MASTERS OF THE UNIVERSE

Menschen beschäftigen sich in ihrer Freizeit mit den ausgefallensten Dingen. Das kann auch im Dienst der Wissenschaft geschehen, wie wir von CAROL SCHEUNEMANN erfahren. **medium US**

What do you enjoy doing in your free time? Birdwatching? Stargazing? Solving word puzzles? Playing computer games? With hobbies such as these, you can contribute to scientific understanding. By taking a look at the world around you, the sky above you, the civilizations that have gone before you, or the molecules inside you, you can become a "citizen scientist."

The work of scientists involves analyzing and interpreting data. But collecting the data often requires hundreds of hours. In what is regarded as the first "citizen-science" project, ornithologist Frank Chapman from the Audubon Society, a group formed for the protection of birds, asked volunteers to count the birds they saw on December 25, 1900. Chapman received reports of 18,500 birds from 27 people across North America. The "Christmas Bird Count" is still held every year for the purpose of identifying birds in various regions. It now provides information on more than 61 million birds from some 60,000 birdwatchers.

Jonathan Silvertown, professor of ecology at the UK's Open University, says that volunteers have contributed to research at his institute for at least 30 years. "Citizen science is not new at all," he says. "What is new is how easy it is to set up new projects and to participate in them." People can quickly find and join projects on the Internet. Thanks to smartphones, they can upload and send data (such as photos or videos) almost effortlessly. "Without any doubt, citizen science is growing," Silvertown adds. One of the Open University's current projects for the public is Evolution MegaLab, in which people throughout Europe can follow evolution by observing the patterns on snail shells.

Researchers have also begun to delegate the digital side of their work through "distributed computing," which uses the processing capacity of home computers — for example, at night. Started at the University of California, Berkeley, the first such project went online in 1999 — the Search for Extraterrestrial Intelligence (SETI). More than six million people have downloaded a free piece of software, Seti@home, which allows their computers to analyze data received from radio telescopes, and help scientists search for life in space.

Now, citizen scientists can choose from a number of "at home" software programs to assist in research — including one that processes climate and weather models for Oxford University. World Community Grid, sponsored by IBM, uses distributed computing for humanitarian aims, such as comparing medical treatments or measuring water flow through various materials. And researchers at CERN, in Switzerland, recently introduced LHC@home, a simulation of the Large Hadron Collider for people interested in smashing atoms.

Scientific discovery needs more than observation and data crunching, however, and a number of projects depend on talents that only humans have. Satellites and space telescopes, such as Hubble, have collected millions of pictures of stars. One would think that computers could quickly sort digitized information, but computers aren't very good at comparing images. The human eye is much better at "spot-the-difference" tasks.

Begun in 2007, Galaxy Zoo invites volunteers to classify photos of galaxies. "Humans evolved to be good at pattern recognition — the same skills that were once used to spot predators now allow us to classify galaxies, or discover planets," says Dr. Chris Lintott, an astrophysicist and researcher at the University of Oxford and co-founder of Galaxy Zoo. Galaxy Zoo belongs to the Web portal Zooniverse, which now has around 500,000 members.

astrophysicist [ˌæstrə'fɪzɪsɪst*]	Astrophysiker(in)
citizen scientist [ˌsɪtəzən 'saɪəntəst*]	etwa: Bürger(in) als Wissenschaftler(in), Laienforscher(in)
co-founder [ˌkoʊ 'faʊndər*]	Mitbegründer(in)
data crunching ['deɪtə ˌkrʌntʃɪŋ]	Berechnung großer Datenmengen
decipher sth. [di'saɪfər*]	etw. entschlüsseln
evolve [i'vɑːlv*]	sich entwickeln
extraterrestrial [ˌekstrətə'restriəl]	außerirdisch
grid [grɪd]	(Gitter-)Netz
hadron collider [ˌhædrɑːn kə'laɪdər*]	hier: Teilchenbeschleuniger
logbook ['lɔːgbʊk*]	Logbuch, Schiffsjournal
pattern [pætərn*]	Muster
predator ['predətər*]	Raubtier
processing capacity ['prɑːsesɪŋ kəˌpæsəti*]	Verarbeitungskapazität
protein strand ['proʊtiːn strænd*]	Proteinstrang
research [ri'sɜːtʃ]	Forschung, Studien
researcher [ri'sɜːtʃər*]	Forscher(in)
smash sth. [smæʃ]	etw. zertrümmern
snail shell ['sneɪəl ʃel]	Schneckenhaus
space telescope ['speɪs ˌteləskoʊp*]	Weltraumteleskop
spot sth. [spɑːt*]	etw. entdecken, erkennen
stargazing ['stɑːrˌgeɪzɪŋ*]	Sternbeobachtung
transcribe sth. [træn'skraɪb]	etw. übertragen
tremendous [trə'mendəs]	enorm
volunteer [ˌvɑːlən'tɪər*]	Freiwillige(r)

* This symbol marks standard US pronunciation that differs from standard UK pronunciation.

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Nature lovers: they can help to collect data

"People have a tremendous desire to do something useful, to contribute to scientific understanding, and to help explore the universe," says Lintott.

Zooniverse also offers projects that will help us to better understand our history on earth — transcribing centuries-old ships' logbooks for weather data, for example, or deciphering Greek texts that were written about 2,000 years ago. Lintott says the work of citizen scientists is taken seriously. "We produce data that scientists actually want," he explains.

Some projects deal with things too small for humans to see. By turning research into a game, scientists make complex concepts seem simpler. Such computer games make use of "distributed thinking." In other words, they depend on the creativity of a great number of people to solve scientific problems.

Players of the game Phylo move simple patterns of small, coloured squares to find matching genome sequences (think of Tetris). Created by the structural biology group at McGill University in Montreal, Canada, the game compares genomes of different animals, and the coloured blocks represent the nucleotides in DNA. But you don't have to understand genetics to win points and contribute to the fight against diseases.

Another simulation is Foldit, from the University of Washington, which asks its 60,000 users to "solve puzzles for science." It encourages gamers to fold protein strands, helping scientists to create new protein structures that could be used when developing medicines. In September 2011, players produced a model of an AIDS-related enzyme that biochemists had been trying to decipher for ten years.

Besides folding proteins, hunting galaxies, or watching snails, thousands of other activities for citizen scientists attract huge numbers of volunteers worldwide, says "science cheerleader" and blogger Darlene Cavalier from Philadelphia, co-founder of the Web portal Science for Citizens. The portal offers a central listing where citizens and projects can find each other. People can search in various categories, such as time, costs, or skills needed, and by specialty, or geographic area. Cavalier says that, while some people want to contribute to research, others "are drawn to citizen science because it connects them to — and helps protect — nature."

When she's not busy working on her Web sites, speaking at conferences, or writing for *Discover*, a U.S. popular-science magazine, you might find Cavalier and her four children adding to scientific understanding by digging in a bag of dirt from the Museum of the Earth in Ithaca, NY, looking for bits of mastodon fossils. BS

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