‘Citizen science’ has a long tradition within environmental and Earth Science fields, from amateur astronomy and ornithology to the plethora of online programs, networks and apps open to the public. *International Innovation* gauges researchers’ opinions on the trend for involving amateurs in research projects and the worth of this potential contribution to their respective scientific fields.
Q. What role should members of the public play in science? Is the ‘rise of the citizen scientist’ beneficial to research or harmful?

Professor David Pyle (University of Oxford):

I’m in favour of engaging citizens in science, particularly when it opens up opportunities that would previously have been unattainable. Great examples that spring to mind are those that use the capacity of humans to recognise patterns, classify shapes and so on, in ways that cannot be done by machine – such as the Oxford-based Galaxy Zoo project. Other good examples are the transcription projects – harnessing people’s enthusiasm for participating in these sorts of projects by helping to digitise and thereby widely make accessible old hand-written records (such as ships’ logbooks, museum catalogues and labels, etc.).

Dr Fausto Ferraccioli (British Antarctic Survey):

I’ve engaged in outreach, but, to date, we haven’t tried citizen science as such. Partially, that is because our work is so technical and also because of data release issues (generally projects are finished by the time we release data). However, there is a lot of publically available data – for example, BEDMAP II – and we are planning a new magnetic anomaly compilation that we hope to have completed by the end of 2015; these datasets will also be publically available. Perhaps we could think of smaller applications to get the general public more engaged – you never know!

Yannick Gueguen (Ifremer – Pacific Oceanological Center) & Nabila Mazouni-Gaertner (The University of French Polynesia):

This is a delicate issue as the definition of ‘citizen science’ is not necessarily clear. In some situations, public engagement in ornithology has significantly advanced public policy and regulation at national and international scales. In this example, the partnership between research and stakeholders was an important asset. However, other examples show that mobilisation can become more closely related to politics, which can be damaging for certain stakeholders (fishermen) or components of a sector (environment).

Thus, it seems important to establish a close partnership to coordinate efforts and especially to consider all the

CITIZEN SCIENCE IN ACTION

NASA: Data provided to NASA by citizen scientists is often of vital importance, helping professional scientists to answer questions posed by their research. In addition, they have contributed many significant discoveries of objects in space such as nebulas, supernovas and gamma ray bursts. One of NASA’s current citizen science campaigns ‘GLOBE at night’ encourages the public to measure the brightness of their local night sky, reporting observations to a website through computers or smart phones, in an attempt to raise awareness of the impact of light pollution.

Galaxy Zoo: Founded in 2007, the Galaxy Zoo project uses the public to classify huge datasets of galaxies from tens of thousands of photographs making up around a million galaxies. The original project asked volunteers to split galaxies into ellipticals, mergers and spirals (also noting spiral direction). The results were robust enough to show that citizen scientist classifications were as reliable as those of professional astronomers and were able to be used in real scientific research. Further projects have required more detailed analysis of images and continue to play a vital role in further understanding galaxies and how they form.

BioBlitz: A BioBlitz is a collaborative event where scientists, naturalists and volunteers alike attempt to conduct an intensive field survey of all biodiversity in a given area over a continuous period of time – generally 24 hours. The species records are fed into national databases that are used to monitor wildlife. The public element of a BioBlitz is fundamental to its success – through encouraging the public to be interested in biodiversity, a much larger dataset is gained than would be possible from experts alone. It is a true example of citizen science in action.

Wildlife surveys: Volunteer surveyors who record sightings of local wildlife are of great use to many conservation organisations. For example, the Zoological Society of London (ZSL) appeals to the public to inform them of sightings of marine mammals in the Thames. The survey has now been running for nine years and enables conservation scientists at ZSL to understand patterns and trends in species distribution, behaviour and habitat use. The data are also fed into national databases.
Researchers also play an important role here because it is their innovations that lead to new applications and technologies. In my field, if national health programmes recommend the detection of hazardous substances and gases, the study and development of new gas sensors and systems for gas detection becomes imperative.

Dr Magdalena Bieroza (Lancaster Environment Centre):

The environment is our common responsibility: public interest and awareness of environmental problems can only benefit research. Public engagement in general requires that research should easily translate into real-life questions and helps researchers to maintain a clear pragmatic focus and a holistic view of environmental, economic and societal problems.

Dr Didier Fasquelle (University of the Littoral Opal Coast):

Members of the public can directly act in a political way to lobby for the improvement of environmental conditions. They can also state their interest in ‘cleaner’ sciences and ‘green’ technologies by using public media, newspapers and journals. When the latter is used, politicians have to consider public opinion weightings and will then be able to decide upon directions for scientific development. The rise of citizen scientists can benefit research if politicians and Members of Parliament (MPs) take into account the weighting of those opinions and if they listen to these citizen scientists without distorting their statements.

Governments can support research programmes dedicated to the improvement of environmental conditions – such as the second National Health and Environment Plan (PNSE2), France – and to the development of green technologies – for example, the French Environment and Energy Management Agency (ADEME) programmes. In many cases, environmental benefits can be restricted because there is often a discrepancy between the benefits to mainstream consumers (in terms of health and the environment) and the benefits to firms that translate to ‘more money’.

Public demand drives the birth of new technologies and equipment. Researchers also play an important role here because it is their innovations that lead to new applications and technologies. In my field, if national health programmes recommend the detection of hazardous substances and gases, the study and development of new gas sensors and systems for gas detection becomes imperative.

Dr Alistair Crame (British Antarctic Survey):

Although it is less relevant in Antarctica, the role of the amateur is important throughout palaeontology. There are some brilliant amateur collectors out there, and a lot of their material ends up in museums and university labs. There are some very good volunteers too, and they often do a lot of the necessary painstaking preparatory work that others rely on.

We need the support of these and many other members of the public to ensure politicians and funders are aware of the importance of palaeo and evolutionary sciences. Most people simply cannot understand how forests once covered Antarctica but would agree that it is important that we try and establish why and how they grew there. The concept of deep time is almost as unfathomable as that of deep space but amateur scientists play a vital role in keeping interest levels up in this area across the board.

Dr Sandrine Delpeux (University of Orléans):

People must change their behaviour towards environmental problems and feel more concerned or involved in pollution reduction and management. Even if scientists are developing new strategies and technologies for reducing damage by water contaminants, action to reduce waste in water and avoid cross-contamination is essential.

Hence, citizen science can be beneficial to research as long as the raw data can be assessed and analysed by a trained scientist with due acknowledgement and collaboration. If this is not the case and amateur scientists publish their interpretations without advice from trained scientists, then there is certainly a risk that less than scientifically rigorous interpretations that reach the general public (or worse, government advisors) could prove damaging to science, which survives on repeatable, open, timely and thorough analysis.

Education is therefore the key. This starts with the national science curriculum, which would benefit from improving Earth Science content from at primary school level. Furthermore, the pursuit of a scientific career for those who show a particular interest should be encouraged and fostered as a viable option, perhaps capturing many of those who would otherwise have become amateur scientists.