

International Community of Citizens Scientists. A New Democratic Form of Scientific Power

Carlo Artemi

Department of Public Education, Civita Castellana, Italy

Abstract Relationships between Science and Power have been studied from centuries and is obvious to ask why Science is a Power and who have scientific power. Paper describes recent phenomenon of Citizen Science and put it inside the bigger phenomenon of globalization both cultural globalization and political globalization. Starting from real examples it is showed this phenomenon has created the International Community of Citizen scientists. This is a new, transnational and fundamentally democratic form of Power. Paper ends with an example showing this Community can take more democracy inside a cultural system in which democracy is poor.

Keywords Citizens science, Globalization, Transnational organizations, Democracy, Cultural systems

1. Introduction

This paper is divided in five parts. In the first part author, starting from the title of a conference, does some considerations on relationships between Science and Power and on what people has the scientific power. In the second part author explains what is Citizens Science, taking as example of it a project in which he was involved. In the third part, starting from real examples, author shows how citizen scientists can influence political power. In the fourth part is showed how citizens science is linked with globalization both cultural and political globalization. The existence of a real International Community of Citizens scientists, fundamental democratic and able to realize a human-face globalization, is showed too. Paper ends with a practical example of how this Community can bring more democracy to a cultural system.

2. Science and Power

In September 2016, an important conference, entitled "Science and Power, Science as a Power," was held in Prague. The conference title is very appropriate as it prompts some important reflection and questioning. The first part of the title immediately raises several questions involving present or past relationships between Science and Power, not only from a political perspective but also from economic, religious, and social viewpoints. However, it is

the second part of the title that raises the most interesting questions. Why is science a power or can science be a Power? What kind of power is science or what kind of Power has it been? Who are the people who have this Power? The answer to the first question seems obvious and was essentially written centuries ago in "*Scientia potentia est*," by philosopher Sir Francesco Bacone, who might even have reworked a concept that was already present in the Bible. The translation of this statement from the original Latin is "*Knowledge is Power*."

Clearly, if people use scientific methods to make discoveries, they gain "knowledge" and therefore increase their Power. However, things are not that simple, because someone could object that people can also acquire knowledge through the arts, Yoga, meditation, philosophy, magic, and so on. It seems, then, that philosophers, artists, Yoga teachers, magicians, and others also have Power. Some very strong objections that famous scholars such as Benedetto Croce and Martin Heidegger have made regarding the ability of Science to produce knowledge must also be taken into account.

The author has made several reflections [1] on this point, and these can be summarized as follows. First, it is important to agree about what it means to know something; in author's opinion (and not only in his) to know something means: to be able to describe the past (the temporal evolution) with respect to this something and its parts, to be able to describe its present, and to be able to forecast its future (in a deterministic or probabilistic way).

Clearly, it is pointless to say that Science has produced these operations in a simple and rational way on many, many systems. For example, consider electromagnetism. Here, a few hypotheses, a few equations, and operations that are, all-in-all, not too complex have explained a huge

* Corresponding author:
carloartemi@gmail.com (Carlo Artemi)

Published online at <http://journal.sapub.org/sociology>

Copyright © 2017 Scientific & Academic Publishing. All Rights Reserved

quantity of phenomena: electric phenomena, magnetic phenomena; indeed, everything involving light and electromagnetic waves. From a few simple equations comes the ability to build all the appliances that we use every day.

Only Science has been able to do such things without building numerous *ad hoc* explanations for every phenomenon but, instead, developing simple and rational theories or models that are capable of explaining many phenomena, to forecast the future behaviours of systems, and to give suggestions for the construction and use of many objects. In short, if it is not possible to say that "Knowledge is reachable only by Science," it is certainly possible to say that "Historically only Science has produced an important knowledge or rather a so deep, vast, and organic knowledge to produce Power."

At this point, it is important to ask ourselves the following: who has this scientific Power?

The answer seems obvious: "the scientists." However, things are, in fact, much more complex. First, a scientist is a man or a woman who lives in a society and whose job can be influenced by shortages of funds, accessibility to certain tools, philosophical ideas, political decisions, personal life, and so on. Next, we need to ask ourselves whether scientists have to be only university professors, teachers, professional researchers, scientific journalists, or intellectuals. Can other people be scientists too?

3. Citizens Science and Power

3.1. Citizens Science

This question makes logical sense in the context of a recent phenomenon that is described below: Citizen Science (CS). To understand what CS is, we have to look at how scientific research has been conducted from the time when Galileo was living until now. To simplify this considerably, scientific work can be divided into three phases. The first phase involves researchers searching for theories that might explain a number of phenomena or merely observing experiments and measuring certain things that are happening. The researchers try to express the phenomena through mathematical entities. This work generally ends with the elaboration of theories or empirical laws that are published in specialized magazines.

The second phase occurs when other researchers perform different types of tests to ascertain whether the theories above are correct, whether they contain errors that can only be repaired by refining the theories, or whether the theories should be rejected. This phase ends with the formulation of generally accepted theories.

The third stage involves proving these theories and experimental results and communicating this to non-scientists by teaching Science subjects in schools or by popularizing them. People such as engineers, who are not scientists, create practical applications based on these theories. Clearly, all of this work is done by people with

specific backgrounds: researchers, university professors, teachers, journalists, engineers, and so on. The only exception to this has been non-professional astronomers, who use modest tools such as binoculars, in their research work when searching for comets or asteroids. To understand how CS can change this situation, it is useful to look at what occurred in the first major collaboration involving CS, the Galaxy Zoo project, which later expanded to become the mega-project Zooniverse. This project is a CS project aimed at classifying galaxies in a more-or-less detailed way from the morphological point of view. The structure of this project is shown in the following picture.

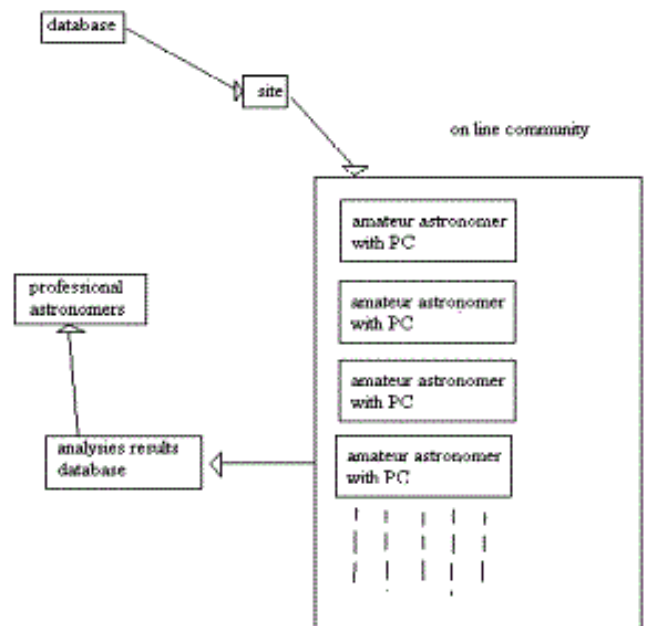


Figure 1. Organization of Galaxy Zoo collaboration

The author is one of these amateur astronomers and has conducted and continues to conduct research. The project site is at www.galaxyzoo.org, and all the information about the project, from the content of papers to the names of professional astrophysicists who are involved, can be found there. Amateur astronomers register themselves and obtain a username and password, and then they can catalogue galaxies after answering a series of multiple choice questions. The online community now includes almost 150,000 people from about 40 countries, and the scientific results have been huge. The collaboration has had 25 papers published or accepted in high impact factor journals (first published paper was in summer 2008). In addition, there are conference communications and citations both from specialized reviews and newspapers such as the *New York Times*, the *Herald Tribune*, and many others including the Italian publication *Corriere della Sera*.

It is essentially impossible to summarize these results in a few words. As has already been stated, the project has been joined by others on topics ranging from a study of the surface of Mars to a study of musical scores of the 19th century, and to a study of the diaries of sailors in World

War I in order to obtain information on weather. To give an idea of these projects, consider the one entitled, "What's the score at the Bodleian?" Here, the "citizen scientist" can see the sheet music from a collection of Victorian-era piano music. After seeing these scores, the researcher has to answer a series of simple questions about the music itself, such as stating whether it is a waltz or a mazurka, whether it is in Sol or Do key, or whether it is a major or minor tonality. As in Galaxy Zoo, the answers to these questions make up a database used by professional musicologists. In addition, the mega-project Zooniverse does not exhaust the CS. It is similar to CS but with some differences in the so-called Science at home. Here, there are people who are not professional scientists but have a strong cultural background in the subjects in which they work. They are, for example, graduates in physics with specialization in non-linear systems or graduates with job experience in the financial markets. They use software that they have written or that has been written inside an environment such as Matlab, which performs simulations of systems. These systems are generally social-economic systems, but they may also be physical or biological. This software runs on home PCs, and when the results of the simulation have any interest for the scientific community they are sent via Internet to international conferences or journals. By this way results become accessible to international community. Clearly, in such cases it is very important that the conferences are organized by scientific organizations that accept papers by not academics as well as academics. Many of these organizations, in order to have more freedom, must finance themselves by asking authors for fees. Although it is well known that all great changes have their downsides, this situation has, regrettably, led to real fraud and the creation of bogus conferences, which have been denounced by the scientific community. Examples at www.arXiv.org by searching for "quantitative finance."

3.2. Two Examples

The following are two examples of how a citizen scientist can influence the Power, at its best. The first, which involves Galaxy Zoo collaboration, describes something that has not happened but could happen, and the second, a criminological study on a cold case, describes the actions of a real author.

Among the many people involved in this Galaxy Zoo project is a Dutch lady, Hanny Van Arkel. Van Arkel was a high school teacher and, before becoming involved in Galaxy Zoo, she was completely unknown and had no presence in mass-media. After observing galaxies, she noticed a strange object in one of them that looked like a green cloud near the galaxy. She reported this observation to professional astronomers, who studied it in depth and discovered [2] that it was a reflection nebula of a completely new kind that mirrors light emitted by a nearby galaxy. This light is not being emitted now but was emitted 12,000 years ago when the galaxy was a Quasar. Several of the objects that

Van Arkel reported have been discovered and are now called "Hanny's Voorwerp." In short, a completely unknown woman discovered a new astrophysical object because no one suspected the existence of "intermittent" quasars. She has become a famous person because the mass-media in several countries have spoken about her. Furthermore, these media not only include specialized magazines but also generic newspapers.

Imagine a situation such as the following. There is a country in which there are two political parties, Alpha and Beta. The elections are coming up and the opinion polls report the parties as being neck and neck. A Hanny-like person, who is now famous, participates in a TV talk show and speaks to the anchorperson, showing that she is in sympathy with Alpha. Undecided electors hear these words and decide to vote for the Alpha party. It wins the election. This shows that a previously unknown man or woman can sway voters so the victory goes to one party rather than the other; since the party's programs may be very different from each other, this victory could significantly influence the international situation because of one party could be favourable to leave European Union and other party favourable to remain.

The second example involves the author who conducted research into a cold case relating to the very controversial crime that involved the Vatican, in Italy, and the disappearance of Emanuela Orlandi. The results of this study have been transmitted to the Judiciary, which then takes measures in accordance with them. These results are presented on an Internet site [3] and in a self-published book. The methods used in the study are described in [4]. However, what is important from the point of view of this article is that the author achieved these results and was able to write a letter to the Vatican State Department. The text of the letter has not been disclosed, but it is possible that there was information in this letter that helped to prevent someone from using the Orlandi case to hamper Pope Francis' reforms.

Clearly, the Vatican State Department is a big centre of Power worldwide, and Pope Francis' reforms and putting them into full effect are very important. Through the use of scientific methods, an unknown person has managed to gain Power by writing a letter to an important centre of Power, not to ask for something but to offer something. Power has always need informations but these has generally been provided by professors, academics, and the experts, such as famous economists and technicians; now, such information is being supplied by the common people. These are only examples, but they show that CS is increasing the number of people who have "scientific Power." However, there are other aspects to consider. Scientists are not lonely men or women; they are part of a scientific community, one that has been international or transnational since Science was born. Galileo already had contacts with scholars who were from many countries and belonged to a number of religions. One of the Galileo's students in Padua was Jewish [5].

4. Globalization

4.1. Cultural Globalization

The Internet, along with low cost and intercontinental air travel, high-speed trains, and radio-TV communications, has accentuated this inter- and transnational feature. Citizen scientists can now accomplish things that until just a two decades ago were possible only for professional scientists. Some of these achievements include the following:

- to obtain news about the latest scientific research by connecting to the Internet sites of universities, research organizations, scientific magazines, and so on,
- to interact with other scientists through forums, blogs, and other sites, to send their papers to magazines, especially open access, peer reviewed journals,
- to participate at scientific conferences and then to interact face-to-face with other scientists.

To conclude, this seems to be describing a transnational group of Power whose organization is deeply democratic: the International Community of Citizen Scientist (ICCS). Over the last 12 years, both newspapers and scholars have studied and looked closely at transnational organizations and the influence they have on the lives of common people. In the European public opinion in the past 20 years there has been a considerable and heated debate over how decisions of the European Central Bank (ECB) or the International Monetary Fund (IMF) can influence or determine the economic politics of sovereign states (e.g., the Greece public debt case), such as by imposing very unpopular economic measures. Clearly, scholars have different points of view regarding these questions, but there is agreement about the fact that we live in a "global village," where globalization both exists and involves transnational Power organizations.

Clearly, the ICCS is part of this globalization and is also a part both of cultural globalization and political globalization. There are two important aspects to consider about this. Cultural globalization has been both endorsed and criticized. The critics have been well represented by people who are afraid that Euro-Disney [6] is overtaking the city of Paris, potentially leading to the reduction in demand for "authentic" French pastry. There is fear that a dominant culture will spread everywhere, leaving local cultures destroyed or forgotten: the "global" killing the "local."

Certainly, because Galileo, Leonardo da Vinci, Newton, Descartes, and so on were all European, scientific method could, in fact, be considered as a product of only one culture, the European culture. However, things are not so simple. Information can be controlled in every Science history textbook, and various cultures such as the Arabian, Indian, old Greek, and Roman have contributed to the birth of Science or have developed ways of thinking and methods similar to scientific ones. Indeed, arithmetic and algebra, and essentially every math that has been used by scientists, were developed by the Arabian civilization. The word "algorithm" comes from Al-Khwarizmi, who was the librarian of

Baghdad caliph in the IXth century A.D. Furthermore, today, research is conducted by Europeans, Americans, Indians, Chinese, Nipponese, Africans, and so on. If we examined the list of participants on Galaxy Zoo there would be people from numerous countries. Scientific method is not, then, a product of one culture dominating others but a product of a "global" culture.

ICCS can study most local cultures and traditions, and the results of these studies can reach people everywhere. At this point, the author needs to relay a personal example. I live in a small town in Italy, near Rome, and went as a tourist to Switzerland a year ago. I used the famous Bernina railway that goes from Tirano (Italy) to St. Moritz (Switzerland). Intermediate stops were announced to passengers inside the train. However, I noticed a strange thing. As the train came closer to Tirano, stops were announced in three languages, which I understood to be English, Deutsch, and Italian. Yet, when the train was approaching St. Moritz, the Italian was replaced by a language completely unknown to me. To give an example, the expression "stop on request" in Italian is "fermata a richiesta" and in this unknown language it was stated as "fermata en dumanda." Clearly, this was a Neolatin language, but which one? After returning home, I consulted Wiki and other sources [7] and determined that this language was "Romancio," a Neolatin language spoken by only about 36,000 people who live near St. Moritz. I had never heard of this language. However, after using globalization tools, such as booking the trip via Internet, using high-speed trains, and so on, I have "discovered" a very local feature of a culture.

4.2. Political Globalization

With respect to the ICCS as an aspect of political globalization, it is important to point to a theory that is explained by two scholars in a book [8] about the theory of "Empire." These scholars envision Empire is a situation in which there is a structure that has Power throughout the entire world. The structure that has this Power is not a single country but an international or rather a transnational "organization." This organization has democratic parts (for example, the United Nations General Assembly), oligarchic parts (examples being the IMF or ECB), and monarchical parts (such as the President of the United States of America). According to the vision of these scholars, the Empire is the final product of capitalism and strongly influences the daily lives of everyone in the world, reducing people to a "Multitude." [9] The two scholars have a very negative view of the Empire, because they believe that it creates wars in order to maintain itself.

Clearly, the ICCS shares some features with the Empire; however, there are strong differences as well. The ICCS can be considered as a product of industrial capitalism because capitalism offers tools for producing huge quantities of cheap objects, such as PCs, software packages, optical fibres, and similar, high-speed Internet services, high-speed trains, and so on, which can be used by communities.

However, the ICCS can be considered in terms of other factors as well, such as the diffusion of cultures, decreases in illiteracy in developing countries, technical progress, and some cultural factors that are not yet well defined. Furthermore, these factors are also present in non-capitalistic countries. For example, some scholars have talked about the "Hippy-bit generation." [10] These scholars believe that the desire for new things and for changes in society that were presented in the Hippy movement have stimulated many people to develop informatics and similar tools to change society.

On the other hand, if ICCS is a product of globalization then it is important to emphasize that globalization was already in effect in pre-capitalistic eras, when there was a need for distinction between an archaic globalization (until the XVth century), a pre-modern globalization (1400–1800 A.D.), and an actual globalization. But the most important point is that the ICCS is fundamentally democratic. Consider the following example, which involves the organization of Italian universities.

5. An Important Example

The Italian university system has a pyramid-like, hierarchical, and authoritarian organization that can be schematized as a series of superimposed levels. At Level 0 there are the university students, who graduate after a series of exams and discussion about a thesis. In the Italian language, this graduation is called "Laurea in (name of the subject in which student has graduated)." Clearly, many of those who graduate do not choose to undertake research.

Students who want to do research can attend freely, without needing any grants or money, and they collaborate with professors and researchers. These students are at Level 1. Students who want to obtain grants have to take an exam, similar to university exams, with a written and an oral test. The scores they achieve in these two tests are much more important than any academic titles, including publications. The jury is made up of two-thirds of the professors who are working in the same department where the candidate will work. At the end of the contest, the students are ranked, and the chance to obtain a grant and pass into Level 2 is given only to the first N of the list, where N is the number of available scholarships. This number is generally far less than the number of students who succeeded in passing the examination. The amounts of the grants are lower than the salaries of a full-time permanent researcher. At the end of a three-year course, students became "Dottore alla Ricerca," which essentially means that they have PhDs.

The permanent researchers are at Level 3. Although being "Dottore alla Ricerca" is not required for becoming a permanent researcher, it is an asset. To move from Level 2 to Level 3, these researchers must take part in a contest that is organized in a way that is quite similar to the exams that have already been described. When the university announces the competition for researcher, it is possible to enter a profile,

such as that the competition is not generically for "researchers" but can be for "a researcher with special expertise to do ..." or for "a researcher with particular experience in managing" Clearly, this provides a Powerful tool for promoting a certain person or people in the competition, since it is sufficient that the profile fits perfectly to the candidate. The commission that examines the aspiring researcher is established according to the same criteria as was described above. On reaching Level 3, they become permanent researchers and, with a competition including a survey, may enter Level 4, the final one, which is that of university professor. This level is divided into two sublayers: associate professor and ordinario (full) professor. The transition from one to the next of these two levels leads to an increase in salary and occurs through an assessment of the titles that have been published. In most cases, only ordinario professors are eligible for election to university management positions.

Clearly, such a system creates an aristocracy within the university that manages the research activities and funding. This lobby can promote friends, relatives, acquaintances, or simply people who are doing what the "aristocrats" want. This situation has been denounced in books, [11, 12] interviews, and statements and has resulted in investigations by the Jury and also in many people leaving for foreign countries (brain drain). As a result, a recent reform [13] has tried to change the system through the following modifications:-the people at Level 3 are no longer permanent staff but their positions are for three or six years, -the people log into Level 3 through a competition that is based only on the valuation of academic titles (publications and talks at conferences, patents, organization of scientific events), valuations that must be objective and include no indications of the profile,-the transition from Level 3 to the associate professor level is virtually automatic.

It's clear that applying this reform makes universities much more democratic organizations. However, consider the situation where a member of the ICCS who is working outside of universities or academies gets published articles, talks at conferences, and collaborates with foreign institutions whose managers he or she met at the conferences themselves. Clearly, this person has many qualifications that are valued by the commissions and should, therefore, go directly to Level 3 or 4, with recognizable consequences regarding the management of funds and the Power of the university. This example was inspired by a typical Italian situation but can be generalized, especially if the possibility of having men and women from the ICCS evaluate scientific articles were introduced.

6. Conclusions

The ICSS is a very interesting and new phenomenon At today is not possible to say how much world can be changed by it. Securely ICSS can contribute to advancement of scientific knowledge and more people enter in ICSS more

people known scientific method and the importance of Science in daily life. But ICSS could do changes in international political situation. As showed in examples it could bring more democracy in the world. This is a very important aspects if we think to countries where there is not an explicit dictatorship but there are authoritarian regime. ICSS, being a product but also a factor of globalization could contribute to realize that human-face globalization that many people desire.

REFERENCES

- [1] C. Artemi, *Un corridoio chiamato Scienza (A Passage named Science)*, Viareggio, Italy, Edizioni Creative, 2015.
- [2] C.J. Lintott et al., "Galaxy Zoo: 'Hanny's Voorwerp', a quasar light echo?", *Monthly Notices of Royal Academic Society*, Vol 399, pp. 129-140, October 2009.
- [3] www.carloartemiattivita.sitonline.it page "sul caso Emanuela Orlandi", in this site there are texts of letters sent to Jury too
- [4] C. Artemi, "Citizens criminology: An example from a (very) strange Italy-vatican case", *Humanities and Social science*, Vol 2, pp. 206-210, 2014.
- [5] www.wikipedia.org issue "Joseph Solomon Delmedigo".
- [6] Hacker and Violaine, "Building Medias Industry while promoting a community of values in the globalization: from quixotic choices to pragmatic boon for EU Citizens", *Politické Vědy-Journal of Political Science*, 2011.
- [7] <http://www.swissinfo.ch/ita/romancio--lingua-o-dialetto-/456094>
- [8] A. Negri and M.Hardt, *Empire*, USA, Harward University press, 2001.
- [9] A. Negri and M. Hardt, *Multitude*, USA, Penguin Book, 2005.
- [10] B. Cosmi, *Non siamo controfigure Docenti beat studenti bit generation*, Rome, Italy, Sovera, 2010.
- [11] D. Carlucci and A. Castaldo, *Un paese di baroni*, Rome, Italy, Chiarelettere, 2009.
- [12] G. Palermo, *Baroni e portaborse I rapporti di potere nell'Università*, Rome, Italy, Editori internazionali Riuniti, 2009.
- [13] Text of reform in https://web.uniroma1.it/dottinfratras/sites/default/files/L240_2010.pdf.