

CERIDAP

RIVISTA INTERDISCIPLINARE SUL
DIRITTO DELLE
AMMINISTRAZIONI PUBBLICHE

FASCICOLO

2 / 2021

APRILE - GIUGNO

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Iscritta con delibera 16.06.2020 nell'Elenco Speciale dei direttori responsabili di periodici o riviste a carattere scientifico annesso all'Albo dei Giornalisti della Lombardia

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Per la citazione dei contributi presenti in questo fascicolo di CERIDAP, si consiglia di utilizzare la forma di seguito esemplificata: N. Cognome, *Titolo del contributo*, in *CERIDAP*, 2021, 2, p. 35 ss.

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Distrust in science as a threat to scientific freedom. Some considerations in light of CoVid-19 emergency

Lavinia Del Corona

La sfiducia nella scienza e la diffusione di teorie pseudoscientifiche risulta essere uno dei principali fattori che nelle moderne democrazie occidentali minaccia la libertà della scienza. Nell'articolo è posto in evidenza come con la pandemia da CoVid-19 tale pericolo potrebbe addirittura incrementare, anche in ragione di taluni comportamenti assunti dai membri della stessa comunità scientifica. Nel presente lavoro si è quindi cercato di riflettere su quali possano essere le strategie di azione, specie all'interno della comunità scientifica, più idonee a contrastare una tale tendenza e si è sottolineato come in ogni caso, quale che sia la soluzione prediletta, la lotta alla pseudoscienza risulti imporre l'avvio di una seria riflessione sul problema della "demarcazione", ossia su un classico tema della filosofia della scienza, che è stato però fortemente trascurato negli ultimi decenni.

DOI: 10.13130/2723-9195/2021-2-22

1. Introduction

At the beginning of the CoVid-19 emergency many scholars have thought that the pandemic could mark an «*epochal turning point*»^[1] in the relationship between the scientific community (scientists and academics) and society, and between Science and Law. The idea was that the pandemic would have led to an increased trust in science and cooperation between the scientific community and politics.

As the emergency started, society began to seek a dialogue with the scientific community, hoping in answers and guidance. Day by day, the importance of

science in public decision making became clear more than ever^[2] and the public attention focused on experts, as virologists and epidemiologists. All elements that suggested a restoration of expertise to its rightful place of influence and esteem.

In this sense were the words of Kurt DeKetele, the secretary general of the League of European Research Universities, who claimed that «*the battle against coronavirus has brought with it a very welcome rehabilitation of experts and universities as deserving society's trust and respect*»^[3].

However, recent events – such as the rise of CoVid-19 denialist movements – seem to point out that such a «*rehabilitation of experts*» could be more difficult than initially thought^[4]: many of the pre-existing problems in the relationship between science and society, instead of being resolved because of the Covid-19 pandemic, seem in fact to have become more evident and serious.

2. The distrust in science: a pre-existing problem

In recent years, many developed democratic countries like Italy have seen a growth of distrust in science and even aversion to science^[5]. Meanwhile, it seems that the popularity of pseudo-sciences and the spread of fake news has increased, becoming alarming^[6].

At the political level this tendency has led to some serious consequences.

Firstly, the anti-scientific thinking, instead of being opposed, has been often exploited by politicians in order to manipulate scientific knowledge for political aims (e.g. to gain consensus of their constituency) and adopt non-scientific based public decisions^[7]. Focusing on the Italian legal system, we can recall, for example, the events related to the Di Bella case^[8], the Stamina case^[9], the law n. 40 of 2004^[10], GMOs^[11] and Xylella^[12].

Secondly, the level of trust and esteem that society has in science is in a certain way connected with the amount of resources that each State is willing to invest in scientific research. On this respect, Italy is from decades one of the States of the EU that invests less in research^[13].

Both the above mentioned practices are clearly extremely detrimental to the freedom of science and the academic freedom: they can, in fact, limit, directly or indirectly, the possibility of work for researchers; limit the autonomy of experts^[14]; and undermine the fundamental role of experts and academics as

advisors of the public decision maker. Therefore the growing distrust in science can rightly be counted among the threats to scientific freedom in modern democracies.

2.1. The Relativism

An important role in the diffusion in society of feelings of distrust in scientific knowledge, or even aversion to science, has been played by the diffusion, in the second half of the last century, of a new way of thinking that questions the possibility itself of drawing a line between scientific thought and non-scientific belief, between science and non-science.

Trust in science reached its peak at the end of the nineteenth century and the beginning of the twentieth century, following the impressive scientific breakthroughs that the so-called “Industrial Revolution” had made possible.

It is no coincidence that at the beginning of the 20th century a movement that identified science as «*the paradigm of rational behavior, the surest path to truth*»^[15], was started. It was the so called “Positivism”, to which we owe the birth of contemporary epistemology.

Positivists’ thought was based on a big consideration of natural sciences, mathematics and logic. Science was considered an absolutely objective knowledge, independent from the opinions of researchers, based on the experimental method. In particular, the fundamental core of Positivism was the idea that only scientific knowledge had meaning.

However, in the second half of the century, Positivism began being highly criticized and fell into crisis.

Meanwhile, a new current of thought started to gain traction, the so-called “Relativism”^[16]. Relativism had the merit of highlighting some weaknesses of positivist theories, such as the idea of the absolute neutrality of scientific theories and the idea that anything that is not verifiable, as the metaphysical thinking, has no meaning at all.

But Relativism also paved the way to more radical approaches, such as the so-called “methodological anarchism”^[17] which, moving from the uncertainty and subjectivity of scientific knowledge, have come to extreme conclusions, substantially excluding the possibility of distinguishing between what is true and

what is false, between science and non-science.

It is simple to understand the drastic effects of a way of thinking of that kind: if scientific knowledge is not recognized as having any superior ability to approximate the truth, the same millenary distinction between *doxa* and *episteme* loses its sense and the philosophy of science itself ceases to have any use^[18].

Such a relativistic way of thinking has helped the diffusion of anti-scientific approaches that ultimately represent a danger for the functioning of democracy^[19] and fundamental rights, as well as the freedom of science itself.

3. The need of a “new philosophy of Science”

In order to preserve and justify the intuitive trust in science^[20] and for politics to effectively “give science its rightful place”^[21], it seems important that some traditional issues of the philosophy of science return to be seriously addressed. In particular, it seems crucial to restart to reflect, possibly in new terms, on some traditional subjects of the philosophy of science, as the distinction between science and non-science^[22].

This would not mean to reject all the relativism’s contributions. Instead, it would mean to make clear that affirming that the truth of a statement is relative to a context or a point of view (which is difficult to challenge) is different to saying that the search for truth is a mythical ideal and that science is no different from any other form of knowledge or, worse, from mere opinion. And the latter is a thesis that conflicts with the experience that over the centuries has shown how knowledge obtained with the so-called scientific method – therefore the scientific knowledge – even if not absolutely certain, has, however, a superior ability to highlight facts, to describe reality and to predict its evolution^[23].

The Constitutional Court itself, which has a rather relativistic approach to science^[24], has on several occasions recognized that scientific knowledge has a particular epistemic value that shall be taken into account by the lawmakers. As a consequence, scientific knowledge constitutes a limit to the legislative discretion^[25].

The attention should thus be on the scientific method; on the importance of facts for both the validation and falsification of scientific theories; and on the contradictions between peers as characterizing elements of science. In other

words, it is important to continue to reflect on what are the characteristics of scientific thought, identifying the elements that allow, at least in principle, to distinguish between science and pseudo-science and science and mere opinion.

This kind of approach would also require, between other things, to pay more attention to the distinction between academic freedom, on one side, and the freedom of expression, on the other side. The two freedoms are in fact not interchangeable, although they have a common core: academic freedom differs from the freedom of expression for the scientific nature of the thought expressed, hence the importance of distinguishing between what can be called scientific and what is not scientific.

The notorious U.S. case *McLean v. Arkansas*^[26] is, for example, particularly explanatory of how important it is to reflect on what can be called scientific in order to establish what falls under the academic freedom. The subject of the judgement was the creationist theory – defined by creationists as “*creation science*” – that had been proposed as a subject to be taught in high schools.

The Court tried to identify the requirements that a theory must have in order to be considered scientific^[27] and among these requirements emerged, in a synthesis between the epistemology of positivists and the Popper’s one, the requirements of being «*testable against the empirical world*» and «*falsifiable*»^[28].

It was then ruled that the creationist thesis shall not be included in high school teaching programs as lacking many of the requirements a theory must have to be considered scientific. Among them, the creationist thesis was not falsifiable, since the Creator was placed beyond what is observable.

The distinction between scientific thought and mere opinion is crucial to avoid relativistic drifts that damage the academic and scientific freedom itself.

To this end it is important that such distinction is clear also within the scientific community. To this end, an important role is played by the internal systems that allow to distinguish between works carried out on the basis of an acceptable method and works that do not meet the minimum requirements of reliability. Scientists should try to be as trustworthy as possible in their testimony, and that means first of all using methods beyond reproach given the circumstances, even if, over time, results are proven wrong^[29].

4. The CoVid-19 emergency and distrust in science

The CoVid-19 pandemic has led the public decision-makers to strongly seek a dialogue with scientific experts in order to grant scientific validity to the decisions adopted to face the emergency. In Italy, as well as in many other countries, *ad hoc* technical committees have been created to assist the Government in the management of the pandemic, and many of the members of such committees are academics.

Also society have looked at science during the pandemic, seeking solutions and answers from scientist much stronger than before.

Given those premises one might think that the Covid-19 pandemic have increased the perception of the specific cognitive value of scientific knowledge and the importance of distinguishing between science and pseudoscience. However, a series of factors are hindering such result. In this respect, the protests^[30] of CoVid-19 deniers – who deny the very existence of the virus – that have taken place all around the world are very significant.

As negationist theories began to spread^[31], researchers, who were initially hailed as heroes, became the object of many people' contempt and anger. They have been accused of lying; of fearing non-existent risks, such as that of a possible “second wave”, to scare people; of being part of conspiracies of various kinds; and, more generally, of being the ones really responsible for the restrictive measures. Some of them, as the U.S. Director of the National Institute of Allergy and Infectious Diseases, Dr. Anthony Fauci, even received death threats^[32].

The above is a trend that, unfortunately, may become even more intense in connection with the newly launched worldwide vaccination campaign. For years now, anti-scientific movements have been waging battles against vaccines based on pseudoscientific theories and fake news, and recent events seem to indicate that things will not be different with respect to the CoVid-19 vaccines, perhaps even worse.

4.1. The responsibility of the scientists

The factors that during the pandemic have contributed to fuel anti-scientific sentiments are several.

Among them, one of the most important is that during the pandemic both the common people and the politicians have looked at scientists seeking the absolute truth, without considering that science is not always able to provide unequivocal, certain and definitive answers, especially with regard to new phenomena such as the circulation of a new virus.

The significant uncertainty of the answers received from the scientific community and how they have sometimes changed over time have then disappointed the expectations of many and, paradoxically, negatively affected the relationship between society and science.

It can be concluded that there is a difficulty of society in understanding that uncertainty and corrigibility of scientific knowledge are intrinsic elements of science and the uncertainty and corrigibility of the answers science provides do not imply *per se* its equalization with other forms of knowledge.

Another important factor playing a central role in increasing distrust in science are social networks. They are a powerful tool for spreading fake news^[33] and, moreover, it is becoming clear that their functioning mechanism based on profiling facilitates the radicalization of ideas, rather than the dialogue and the data comparison^[34].

What is very peculiar of the Covid-19 emergency, however, is that, in addition to the abovementioned and generally known phenomenon propelling anti-scientific sentiments, the way scientists themselves behaved during the pandemic is one of the key elements that lately increased the distrust in science.

First of all, it has been wrong the way some scientists have dealt with the media. During the pandemic, there has been an increasing demand for scientists' opinions on TV, newspapers and online that has caused a media overexposure of the scientific community. Scientists, mostly not used to the language, timing and "rules" of the media, have not always managed correctly and responsibly such exposition.

As pointed out by some scholars^[35], many scientists that appeared on Italian media seemed to have abandoned their scientific rigor and intellectual honesty. Firstly, many scientist requested to provide clear answers to complex questions concerning Covid-19 pandemic, instead of admitting the uncertainty of science on certain aspects of the topic, have presented as scientific certainties mere hypothesis that were still to be confirmed as correct through the scientific

method. At the same time, prominent scientists have accepted to comment on subjects far from their area of expertise and have inevitably provided answers based more on their personal opinion than on scientific and empirical data, causing the public opinion to rely on answers that were not always correct or complete.

When the answers provided have proven wrong because too preliminary or not correct nor complete, the result has been the erosion of the trust in science, the disorientation of the general public and the spread among society of the conclusion that there is no difference between scientific knowledge and mere opinion.

Moreover, other scholars^[36] have pointed out that several scientific papers on Covid-19, sometimes not even about the definitive outcome of scientific analysis but rather discussing the preliminary results of such analysis, have not undergone the usual peer-review before being published and in some cases have been sent to the media even before publication. In other words, scientists and scientific reviews have in some cases accepted to loosen their standards and to prioritize rapidity against accuracy and rigor, publishing papers that in a different context would have not been published.

Significant in this respect is the case of the two studies about hydroxychloroquine published in the prestigious scientific journals *The Lancet* and *New England Journal of Medicine*, which after a very short period had to be withdrawn because they turned out to be based on unreliable data^[37]. The publication of these studies – according to which the use of hydroxychloroquine as a treatment for Covid could have serious side effects – had great repercussions in the search for new treatments against the disease caused by the coronavirus, to the point of inducing the World Health Organization to interrupt the trials with hydroxychloroquine that were in progress.

Shortly after, however, several researchers questioned the reliability of the data provided by Surgisphere on which the research was based. Surgisphere is in fact a small company, with less than a dozen employees, and could hardly have collected and processed health data from tens of thousands of patients, provided by hundreds of hospitals with whom it claimed to have cooperated.

The company's refusal to provide complete patients' data made it impossible for other researchers not directly involved in the studies to verify the data. Even the

authors of the research, having had no access to the raw data, were unable to have further confirmation of its quality.

Given the circumstances, the authors of the articles themselves asked for them to be withdrawn.

It is clear that all the above described behaviors that have taken place in the scientific community during the Covid-19 pandemic have contributed themselves to increase the distrust of the public opinion in science and reduce the capacity of common people to distinguish between science and pseudo-science or mere opinions.

5. How to react?

Many of the trends described above are not new and in the past have already contributed to foster anti-scientific approaches. For example, it is not new that some members of the scientific community, perhaps in search of notoriety, support theories without any scientific basis and give some credit to pseudoscience and fake news.

Currently, however, the phenomenon has taken on an unprecedented dimension and created particularly serious risks.

Therefore, the problem of understanding how to react to the factors that increase distrust in science, at least those coming from the scientific community itself, is rather pressing.

A repressive law provision is complex from many points of view: there is the problem of distinguishing what can be considered scientific and what not, which is particularly complex with respect to topics where there is great scientific uncertainty; moreover, even when it is a question of targeting statements that are certainly lacking of scientific foundation, there is still the problem of the compatibility of such law provision with the constitutional protection of the freedom of opinion.

However, it must be considered that the protection of the freedom of science and the freedom of opinion is not absolute: scientific autonomy is protected as long as the activity in question can actually be qualified as “scientific” and the protection of the freedom of opinion must in any case be balanced with the protection of other constitutionally relevant rights. An inhibitory and

sanctioning law provision would thus be conceivable when, for example, the trust which could be generated in the public opinion about the validity of certain news that are in reality completely lacking scientific basis could create serious dangers for constitutionally important rights.

It is interesting that at the end of March of last year the scientific association *Patto Trasversale per la Scienza* (PTS) sent a warning letter to the virologist Prof. Gismondo, holding that certain of her statements had concreted a violation of art. 656 of the Italian Penal Code (Publication or dissemination of false, exaggerated or tendentious news, capable of affecting the public order). According to the PTS, Prof. Gismondo's statements^[38] were completely lacking in scientific basis and could create a danger to public order, as they could «*induce part of the population to violate governmental precepts aimed at containing the contagion, with adverse effects in terms of public health, especially because they come from a doctor with institutional responsibilities not only for the health facility where he works, but for the entire Nation, since hers is one of the diagnostic laboratories of reference at the regional level, moreover in Lombardy, the region most affected by the epidemic*»^[39].

However, as noted above, in order to avoid dangerous forms of censorship, criminal law instrument should be the *extrema ratio*, to be used only in the most serious cases. In addition, it should also be considered that they may have counterproductive effects such as giving even more media coverage to the non-scientific thesis.

Of crucial importance should rather be the organization of measures to contrast scientific disinformation within the scientific community itself.

First of all, it would be important to set up organizations that are points of reference for citizens and guarantee a certain quality of scientific communication. This was, for example, the role the Robert Koch Institute (RKI)^[40] was able to assume in Germany during the pandemic, while in Italy an equivalent institution seems to be lacking.

Secondly, the diffusion of misleading and false information should have repercussions on the reputation and role in the scientific community of those who are responsible of such diffusion and have done so using the language and authority of his/her profession. In this respect, the organs regulating the scientific community should be able to take actions that affect the scientific reputation and

the position in the scientific community of those responsible for spreading false and pseudoscientific news.

On this regard, in Italy the activism in fighting scientific misinformation within the scientific community seems to have intensified on the eve of the vaccination campaign, when it has become clear the enormity of the damage that might be caused by misinformation, especially if it comes from scientists.

In particular, the fact that last December, 13 denialist and no-vax doctors were investigated by the Order of Physicians of Rome, marked a change toward more restrictive policies against scientific disinformation^[41]. Doctors who had openly supported theses without any scientific basis on CoVid-19 now risk being subjected to disciplinary sanctions ranging from warning, suspension, up to disbarment.

Similar measures have also been taken in other countries. For example, in the US doctors who provide outrageous advice that is far outside the bounds of accepted standards, such as no-mask theories, have been investigated by their state medical boards and subjected to sanctions, as the suspension of their license of doctor^[42]. Those described seem to be important signs that there is an ongoing awareness of the importance of mechanisms within the scientific community to contrast the spread of pseudoscience and distrust in science.

In order to grant the correct functioning of such mechanisms, however, it seems necessary the reopening of a serious reflection on the typical subjects of the philosophy of science mentioned above, such as the demarcation between what is scientific and what certainly cannot be qualified as such.

1. A. Iannuzzi, *Leggi "science driven" e CoViD-19. Il rapporto fra politica e scienza nello stato di emergenza sanitaria*, in *BioLaw Journal*, 1, 2020, 120.
2. L. Del Corona, *Le decisioni pubbliche ai tempi del Coronavirus: la tutela dei diritti tra fondatezza scientifica, trasparenza e principio di precauzione*, in *BioLaw Journal*, 1, 2020, 71 ss.
3. K. Deketelaere, *The future will be different*, in *www.researchprofessionalnews*, 16 April 2020.
4. P. Lem, *Trust in time of coronavirus*, in *www.researchprofessionalnews.com*, 4 June 2020.
5. On this topic see ALLEA (All European Academies), *Loss of Trust? Loss of Trustworthiness? Truth and Expertise Today*, Discussion Paper, may 2018.
6. On the topic see G. Corbellini, *Nel Paese della pseudoscienza. Perché i pregiudizi minacciano la nostra libertà*, Feltrinelli, Milano, 2019.

7. G. Corbellini, *Scienza, quindi democrazia*, Einaudi, Torino, 2011, 5 ss.
8. About the case *ex multis* A. Anzon, *Modello ed effetti della sentenza costituzionale sul caso Di Bella*, in *Giur. cost.*, 1998, 1528 ss.; T. Groppi, *La Corte costituzionale tra «fatto legislativo» e «fatto sociale»*, in *Giur. cost.*, 1998, 2798 ss.; A. Santosuoso, *Libertà di cura e libertà di terapia. La medicina tra razionalità scientifica e soggettività del malato*, Il Pensiero Scientifico, Roma, 1998.
9. About the case see, *ex multis*, E. Falletti, *La giurisprudenza sul “caso Stamina”*, in *Fam. dir.*, 2014, 610 ss.; G. Nucci – D. Piergiovanni – M. Gabbrielli – M. Benvenuti, *Il cosiddetto “metodo Stamina”: cronistoria, giurisprudenza ed esperienze casistiche personali*, in *Riv. it. med. leg.*, 2014, 437 ss.; G. D’Amico, *Il volto compassionevole del diritto e la dura scientia. A proposito del «metodo Stamina»*, in *Quad. cost.*, 2013, 423 ss.
10. The doctrine and even the Constitutional Court (decisions n. 151 del 2009 e 162 del 2014) pointed out the contrast between some of the provisions of Law n. 40 of 2004 and the state of the scientific knowledge. About the topic see *ex multis*, G. Di Genio, *Il primato della scienza sul diritto (ma non sui diritti) nella fecondazione eterologa*, in *Forum di Quaderni costituzionali*, 2009; M. D’Amico, *L’incostituzionalità del divieto assoluto della c.d. fecondazione eterologa*, in *Rivista di Biodiritto*, 2, 2014; E. Cattaneo, *Ogni giorno tra scienza e politica*, Milano, 2016; Liberali B., *Problematiche costituzionali nelle scelte procreative. Riflessioni intorno alla fecondazione medicalmente assistita e all’interruzione volontaria di gravidanza*, Milano, 2017.
11. About the topic see C. R. Sunstein, *Il diritto della paura*, Bologna, 2010. With specific regard to the Italian legislation see G. Ragone, *L’Italia e la questione OGM alla luce della recente normativa UE*, in G. Cerrina Feroni, T.E. Frosini, L. Mezzetti, P.L. Petrillo (a cura di), *Ambiente, energia, alimentazione modelli giuridici comparati per lo sviluppo sostenibile*, Cesfin, Firenze, 2016, 381 ss.
12. D. Rielli, *La Xylella fastidiosa che uccide gli ulivi in Puglia*, in *Internazionale*, 8 May 2015; A. Abbott, *Italy rebuked for failure to prevent olive-tree tragedy*, in *Nature*, 7 June 2017; Gruppo Informale SETA – Scienze e Tecnologie per l’Agricoltura, *Contro la disinformazione sull’epidemia di Xylella fastidiosa*, Petition letter, in *www.cattiviscienziati.com*, May 2019; Accademia dei Licei, *Licei, sulla Xylella c’è stata disfunzione tra politica e scienza*, in *ANSA*, 2 May 2019.
13. For some data European Commission, *Country Report Italy 2020*, 26 February 2020.
14. Constitutional Court has repeatedly emphasised «*the limits placed by scientific and experimental knowledge on legislative discretion, which are continuously developing and on which the medical state of the art is based: this means that, in matters concerning clinical practice, the basic rule must be the autonomy and responsibility of the doctor who, with the consent of the patient, makes the necessary professional choices*». See on this regard Corte Cost., sent. 19 June 2002, n. 282 and Corte Cost., sent. 1 April 2009, n. 151.
15. S. Okasha, *Il primo libro di filosofia della scienza*, Giulio Einaudi editore, Torino, 2006, 80.
16. About the so called “relativistic breakthrough” see C. Pizzi, *Diritto, abduzione e prove*,

- Giuffrè, Milano, 2009, 113 ss.
17. P. Feyerabend, *Against Method. Outline of an Anarchistic Theory of Knowledge*, Verso, London, 1975.
 18. C. Pizzi, *Diritto e abduzione*, cit., 118.
 19. About the correlation between trust in science and well-functioning of democracy see G. Corbellini, *Scienza, quindi democrazia*, cit., 15.
 20. About the reasons of the «*intuitive but rational trust in science*» see M. Dorato, *Disinformazione scientifica e democrazia. La competenza dell'esperto e l'autonomia del cittadino*, Raffaello Cortina Editore, Milano, 2019, 80 ss.
 21. Using the words of President Barack Obama during his inauguration speech in the January of 2009. About this topic see T. Kalil, C. Dorgelo, *100 Examples of Putting Science in Its Rightful Place*, in www.obamawhitehouse.archives.gov, June 2016.
 22. In the sense of the existence of a need for a new philosophy of science see ALLEA, *Trust Within Science: Dynamics and Norms of Knowledge Production*, Discussion paper, January 2019.
 23. M. Dorato, *Disinformazione scientifica*, cit., 81.
 24. P. Veronesi, *Le cognizioni scientifiche nella giurisprudenza costituzionale*, in *Quaderni costituzionali*, 3, 2009, 595.
 25. Corte Cost., sent. 19 June 2002; Corte cost., sent. 1 April 2009, n.151; Corte cost., sent. 9 April 2014, n. 162; Corte Cost., sent. 1 December 2014, n. 274; Corte Cost., sent. 22 November 2018, n. 5.
 26. *McLean v. Arkansas Board of Education*, 529 F. Supp. 1255 (W.D. Ark. 1982).
 27. The testimony of Dr. Michael Ruse on the matter has been crucial for the decision. The transcript of such testimony is available on http://www.antievolution.org/cs/mclean_ruse_test.
 28. In particular, the Court stated that «*the methodology employed by creationists is another factor which is indicative that their work is not science. A scientific theory must be tentative and always subject to revision or abandonment in light of facts that are inconsistent with, or falsify, the theory. A theory that is by its own terms dogmatic, absolutist, and never subject to revision is not a scientific theory*».
 29. ALLEA, *Trust Within Science*, cit.
 30. Since the pandemic began, there have been many protests against the restrictive measures adopted to contain the spread of the pandemic. On this regard see A. Rettman, *Anti-mask protesters pose challenge for EU authorities*, in www.UObserver.com, 24 September 2020; M. Specia, *As Europe's Coronavirus Cases Rise, So Do Voices Crying Hoax*, in www.nytimes.com, 28 September 2020; C. Zunino, *Duemila No mask in piazza a Roma: accenni di scontri con la polizia, un fermo*, in www.repubblica.it, 10 October 2020.
 31. G. Sessa, *COVID-19 Conspiracy Theories: Comparative trends in Italy, France, and Spain*, in www.disinfo.eu, 27 April 2020.
 32. R. Stein, *Fauci Reveals He Has Received Death Threats And His Daughters Have Been Harassed*, in www.npr.org, 5 August 2020.

33. A. Campan, A. Cuzzocrea, T. M. Truta, *Fighting fake news spread in online social networks: Actual trends and future research directions*, in *2017 IEEE International Conference on Big Data (Big Data)*, Boston, 2017, 4453-4457.
34. L. Li, A. Scaglione, A. Swami and Q. Zhao, *Trust, opinion diffusion and radicalization in social networks*, in *2011 Conference Record of the Forty Fifth Asilomar Conference on Signals, Systems and Computers (ASILOMAR)*, Pacific Grove, 2011, 691-695.
35. L. Del Ninno, *Coronavirus, Corbellini: "Si è scatenato il panico. Ma non è come le altre pandemie"*, in *www.quotidiano.net*, 22 May 2020.
36. G. Di Chiara, *La comunicazione e l'informazione scientifica ai tempi del Covid*, in *www.scienzainrete.it*, 24 June 2020.
37. About the case C. Dall, *Controversy over data in hydroxychloroquine COVID-19 study grows*, in *CIDRAP News*, 3 June 2020; M. Landucci, *The Lancet e il pasticcio sullo studio ritirato su idrossiclorochina e clorochina*, in *www.quotidianosanità.it*, 5 June 2020; L.M. Nejrotti, *Ritirati due studi sulla COVID-19. Un pasticcio metodologico?*, in *www.TorinoMedica.com*, 9 June 2020.
38. In particular, in the warning letter sent to Prof. Gismondi, the PTS highlighted the seriousness and danger of the following statements: «è una follia questa emergenza, si è scambiata un'infezione appena più seria di un'influenza per una pandemia letale» (23.2.2020); «non voglio sminuire il coronavirus ma la sua problematica rimane appena superiore all'influenza stagionale» (1.3.2020); «tra poco il 60-70% della popolazione è positivo ma non dobbiamo preoccuparci» (13.3.2020), «l'epidemia potrebbe esser mutata, sta succedendo qualcosa di strano» (21.3.2020).
39. The text of the warning letter is available in *www.pattoperlascienza.it*.
40. https://www.rki.de/DE/Home/homepage_node.html.
41. L. Barbuscia, *"Il Covid? Una banale influenza. Pericoloso il vaccino". Sanzionati 10 medici "negazionisti", altri 3 sotto inchiesta*, in *www.repubblica.it*, 28 December 2020.
42. D. Sweeney, *Doctor who bragged about not wearing a mask has his license suspended in Oregon*, in *www.sacbee.com*, 6 December 2020; R.A. Friedman, *We Must Do More to Stop Dangerous Doctors in a Pandemic*, in *www.nytimes.com*, 11 December 2020.