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"Citizen criminology": An example from a (very) strange Italy-vatican case

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Abstract: In this article some actions performed in Italy by myself and by another people are described. These actions have been made to investigate a very famous Italian-Vatican case. In these investigations techniques and tools as DNA analysis or geosonar typical of scientific researches have been used or could be used. This behavior can be set inside so called "citizen science "a new way to make researches such as common people aren't only a receiver of scientific culture by specialists but he) she begins an "actor "to create scientific culture. In article citizen science is described with reference to a famous example after there is a schematic (for reasons of privacy) description of action more some conclusive remarks.

Keywords: Citizen Science, Unresolved Crimes, Criminology, Vatican Case, Orlandi Case

1. Introduction

In the last years a very big change is happening in the way of doing science: the emergence of so-called citizen science [1] henceforth C.S.. In this article, after describing what the citizen science is, with references ranging from astrophysics to the humanities, it will be discussed, with reference to a real case, the impact C.S. may have on a field halfway between the scientific research and the crime: the field of criminology or to be more accurate the scientific study of unsolved crimes. Specifically the reference is to what the author and another people have done to investigate one of the most mysterious and intriguing Italian-Vatican affaire in recent decades: the Emanuela Orlandi's disappearance. This case will not be described in detail because it is not possible to do it in the space of an article, but there are many books talking about it [2] [3] or about particular assumptions made on it by judges, journalists, relatives etc ... [4] [5] [6]

2. Citizens Science

To understand what C.S. is, we have to see how science has been done since the time Galileo was living until now. Simplifying a lot, the scientific work can be divided into three phases.

First phase: researchers search for theories that may explain a number of phenomena or merely observe experiments and measures certain things happening. They try to express phenomena by mathematical entities. This work generally ends with the elaboration of theories, or of empirical laws, that are published on specialized magazines

Second phase: other researchers perform any type of tests to check whether the theories above are correct or if there are errors repairable by refinements of the theories, or theories should be rejected. This phase ends with the formulation of generally accepted theories

Third stage: these theories and experimental results proving them are communicated to not-scientist by teaching of science subjects in schools or by popularizing them. Those who are not scientists but are engineers create practical applications of these theories.

As you can see it's all a job done by people with a specific preparation: researchers, university professors, teachers, journalists, engineers, etc.... The only exception is non professional astronomers, using modest tools as binoculars, making researches as search of comets or asteroids. To understand how citizen science can change this, let's see what happens in the first major collaboration of C.S. the GalaxyZoo project [7] which later expanded to become the mega-project Zoouniverse [8]

This project is a citizens science project and its aim is to classify, in a more or less detailed way , galaxies from the morphological point of view . The structure of this project is showed in the following picture

Author is one of amateur astronomers even he has made

and makes researches. The project site is www.galaxyzoo.org and in this site every information on project (from content of papers to names of professional astrophysics involved) can be found.

The amateur astronomers register themselves, obtaining an username and a password, after they can catalogue galaxies answering to a series of multiple choices questions. Until today online community includes almost 150000 people of almost 40 countries. Scientific results have been huge. The collaboration has 25 papers published or accepted in press in high impact factor journals (first published paper in summer 2008).[9] And besides there are conference communications and citations both from specialized reviews and from newspapers as New York Times , Herald Tribune and many other among which Italian Corriere della Sera .

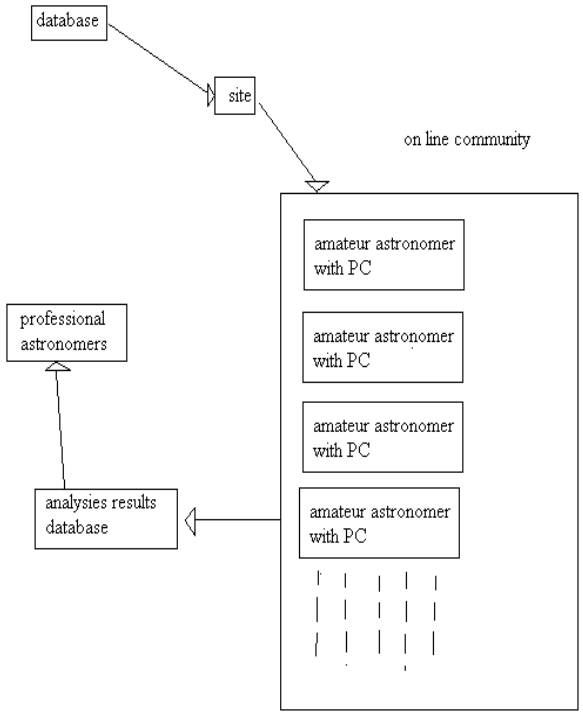

Figure. 1. *A schematic vision of "modus operandi "of Galaxyzoo project.*

It's practically impossible to summarize these results in few words.

As we have already said it has been joined by other project on topics ranging from the study of the Mars surface to the study of musical scores of the nineteenth century to the study of the diaries of sailors of the WW1 in order to obtain information on weather to other studies. To give an idea of these projects consider the project "What's the score at the Bodleian." Here the "citizen scientist" can see the sheet music from a collection of Victorian era piano music. Seeing these scores, the researcher has to answer a series of simple questions about the music itself .as for example to say if it's a waltz or a mazurka or if it is in Sol or Do key, or if it is major or minor tonality, As in GalaxyZoo the answers to these questions make up a database used by professionals musicologists

And the mega-project Zoouniverse does not exhaust the citizen science. [10][11] Similar to citizen science but with some differences is the so-called science at home. Here there are people who aren't professional scientists but have a strong cultural background in the subjects which they work in. They are, for example, graduates in Physics with specialization on non linear system or graduate with job experience in the financial markets. They use software, written by them or written inside an environment like Matlab that performs simulations of systems. These systems generally are socio-economic systems but they may be physical or biological, too. This software runs on the PC at home and when the results of the simulation have an interest for the scientific community, results are sent via Internet at international conferences or journals. Obviously in this case it is very important the existence of conferences organized by scientific societies accepting papers by not academic too

Many of these organizations , for having more freedom too , have to finance themselves by asking fees to authors This situation has led unfortunately to real fraud denounced by the scientific community with the creation of fake conferences; but it is well known that all great changes have their downside

Examples of science at home papers can be seen at www.arXiv.org in issue "Quantitative finance".

3. Citizens Criminology

Now we will describe some actions that are a criminological equivalent of measurements made on physical systems. Generally, the common people participate to police investigation as a witness, as a person who "registers "a fact but that doesn't "elaborate "the fact itself. Common people are the people saying "I heard a gunshot and saw." or "I saw a tall and medium-size man to enter in a red car parked ...". Here actions by common people elaborating facts will be described.

These actions have been performed by international photographer Roberta Hidalgo [12] and by myself [13] to investigate the Emanuela Orlandi case. For privacy reasons, it will be made a generic description without people's names

First a very important remark: these actions have been made in Italy and they are fully compatible with Italian laws

The Emanuela Orlandi's case is too long and complex to be recounted here, it's suffice to say that it is the disappearance in 1983 of a fifteen Vatican-citizen girl and this case was linked to the assassination attempt of Pope John Paul II. This girl has never returned home but her body was never found. On the fate of the girl the most varied hypothesis have been done: for some scholars she is dead and buried under a church in Rome for other she lives with false name in a Vatican place or lives in Turkey married to a Turkish man

3.1. DNA Analysis

DNA analysis is one of the most important scientific measurements that can help investigators of a crime and in

recent years many killers (even of past eras as Jack the Ripper) have been identified thanks to this technique. This analysis can be made by small laboratories present in many parts of the world. The problem is finding the organic material to be analyzed .Let suppose that many years ago a girl (the girl X) has disappeared and she was never traced. Image we notice a striking resemblance between this girl and our neighbor lady Y, let suppose lady Y has the right age to be just the disappearing girl. Suppose that X'mother , lady L , is still alive and that we can attend her (for example, we go to Mass in the same church). We recover from the garbage of Y her tampon and tear off L'hair, including their bulbs, using a double-side adhesive strip. We may make a comparative DNA analysis If Mrs. Y is the daughter of Mrs. L will have practically solved the case, obviously informing prosecutors. on our finding

3.2. Social Network

We are always assuming the previous example. Mrs. Y may have a FB profile with her photos, of course we can compare the lady's face with the X girl's one using photos posted on old newspapers or on Internet. If we use a software like GIMP or other photo processing software [14] [15] which are freely downloadable, we can do complex analysis of the photos too. For example, we can combine the right part of the face of X with the left of the face of Y in one image. The following is an example of this technique. Image was taken from a research on Google and has been obtained by famous criminologist Francesco Bruno, in 2008 using a software which today is freely available

Figure 2. *Photo composition from a job by an Italian criminologist The right part of the face of the girl disappeared many years ago ant the left part of the face of a lady who could be the girl.*

The right part of image was taken from a photo representing Emanuela Orlandi when she was a baby and the left part of image from a recent photo of a lady who could be Emanuela

If the resulting image is symmetric we obtained a strong indication that the two people are the same person. Always referring to the FB profile of Y we can do even more. If the X's case has been described in some books it's very probably there are in these books informations about the character, tastes and habits of girl But we can understood Y's personality examining the FB friends of her and we may compare the two personalities To be more clear let us suppose that the girl X 1)kept dog in her home 2)belonged to " Azione cattolica ", (an Italian association) 3) was a passionate musician 4)wanted to do hostess 5)her family was O family 6)was suspected of being held by kidnappers in an area of the Marche district (a region of Italy) 7)had worked for a multinational cosmetics. If there are , among FB friends of Y :people who have dogs in the house, people living in the Marche, people who works on airplanes, musicians, leaders of " Azione cattolica " and so on . .. we may suppose that the two women have the same personality It is very likely that two people of the same appearance and the same personality are the same person. Apart from FB another popular social networking site is Youtube. Let assume that there is a video on Youtube and that Mrs. Y plays and sings. We could just hear her voice and to characterize it in terms of music too (high-pitched or grave, soprano or contralto, clear or husky, and so on ...). Besides Y lady can sing in a club or in a pub too then we can also record her voice by a recorder small enough to be hidden in the inside pocket of a jacket or by a device, , freely and legally salable , that has hidden inside everyday objects such a pen or a watch.

If X sang too and we have records or testimony of her vocal characteristics we can make an obvious comparison

3.3. Lie Detector

We come finally to the use of a device that is controversial but it's readily available for sale in online stores at affordable prices, and it's easy to use.: lie detector [16] Two remarks about the "lie detector" necessary because the reliability of such an instrument has been extensively in discussion The various types of lie detectors are based on same principle: when we lie subtle variations of parameters of our body occur. Increased heart rate, increased blood pressure, increased sweating or changes in the tone of the voice There are also non-verbal signals as blocking the movement of the hands or rubbing the nose The criticism of these tools are they reveal when liar deliberately lies, and a person with a lot of self-control in front of the polygraph may reduce or cancel these changes especially if the suspect is aware of being analyzed by a lie detector. Machine used by me is just a voice-analyzing device based on Israeli military patent bought in a legal manner from an Internet site. Please note that the machine used by me doesn't work in a true-false way but it shows the result of analysis on a little screen in the following manner. The figure of an apple means truth (following figure shows the device screen), if holes begin to appear on apple it indicates an emotional tension of the tested people, if a worm appears there is a very strong emotion of people. Details of the difficulties that I have met and the obtained results are described by me in[13] Unfortunately, the device used by the author and others devices like it do not have the way to record the measurements , but we can report our observation to

investigators and they can , observing same Youtube videos , by more professional devices , confirm our findings

Figure 3. *The screen of the lie detector mentioned in the main text. Apple means "true ".*

- The important thing is this kind of analysis can be applied to Youtube video in which people involved in girl's case speak on it. Obviously these people when spoken to didn't known someone would have analyzed their voice Obviously we can also observe the gestures of the speaking people to see if there are non-verbal signs [17] that indicate a lie

3.4. Geosonar

Let conclude with an example of a technique that has not been used by me, but may be used without great difficulty. Suppose that journalists or investigators have suggested that the X girl is dead and the body is under the Z church. Let hypothesize that the girl was 1 meter and 80 centimeters high, thus significantly higher than the average height of women lived centuries ago. Now common people can buy or rent a geosonar [18] and some of these devices are able of providing 3D images of the subsurface to depths of 40 meters [19]. In addition, these devices are controlled by PC or laptop, by user friendly software. Let suppose moreover to be the owners of a house with an underground room such as a winery, or to have a friend with a similar home. At this point we can rent the geosonar and learn how to use it trying to get a 3D image of the winery, and compare geosonar output with winery itself to get more familiar with the geosonar. Then we can enter the church, taking care don't disturb any activity, and make the 3D image of the subsurface of the church. If there are no objects of the size corresponding to the girl's body the thesis is refuted. Obviously if the church was closed, it's always possible to place the geosonar very near to church such a way don't disturb anyone. The following is a publishing geosonar image where arrows indicates two cavities

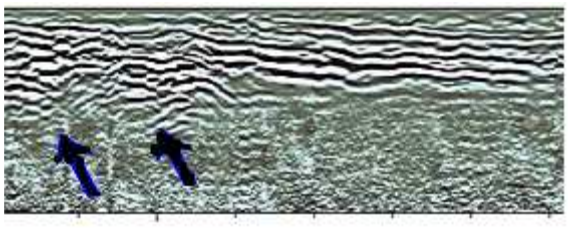

Figure 4. *Typical output of a geosonar system mentioned in the main text .Arrows indicate two cavities.*

4. Conclusion

In this article it's explained what C.S. is, by several examples ranging from Astrophysics to humanities. A comparison has made between traditional science and C.S. This article shows , referring to real facts and actions, how not professional detectives can use several tools , from DNA analysis to use of a geosonar , such a way to investigate a case making possible a " citizens criminology " The references to a specific case doesn't limit possibility of application of these tools (or of other tools) to different cases Writing this article author doesn't want to invite anyone to improvise 007 or to say ordinary citizens can replace officers and judges In fact " citizen detective " must always tell the result of his researches to policemen and/or judiciary This article is just a practical example of how the C.S. can change many things outside the traditional fields of Sciences too It must also be emphasized that the involvement of ordinary people in scientific activities is also a powerful way to teach what science is and to distinguish it from pseudoscience and irrationality

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