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Testimony, Pictures, and the Credibility of Science in the Mobile Age

Taking and forwarding photos and videos is one of the specific features pertaining to modern mobile devices. To call them just mobile phones or cellphones would be to refer to their historical origin rather than their third-generation incarnation, which is much more complex than a mere telephone. These devices can be used for full internet communication, listening to radio, voice recording, watching TV, as well as shooting and watching moving pictures and good-quality digital photos. For this latter feature, it seems worthwhile to return to the subject of the scientific application of modern communications technologies, with special regard to the usage of digital pictures. Within the framework of the COMMUNICATIONS IN THE 21ST CENTURY project, we had previously analyzed some possible impacts of modern communications technologies upon science both from the sociological and cognitive points of view.[1]

Considering the sociological components, the role played by communication devices in science is related to the historic and cognitive fact that science has always functioned as a social entity. Informal networking activity has played a decisive role in its success even under highly organized formal institutional circumstances. Networking made the role of informal communication essential, although the social structure of science grew increasingly complex over the centuries. Particularly after the second World War, scientific research gained entirely new forms while connected with the front line of production that relies heavily on scientific knowledge. Research too became a branch of production resembling industry, as some recent authors, including a group led by Michael Gibbons, have expressed the matter.[2]

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[1] János Laki and Gábor Palló, "New Communication Media and Scientific Change", in Kristóf Nyíri (ed.), *Mobile Communication: Essays on Cognition and Community*, Vienna: Passagen Verlag, 2003, pp. 185–209.

[2] Michael Gibbons et al., *The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies*, London: Sage Publications, 1994.

On the other hand, the *project*, being the central organizational unit of contemporary research instead of the *discipline*, started to grow enormously in size and significance. Big Science uses massive hardware and employs many people with various specialties. This large-scale science relies on the new communications technology, including the internet and mobile devices, in organizing its activities and also in its cognitive content. The huge instruments, such as accelerators or space telescopes, continuously collect information day and night, and send it to a central database that can be used by the entire interested scientific community the world over via the internet, without any geographical limitations, requiring only a registered username and password. The existence of a common database has a significant relation to the concept of scientific truth, a central theme in the philosophy of science. Since all researchers rely on the same database, the cultural relativist argument that all human experience, including scientific experimentation, is influenced by particular cultural circumstances seems to become weak at least in this area of scientific activity.

A study by Rich Ling analyzed the practical applications of digital pictures transmitted by mobile devices.[3] He showed how widespread the usage of pictures can be in current-day crafts, industry, and commerce, and he drew attention to the possibility of applying counterfeit images as a means of maximizing profits. In this context, a problem arises regarding whether science, benefiting so much from modern communications technology, gains or loses credibility when using digital pictures in a similar way to crafts, industry, and commerce. To put it in another way, the problem is whether the truth of scientific statements remains untouched, becomes more confirmed, or becomes less confirmed by the application of digital pictures.

The very formulation of this problem leads us to a particular approach in philosophy, called social epistemology, that studies the social components of knowledge assuming that knowing is not individualistic as presupposed by traditional epistemology. In the COMMUNICATIONS IN THE 21ST CENTURY project, Robin Dunbar analyzed the communicational behaviour of human communities.[4] He established that this behaviour depends on the size of the group in which the communication proceeds. Social epis-

[3] Rich Ling, "Grounded Genres in Multimedia Messaging", in Kristóf Nyíri (ed.), *A Sense of Place: The Global and the Local in Mobile Communication*, Vienna: Passagen Verlag, 2005, pp. 329–338.

[4] R. I. M. Dunbar, "Are There Cognitive Constraints on an E-World?", in Kristóf Nyíri (ed.), *Mobile Communication*, pp. 71–82.

temology, on the other hand, investigates the truth-content of the statements communicated, including statements transmitted by mobile devices.

Traditionally, knowledge (disregarding theories which suppose that knowledge is innate), is defined as justified true belief arising from experience or from memory combined with the ability to make inferences from these two. In this epistemology, a person encounters a statement and tries to judge its truth by comparing its content with the person's own experience or with knowledge he or she already possessed. Social epistemology, however, holds that most of our knowledge comes not from a person's own experience, but from other people's communication in written or spoken form. In this case, a person encounters other people's statements and judges whether the others' statements are true or not. This kind of acquiring of knowledge relies on communication with other people. It therefore represents a kind of collective knowing. In a broader sense, knowledge that we learn from other people is called testimony. Through testimony, we can acquire any kind of knowledge, even the most basic kind such as our birth-date and place, our family history, and the like. Testimony represents an eminent kind of collective knowledge. In this sense, mobile phones can be considered as the handiest devices of testimony.

Testimony grew into a widely discussed subject in philosophical research only after C. A. J. Coady published his seminal book in 1992.[5] Yet, the field of social epistemology goes back to the 19th century (even to Karl Marx), and has been proceeding since the early 20th century.[6] Coady distinguished between two approaches to testimony. The reductive approach, originating in David Hume's essay "Of Miracles", assumes that all kinds of testimony can be reduced to someone's experience.[7] Any statement referring to testimony is based on the experience of a witness, and its truth can be judged the same way as the truth of any experiential statement supplemented by the evaluation of the witness's reliability. Con-

[5] C. A. J. Coady, *Testimony: A Philosophical Study*, Oxford: Clarendon Press, 1992.

[6] Kristóf Nyíri showed that in the philosophy of science, the idea of the social construction of knowledge originates in the works of Maurice Halbwachs, Ludwik Fleck and Ludwig Wittgenstein, and that a number of Austrian philosophers contributed to working out various approaches to the social theory of science. In addition, Nyíri showed that Wittgenstein, in his book *On Certainty*, emphasized the significance of learning from other people, a kind of testimony. Cf. Kristóf Nyíri, "Collective Reason: Roots of a Sociological Theory of Knowledge", in W. Gombocz et al. (eds.), *Traditionen und Perspektiven der analytischen Philosophie*, Wien: Hölder-Pichler-Tempsky, 1989, pp. 600–618.

[7] "Of Miracles" is a chapter in David Hume, *Enquiry Concerning Human Understanding*, ed. by L. A. Selby-Bigge and P. H. Nidditch, Oxford: Oxford University Press, 1975, pp. 109–130.

sequently, testimony is no more than a mediator between the experiment and the person who made the statement. The second approach to testimony, the fundamentalist approach, also worked out by an 18th-century Scottish philosopher, Thomas Reid, states that testimony is an autonomous, irreducible source of knowledge, just as valuable as experience or memory.[8]

Almost simultaneously, in fact somewhat earlier, very influential research in the field of the history of science, which culminated in Steven Shapin's numerous publications, raised the issue of testimony.[9] Analyzing the birth of modern science, the so-called Scientific Revolution in the 17th century,[10] the notion of experience and particularly that of fact came under the scrutiny of historiography. Indeed, a leading theoretician in the age of the Scientific Revolution, Francis Bacon, emphasized the utmost importance of "the matter of fact", as contrasted with the position of speculative philosophy based on scholastic logic. Bacon and Robert Boyle, Shapin's hero, were enthusiasts of natural history, an ancient discipline, which includes such classics as Aristotle and Pliny. Natural history mapped nature by collecting objects and their descriptions, and ordering them according to various taxonomies. Bacon favoured this scientific activity that was based on facts without any speculation. As he was a lawyer, he connected law, the basis of human society, with natural history when emphasizing the fundamental significance of "the matter of fact" both in scientific and legal practice.

Indeed, when reporting on some strange, even monstrous facts in nature, the problem of whether such a thing exists or whether the account is false can be raised in the same way as the question of whether a given person stole the chicken of his neighbour or not. In cold rainy Britain, it was not easy to believe in the existence of a huge lizard, strong enough to eat a man (a crocodile). It was recounted by some travellers, but can their testimonies be taken seriously? How can we decide whether a witness is

[8] Thomas Reid, "An Inquiry into the Human Mind on the Principles of Common Sense", in R. Beanblossom and K. Lehrer (eds.), *Thomas Reid's Inquiry and Essays*, Indianapolis: Bobbs-Merrill, 1975.

[9] Steven Shapin and Simon Schaffer, *Leviathan and the Air-Pump: Hobbes, Boyle, and the Experimental Life*, Princeton, NJ: Princeton University Press, 1985; Steven Shapin, *A Social History of Truth: Civility and Science in Seventeenth-Century England*, Chicago: The University of Chicago Press, 1994.

[10] Shapin called into question the existence of a clear historical period that could be identified as a scientific revolution, although he produced epoch-making works on the period. Cf. esp. Steven Shapin, *The Scientific Revolution*, Chicago: The University of Chicago Press, 1996.

a liar or whether they tell the truth? This is the most important question relating to testimony both in social epistemology and in 17th-century natural historical research, as well as in legal courts and when we turn to modern mobile devices.

Culture was full of marvels, miracles, and fictions in the 17th century. Hume thought about testimony in relation to miracles that constituted basic proofs of religious tenets. He argued against the credibility of witnesses testifying about such miraculous events as a dead man being restored to life, the deaf gaining hearing, and the blind gaining sight. However, as historians Lorraine Daston and Katharine Park show in detail, strange facts and marvels were integral parts of the culture of the time. The existence of a hairy man and his hairy daughter, a woman with horns on her body, stones falling from the sky, and blood rain were all reported by witnesses.[11] Robert Boyle described a diamond that gave light in the dark as did some rotten fish. All these were singular phenomena, rather than general ones that were studied by science, which was just on the rise.

Hume said: "A miracle is a violation of the laws of nature."[12] However, do we know the laws of nature? Perhaps a miracle, such as falling stones from the sky, leads researchers to unknown laws or to the recognition of general phenomena, like the meteors. A law could perhaps be induced from a miracle that loses its miraculous character because of the new law. In addition, the strangeness of a fact depends on the metaphysical beliefs of the community. Henry Oldenburg, the editor of *Philosophical Transactions*, the journal of the Royal Society, asked his colleagues in letters whether a report, e.g., on a crying unborn child in the womb should be published or whether it had to be considered nonsensical.[13]

At this point, the credibility of a given testimony becomes the crucial issue. Who is a credible witness? Whose report can be considered reliable? The justification of statements about singular events transforms experiential justification into a judgment of the witness. With this, the traditional approach to the philosophy of science converts into a sociologized philosophy of science. According to Shapin, the credibility of a witness is

[11] Lorraine Daston and Katharine Park, *Wonders and the Order of Nature, 1150–1750*, New York: Zone Books / Cambridge, MA: MIT Press, 1998.

[12] David Hume, "Of Miracles".

[13] "A Child Crying in the Womb", by the Rev. William Derham cited in Palmira Fontes da Costa, "The Making of Extraordinary Facts: Authentication of Singularities of Nature at the Royal Society of London in the First Half of the Eighteenth Century", *Studies in History and Philosophy of Science Part A*, 33 (2002), pp. 265–288.

determined by his gentlemanly social status which provides him nonpartisan disinterested neutrality.[14] This thesis has widely been discussed, with new sociological criteria being applied to the witness's credibility, including authority and expertise, particularly in medical cases where, for example, a doctor's testimony on strange foetuses with six fingers or two heads was considered more credible than that of a layman.[15]

Testimony and the credibility of the witness were matters of utmost importance in accepting the existence of singular phenomena, even if they were not interpreted as miracles, in 17th–18th century science in Britain. These phenomena were described by travellers, sailors, and others in letters sent to the Royal Society, giving headaches to Oldenburg, the Society's secretary, who corresponded on a vast scale with the "virtuosi" on the credibility of some reports. Postal letters came and went slowly but, in the absence of modern communication devices, they served as the only medium that could transmit testimonial information from witnesses who could not attend Royal Society meetings. This situation shows how essential reliable and fast communication technology has always been to science. In principle, the Royal Society, an institution, had to decide whether a particular report was credible and, therefore, publishable in *Philosophical Transactions*.[16] In this way, not an individual person but a formal institution, legitimized by the King, the embodiment of the state, legitimized a scientific report and guaranteed the possible truth of the statement in question. Since then, institutions, sociologically defined entities, have made decisions about the most important matters of science, including the value of a knowledge claim.

Consequently, not one person but an institution should be persuaded to accept a particular knowledge claim. Among the methods of persuasion, besides demonstration, various rhetorical devices were used, including pictures. Palmira Fontes da Costa noticed the frequent use of illustrations in articles on strange medical cases, in spite of the high costs and technical difficulties of printing pictures. In extraordinary cases, testimony could be supplemented by the curious object itself placed in the repository of the society. In medical cases, such as a baby born without a brain

[14] Shapin, *Social History of Truth.*

[15] See for instance Palmira Fontes da Costa, *op. cit.*

[16] See Steven Shapin, "The House of Experiment in Seventeenth-Century England", *Isis*, vol. 79, no. 3 (1988), pp. 373–404. On Oldenburg's huge correspondence on singular facts or invention see David S. Lux and Harold J. Cook, "Closed Circles or Open Networks? Communicating at a Distance during the Scientific Revolution", *History of Science* 36 (1998), pp. 179–211.

or a mother giving birth to a baby through her navel, the society relied on the report of the witnesses, whose descriptions were highly enhanced by pictures. The pictures served as a substitute for the object. They could show, even to the lay public, a given strange, extraordinary, singular phenomenon. This is why the pictures in the *Transactions* were so naturalistic and contained so many details. The style and technology served the purpose of persuading Royal Society members.[17]

Pictures, in a scientific context, became a particular means of testimony. If we consider testimony as a source of knowledge originating from other people's report, then pictures, as a kind of report besides textual (oral or written) forms, can also be considered as a source of knowledge. Moreover, in the non-reductive approach to testimony, pictures have the same epistemic value as experience and memory. In the same way as experience or memory need epistemological criticism (illusions, false memories, etc.), testimony should and can be judged as to whether it is reliable or not. Pictures, as forms of testimony, can also be assessed as to whether they are similar to the object, whether they represent the object accurately, realistically or not. The same way as a written or spoken text can be the product of mere lies, a picture can depict the fantasy of its creator. In short, asking whether a picture is true or not is justified if we put the question in this way: "Does the object in the picture exist, or does it not exist?" This question can be replied to in the positive or negative, in the same way as the question: "Does the object described in this sentence exist or does it not exist?"

A picture portraying a bearded newborn baby was used to prove the statement that such a monster really existed. Natural history used pictures to show plants, flowers, birds, animals, and the anatomy of man. Atlases belong to the most popular genre of book culture.[18] In the 17–18th century, natural history pictures were created by artists. In their study, Lorraine Daston and Peter Galison pointed out that the objectivity of these pictures changed during the times. Indeed, the artist could not and did not want to put all the visible details into the picture, only the important ones. He decided what was important or what was typical, and drew and painted these features disregarding those that he considered unimportant. In natural history, objects are ordered according to some sys-

[17] Palmira Fontes da Costa, *op. cit.*

[18] Barbara Stafford demonstrated in a magnificent book the relationship between singular phenomena and pictures in the history of anatomical atlases, see Barbara Maria Stafford, *Body Criticism: Imaging the Unseen in Enlightenment Art and Medicine*, Cambridge, MA: MIT Press, 1991.

tem or taxonomy; hence, in a natural history picture of, say, a sparrow, those lines are shown that are supposedly characteristic of the sparrow in general, to the class of sparrows, rather than those characteristic of the individual bird. A natural history picture presupposes the existence of a system, a kind of ontology, which enables the artist to draw at all – since to draw all the visible lines, patches or colours is impossible. Therefore, he attempts to show the typical, instead of the singular, creating, together with the naturalist researcher, the notion of ideal types or archetypes, a logical and metaphysical basis of ordering natural objects, as became clear in the German Romantic movement at the end of the 18th century, and in the works of thinkers such as Goethe. This implicit scientific theory represented by pictures is a possible object of discussion regarding scientific controversies.[19]

At the same time, it was possible to call into question the objectivity of pictures by referring to the artist's metaphysical and aesthetic commitments which unavoidably influenced his hands while drawing or painting. The scientific effort to gain objective, accurate pictures achieved success with photography after 1860 and took a big step ahead with X-ray photos, then another with moving pictures and procedures depicting objects invisible to the naked human eye. Photos could accurately represent the singular object without presupposing the existence of any kind of "Typus" in Goethe's terms, or essence, a feature that tremendously enhanced the pictures' testimonial value in natural history and science.[20] In his book, William Ivins pointed out the significance of photos in modern physics, particularly when it came to accepting the theory of relativity and modern atomic theories.[21]

The mechanical technology of photography might seem to fulfil the goal of gaining accurate pictures that can serve as perfectly reliable sources of knowledge. Photographs can be used as proof of the existence of strange and not so strange facts. They can be used as substitutes for objects. If one shows a photo portraying a monster, they prove its existence. With the advent of digital photos, the procedure of shooting and processing pictures apparently just became more simple and more ubiquitous, but their accuracy did not appear to change as compared to that of photo-

[19] Lorraine Daston and Peter Gallison, "The Image of Objectivity", *Representations* (40) 1992, pp. 81–128.

[20] Daston and Gallison discussed the problems emerging from possible interpretations of accurate pictures, cf. Daston and Gallison, *op. cit.*

[21] William M. Ivins, Jr., *Prints and Visual Communication*, Cambridge, MA: Harvard University Press, 1953.

graphs. The great novelty in digital photography lies in the easy manner of image transmission. Via modern mobile devices, digital pictures can be made and immediately communicated to other people, including fellow scientists; these pictures can be of strange facts, new experiences received by experimental apparatus that take place in space, or in the lab seen only through special microscopes. Scientific research uses digital photography and its transmission by mobile phones as a standard method.

However, beginning in late 2005, a scandalous scientific fraud unfolded. The respected Korean biomedical scientist, Hwang Woo-suk, in an article published in *Science*, claimed to have produced human embryonic stem cells by cloning. Soon, he was accused of communicating fake data. Besides describing his results, Hwang used photos to show the stem cells he produced by cloning. According to his critics, even his published pictures were fraudulent.[22] The prestigious journal *Science* faced the problem of whether the general editorial methods for screening out manipulated pictorial scientific information is suitable or not. Other, mostly biological journals were also found to have published falsified pictures. The problem is that digital pictures can be manipulated by software such as Photoshop and others. Through these methods the unwanted, "disturbing" details can be cut out and desired content can be added.

So here we are again. This scandal once more raised the issue of the credibility of pictures, now digital photos, and, apparently, in this way, the problem of the testimonial value of pictures has reemerged. However, the problem has not remained unsolved. Mike Rossner, the managing editor of the *Journal of Cell Biology* explained that they have introduced a new method of screening the photos authors attach to their articles to be published. Their methods include a check of the submitted pictures by electronic means, such as increasing the contrast to see fainter lines, or magnifying the picture extremely and looking for small signs of alteration, etc. The editors found that about one percent of manuscripts had to be rejected because of fraudulent pictures. Their screening proved that 25% of the submitted manuscripts contained at least one manipulated picture and the editors had to ask for another photo in these cases. *Science* magazine and other scientific journals also introduced a new picture screening system.[23]

At this point the foregoing can be summarized. Our main problem was whether the mobile phone is indifferent to the truth-value of a scien-

[22] The scandal is covered very well by http://en.wikipedia.org/wiki/Hwang_Woosuk. The article refers to many relevant sources.

[23] See www.tmcnet.com/usubmit/2006/jan/1279535.htm.

tific statement, whether a mobile device does or does not influence the content of science, or, philosophically speaking, whether it plays or does not play any epistemic role in the sciences. The answer proved to be positive. Looking at science as a social entity, as an activity done by the community of scientists, communication appeared to be a crucial factor. Hence, mobile phones as the most convenient communication devices can be considered as an obviously helpful tool in research. It does indeed matter that scientists can communicate with each other through mobile phones.

Attempting to look for a less pragmatic and more epistemic role, we found the notion of testimony, a hot topic of social epistemology, to be conducive in understanding it. Testimony provides knowledge through other people's reports. Reports are characteristic types of scientific communication and communication pertains indispensably to testimony that is often considered as a primary source of knowledge. In this approach, mobile phones function as instruments of testimony, making testimony easier and more effective, thereby helping us gain scientific knowledge. Modern mobile phones, however, provide a more important service to science through their ability to make and transmit pictures, a particular form of testimony. Pictures as substitutes for objects of phenomena can be considered as primary sources of scientific knowledge, because they can be copied and transmitted, providing visual knowledge to the part of the scientific community that has no opportunity to be present at the site of an experiment and allowing them to see the studied phenomenon. With the appearance of digital technology, making and transmitting pictures by mobile devices has become very easy, but pictures also became vulnerable to manipulation. However, the same kind of technology that made the production, communication, and manipulation of these pictures possible serves well for their validation, for their screening, for checking their reality. In this way, technology is used to help determine the reality of a kind of human knowledge regarding the truth-value of a scientific report. Thus, mobile phones have become contributors to scientific research, rather than just instruments transmitting knowledge that originates in other sources. Through their connection with the new system of the digital world, they help to evaluate the content of scientific statements. Mobile devices, by their testimonial significance, can add new dimensions both to the content and to the credibility of scientific research.