinating others, and surrounding others with garden fleece to prevent pollination. Volunteers were then asked to count and weight the pods and beans produced by each plant and record the type and number of visiting pollinators.



Hubble

Gazing into deep space: the Spiral Galaxy

"I found bumblebees did most of the pollination," says Susan. "I hadn't realised how many different types there were. It was absolutely fascinating to watch them and it made me really examine all the pollinators in my garden. There's a whole world out there that you never imagine."

The data collected by the project has already contributed to an article in a scientific journal. "My interest has really been fired and I'm hoping to get more WI members involved. People can be quite scared of science but the citizen science projects are something anyone can do. You just need enthusiasm and to make sure you keep a careful record. Not everything will succeed and there's no right answer – lots of scientific advances have been made because people have noticed anomalies in their results. Science can be so wonderful and creative. If you can follow a recipe to bake a cake, you can follow a recipe to do a citizen science project."

Claire Perrens became involved in citizen science through the charity Plantlife, one of the partners in the National Plant Monitoring Scheme, an annual stock-take of plants growing wild in our countryside. "I'm a complete amateur," she says, "but they did a really brilliant training workshop. You're given a one square kilometre plot near where you live and you have to look at five habitats within that plot, and survey it twice a year." Claire's plot is in the New Forest and last spring she and her husband set off to find it armed with a GPS watch. "We had quite a hike to get there so we took a picnic lunch and made a day of it."

It's fascinating to learn more about her local environment, she says. "One of my habitats is heathland and, although I knew there were two types of heather – the common and the bell heather, I'd never appreciated you can distinguish them from the leaf." The scheme provides training and support to volunteers to help them develop their expertise and enable them to carry out more detailed surveys, and Claire plans to extend her botanical knowledge over the next few years.

"It's really rewarding and you get quite excited and territorial about the place you're monitoring," she explains. "It's an area where I've walked and ridden horses before. I've admired it but I've never got it under the microscope. A lot of flowers are very small and you don't really notice them, but when you go in there and really look, it's amazing. It makes you observe the world differently."