European Journal of Science and Theology, August 2022, Vol.18, No.4, 133-147

SCIENTIA PETITA, THEOLOGIA MANIFESTA SCIENTIFIC RATIONALITY AND THEOLOGICAL PROPOSALS IN THE PANDEMIC

Flavia Marcacci[1] and Michał Oleksowicz[2*]

[1] *Pontifical Lateran University, Piazza di S. Giovanni in Laterano 4, Rome, 00184, Italy*
[2] *Nicolaus Copernicus University, Gagarina 11, Toruń, 87100, Poland*

(Received 4 March 2022, revised 2022)

Abstract

The urgency of understanding the pandemic has exponentially increased the circulation of information. The main directions of information transfer have been internal, that is within scholarly communities, and external, that is towards the public. The very manner in which scientific communication is produced has also changed. While the difficulty of finding practical solutions has often created a sense of mistrust, it has also led to the emergence of an image of scientific rationality as progressive, collective and capable of growth. This image of Science makes it possible to understand and distinguish the epistemic and ontological dimensions of scientific analysis. Theology can identify an attitude of epistemic humility that is conducive to a better understanding of the role of the human being in relation to nature and as the protagonist of history in collaboration with God.

Keywords: coronavirus, covid-19, scientific, rationality, theology of science

1. Introduction

In early 2022, nearly two years after WHO's declaration of a pandemic in connection with the outbreak of covid-19, a disease caused by the SARS-CoV-2 coronavirus (March 11, 2020), the debate about the pandemic is not over. Nobody knows whether the current phase will come to an end or continue due to the emergence and spread of the Omicron variant with its high transmissibility. Virologists and immunologists formulate their hypotheses and express their ideas, but these are essentially untested. On the one hand, some argue that mass infection and mass vaccination will make it possible to accumulate immunity and that the virus will becomes less virulent. On the other hand, the scenario shaped by the spread of the Omicron variant forced us to accept the possibility of a different outcome. Are ideas based on perceptions of individual scientists? By monitoring the pandemic data, it will be possible to tell who is right during

[*] Corresponding author, e-mail: michaloleksowicz@umk.pl

the time that a pandemic is still unfolding. According to the World Health Organization, there are six phases of a pandemic, with specific actions prescribed for each phase [WHO Global Influenza Programme & World Health Organization, *Pandemic Influenza Preparedness and Response: A WHO Guidance Document*, 2009, https://apps.who.int/iris/handle/10665/44123], so there are reasons to think that we are moving towards eliminating and eradicating the virus. However, caution is still needed. At the beginning of 2022, many immunologists as Antony Fauci issued a warning and advised being careful about the post-pandemic phase [World Economic Forum, *Does Omicron mean the end for COVID-19? Anthony Fauci and other experts on Radio Davos*, 18.01.2022, https://www.weforum.org/agenda/2022/01/omicron-end-of covid-19-anthony-fauci-radio-davos/].

Reasoning about the pandemic is not simple now, and it was much less so in the early days of pandemic. Only a handful of long-lived individuals today could have any memory of a pandemic, namely the Spanish Flu of 1918-1920 [1], and their ability to access information at that time belonged to a completely different era. Two years ago, the difficulty of understanding an event like the pandemic was primarily scientific: people with moderate or no scientific training had to grasp technical concepts related to epidemiology (virus, epidemic peak, comorbidity, droplet, healing, contagion, adenovirus, mRNA, vaccine hesitancy, etc.) to describe what was happening. Then, there were also practical, existential and social issues to consider as the physical distancing forced a laborious collective re-education. Within a short period of time, the world witnessed one of the most important and rapid mobilizations of the scientific community in living memory: the rapid sharing and global diffusion of knowledge with an intensity perhaps never seen before. From the point of view of a historical theory of human knowledge [2], the dynamics and mechanisms of scientific research have mainly been the same as those according to which this world has been functioning since the days of the Scientific Revolution and, going forward, Big Science: Science is a quest for knowledge that is inherently based on the transmission, sharing and dissemination of results and concepts. Over time, the social and institutional structures that facilitate exchanges among scientists are subject to change, either enhancing or impoverishing the scientific enterprise. During the pandemic, both the sense of emergency and the data-driven approach have amplified and made visible the mechanisms of diffusion and growth of Science. Furthermore, the events have provided an opportunity to exploit the possibilities of the information society. Information about the pandemic has spread exponentially in two contexts and directions: within the world of Science and from Science to the non-expert public, the latter being interested in scientific matters sometimes by necessity and sometimes by genuine curiosity. As a result, a widespread sensibility has been forming in terms of talking about pandemics using technical and scientific terms. This paper aims to reflect the question of whether and how Theology can address this new sensibility in individuals epistemologically shaped by the scientific discourse. In our response to that question, we will first identify the positive and problematic aspects of Science

which have manifested themselves in public sensibilities during the pandemic. Then, we will identify the experiential elements of the pandemic that we believe are theologically sensitive, with a particular emphasis on the role of randomness. Finally, we will propose some conceptual and contextual perspectives with which theology can capture the sensitivity of the modern-day men and women so that the pandemic can be used as an opportunity for evangelical proclamation.

2. Scientia petita - the urgency of understanding

Freedom and ability to tap into information sources and speed of information dissemination: the world of the covid-19 era thrives on these characteristics. While Science has been abundantly shared and communicated, the complexity of the scientific enterprise has often surfaced nonetheless. The complex nature of an event such as a pandemic requires considerable effort from many sides. Since the beginning, in daily, weekly or periodic communication, it has been necessary to reason about numbers and graphs, even though not everyone has had the epistemic and mathematical skills to grasp their meaning.

The flow of information since the beginning of the pandemic has been massive. Databases helpful in monitoring the pandemic have been accessible to anyone, making it possible to develop a global asset for sequencing the SARS-CoV-2 virus. For instance, the open-source project *Nextstrain. Real-time tracking of pathogen evolution* [https://nextstrain.org/ncov/gisaid/global/] or the software development hosting provider *GitHub* [https://github.com/]. But big data alone is not enough. In addition to data, individual researchers and entire scientific communities have also shared analyses and interpretations. The emergency has altered the very manner in which information is produced and shared, beginning with the scientific world. The rapid pace of pandemic developments and the massive amount of data processed on a daily basis has demanded an incredible increase in the speed at which papers are referenced and published. This has entailed the replacement of double or single-blind or open peer review with post-publication review as a free and open yet fast and less cautious way of discussing content. Since the beginning of the pandemic, the problem of pandemic referrals has been discussed in journals and blogs that focus on the dissemination of academic research [3-6; S. Horbach, *How the pandemic changed editorial peer review - and why we should wonder whether that's desirable*, LSE Impact Blog. A platform for understanding and increasing the impact of academic research, https://blogs.lse.ac.uk/impactofsocialsciences/2021/02/10/how-the-pandemic-changed-editorial-peer-review-and-why-we-should-wonder-whether-thats-desirable/; F. McIntyre, *What to expect from post-pandemic publishing*, Research Professional News, https://www.researchprofessionalnews.com/rr-news-australia-universities-2022-1-what-to-expect-from-post-pandemic-publishing/].

Another important consideration is that the general public access scientific information through general-interest newspapers, which are not the subject of our discussion, or through new communication and dissemination channels. In

that context, the work done by science communication professionals has come to foreground, and journals and newspapers specializing in broad scientific dissemination have contributed to making the pandemic event more understandable. Goodwill scholars and researchers have personally engaged with the public through social channels for the same purpose. Thus, graphs, diagrams and scientific discussions have filled social networks in a positive and impressive attempt to make these issues comprehensible despite their complexity. Conscious and transparent communication would be an ideal vehicle through which knowledge can spread to strengthen the dimension of 'scientific citizenship' for the community [7-10].

Social networks - less cognizant of scientific references but capable of capturing many readers - have also helped spread an educated debate. Historians, anthropologists and writers have offered their points of view on the pandemic, enriching the present view with references to similar events in the past. Only in an information society could such an experiment have been possible, making the circulation of ideas so intense and attempting to overcome the divide between information and education thanks to the communicative efforts of experts in science, philosophy and media.

Continuous interaction with this scenario has shaped the personal and collective imagination about Science for better or worse. The general public's perception of scientific facts and concepts has produced what can be described as 'scientific common sense': a collective way of perceiving Science. The veil separating natural and social facts has been broken, although this has not happened as a result of it being unified by the method by which Science and Sociology studied their objects as it was for Durkheim [11]. Science no longer creates the sort of knowledge that is far removed from common sense. On the contrary, common sense has been shaped by Science during the pandemic. Thus, scientific facts have become an intermediary between the natural and the social. Understanding social events during the pandemic has required the mediation of well-communicated science: a process of approximation and sometimes misrepresentation of scientific content, which may in some cases resulted in a feeling that interpretation has trumped reality [12].

While scientific journalists have made an effort to bring Science to the world of non-experts, disputes among experts have often been vehement, and the issue has been further exacerbated by the polarizing tension typical of the media. A sense of frustration has spread among people, sometimes even bordering on alienation and hostility to Science. In the past, Science used to be described by characteristics such as universalism, communitarianism, disinterestedness and organized scepticism [13, 14]. These characteristics then turned out to be partial and incapable of describing the scientific enterprise in its entirety. At the same time, however, diversity of opinions is inherent in the dynamics of science.

Well before the covid-19 pandemic, Science had already shown itself to be a theatre of clashing theories. Scientific theories are not definitive, and there have been many cases where different theories contended for the role of the 'right one' to explain reality. Science is not only a logical product but also an

interaction with social rules, metaphysical beliefs and the historical backdrop - as had been clarified by the mid-twentieth century [15-18] in a continuing and lively debate. How can this sense of frustration be defused? It is essential to explain the mechanisms of the world of Science and the *forma mentis* of those who practice it in order to help distinguish what is inherently scientific and what is instead induced by the media. Scientific knowledge is not impartial and aseptic, or extraneous to the world that it models and to absolute truths. Science is understandable within the architectures of knowledge in which it is rooted [2].

The clash of opinions among scientists is vital to the advancement of scientific activity. This fact has often been misrepresented and can undermine the credibility of science because today's information marketplace means that the risk inherent in scientific practice is made public. Nevertheless, this risk does not imply that science does not provide guarantees. On the contrary, formal and quantitative methods and analyses have been exported outside of strictly naturalistic, mathematical and physical disciplines and have proven to be necessary even in branches of the Humanities and Social sciences, such as Economics and Sociology, Linguistics, and Psychology. While risk is intrinsic in Science, it is from Science itself that solutions to many problems arise: the race for vaccines and the hope of achieving herd immunity within a short period of time have been possible thanks to the fact that technology has developed in this direction in the last twenty years.

The audience of non-experts must therefore be made epistemologically strong, capable of understanding this risk adequately. In this regard, Ulrich Beck has spoken of 'reflexive scientification' or 'second scientification' whereby men and women who today live in a technology and information society know that scientific knowledge is not immune to criticism [19, 20]. In order for such criticism to be productive, it is crucial to understand that while risk and error exist in science, it is still possible to overcome and resolve them. To this end, correct and, above all, transparent public communication of scientific results is essential. Precisely because data and predictions are constantly revised, it is necessary to communicate the criteria for their evaluation, especially when there is a substantial political and social impact. When insolvable systemic uncertainty remains, scientists themselves must explain it, which means provisional and sometimes revisable decisions. Uncertainty may have been felt as a disvalue, but it is not. From a religious point of view, this type of education is also a work of spiritual mercy, because it allows us to restore to the human dimension that which belongs to it and makes it possible to identify the things in scientific work that have social value to be preserved. In this way, dialogue is promoted in relation to the current sensibilities.

In addition to the idea of an uncertain science as a place of confrontation between individual scientists and forces external to Science, it is crucial to focus on some values that counterbalance this image of Science (Table 1). Today's science reveals itself as a form of knowledge that is:

1. Open and never ending but not inconclusive. Scientific knowledge does not make it possible to reach the absolute truth, and even less so to do it

quickly. Instead, it proceeds by way of successive approximations. Science is relative to the methods that are employed, the possibilities that technology makes available and the historical context of a given theory. However, it is the best form of knowledge possible because it is controllable as long as its data and methods are transparent and public [21].

2. Collective. Science is not only the work of individual, enlightened minds, but also of a scientific community with its rules, be they fair or unfair. Therefore, it must remain debatable and controllable so that every achievement has a collective dimension.
3. Free. Science necessarily interacts with, and is conditioned by, public spaces. However, scientists are free in that they can criticize or refute an argument regardless of the person who formulates it thanks to the common application of the scientific method.

Table 1. The opposing ways of perceiving Science during the pandemic.

Values and the image of Science	Proposed solutions	Opinions in comparison	Relationship with the public sphere
Disvalues	Uncertainty, inconclusiveness	Centrality of individual personalities	Dominance of non-scientific points of view over Science
Values	Openness, fairness (though solutions may be partial)	Collective assessment and examination within scientific communities	Freedom of Science to apply the scientific method and formulate answers

3. Theologia manifesta - the pandemic, the science, the casual evil

What has the science education received during these months produced in people's hearts and minds? To what issues has it made them sensitive? Have existential questions been raised? No matter how hard we try to understand the nature and dynamics of the pandemic, estimates and numbers make up the science of the pandemic event. The totality of individuals makes up large numbers, and assessments made on large numbers produce regulations that fall on individuals. At the same time, science does not necessarily give existential answers. Nevertheless, feeling like a number does not console the soul, so how can large numbers be in tune with people's hearts and minds? Is it possible to glimpse a spiritual passage? The sense of loneliness, the inability to rely on the usual network of social aids, the inability to see the future serenely, the sense of insecurity and the dominance of fear over courage: these are only some of the many aspects that have created difficulties in these months [22].

A key element in living religion is community. The exercise of religious practices and spiritual life requires interaction with other believers. Similarly, access to the sacraments requires physical presence. Many believers have reacted with difficulty, even with hostility, to measures of social distancing. The

need for social distancing in pandemics stems from the need to stop contagion, but this great sacrifice requires a great explanatory motivation.

Epidemiology offered the compartmental models SIR (*Susceptible, Infected, Recovered*, where the latter term refers to those who have recovered or died from the disease), where data are normalized and treated by differential equations and various statistical techniques [23]. Other models have been developed, which introduce the distinction between cured and deceased, or identify the category of infected who are immune for a certain period. All models have as their prerequisite that the contact network of each individual and the exponential trend in the succession of contacts from individuals to the entire population are identified. At the pandemic's beginning, scientists were looking for models that could describe the epidemiological situation even in a 'forced' lockdown state. These evaluations were essential to be able to control the spread of the virus. This could be calculated with the so-called R_t index (*Replacement number*, referring to epidemics subjected to restrictive measures) in place of the R_0 index (basic *Reproduction number*, initially used but specific to unforced epidemics, e.g. when infected people are not isolated) [24, 25].

Despite later refinements, each compartmental model had partial predictive power: 'partial' because they did not show uncertainty in the data representation. There are many reasons for this. For example, the mechanisms of opening and suspending social activities are difficult to calculate in transmission chains. In other words, isolation, lockdowns and wearing masks, were initially the only possible, although uncertain strategies. Due to the uncertainty, there were various ways of putting it into practice in different countries as well as in the rules for managing the life of religious communities [26]. The understanding of why isolation was necessary was essential to motivate sacrifices, and good communication was often lacking. One could have considered adjusting the initial expression 'social distancing' to 'physical distancing', as the latter had fewer negative connotations. The need for social contact is so crucial that it would have been good to use correct language from the beginning.

The view that the use of precautionary measures was an undemocratic and authoritarian intervention spread in various ways. We do not know whether better communication would have mitigated its spread. The controversies were complex and brought to the surface through different approaches and opinions among Christian churches, believers, and leaders [27]. They were concerned mainly with the sociopolitical implications of the governments' actions, ranging from trust to scepticism. Many reports on local situations have been published [28]. However, a second point still deserves importance: the relationship between adequate science education and the perception of covid information, a relationship that intercepts religious sensibilities [29].

Another important aspect in the face of the chronicle of the pandemic, one must realize that the experience of covid-19 has, like few others, carried with itself the profound pathos of randomness. By chance, more than one family member died in the same house, while in the next house those infected remained asymptomatic. Someone had carefully avoided situations that could expose them

to risks but got sick nevertheless. Someone else had deliberately chosen to expose themselves to situations that could cause contagion and yet did not become infected or ill. These things have happened - really and dramatically. And now, people with a history of bad health have joined the ranks of those hesitant to vaccination, but without becoming anti-vax: the fluctuation of the preferences of these people has determined the best or worst outcomes of the vaccination campaigns.

Living through the pandemic has been very tiring. Where Science cannot yet provide answers, one needs to ask about the extent to which faith and religion can help in the struggle against the disease. In the pre-scientific context, people experienced the relationship with illness religiously, whereas today, they live through the illness outside the realm of religious experience and theological reflection. On a public level, the religious dimension has emerged episodically from East to West: in China, the hospital of Huoshenshan was named after the god of fire invoked to purify people from the demons of pestilence, and in Europe, certain forms of popular piety seem to have spread [30]. Theological and religious activities and reflections have been undertaken in response to the pandemic, creating vital spaces for themselves in the digital environment, and there has been no lack of commendable results in pastoral products and educational content [31]. Nevertheless, the number of believers has certainly not increased. Can theological reflection offer something to help understand this time in reference to the religious dimension? Can it offer opportunities to reason about the nature of evil, about the meaning of the random transmission of the virus [32]? Perhaps it is not true that people have displaced God, but the way of understanding the relationship between God, the world and his action in history is in crisis. The 'second scientification' permeates the common scientific sense of men and women who listen to the Christian proclamation, and it is these men and women to whom we must relate. It is precisely here that Theology finds new ground to plow.

The experience of the pandemic seems to be a challenge for Theology today. And yet, if the latter is supposed to be a current understanding of God's Revelation, then it cannot abstain from considering the current challenges [33]. Although Theology is basically conceived of as a reflection on the content of the Revelation and not directly on science, we believe that such reflection could be performed theologically with respect to scientific rationality rather than to specific results of the scientific enterprise. Such a theological project, which Michał Heller refers to as the 'theology of science' [34], can be defined as a theological evaluation of the fact that empirical sciences study and seek to comprehend the world created by God. While it is not our aim to discuss the whole idea of Heller' theological project [35, 36], we think that good theological reflection on the scientific rationality emerging from the challenges of the pandemic time may contribute to enriching the common scientific sense of the men and women who listen to the Christian proclamation. On the one hand, the theology of science assumes that there is (or should be) an interaction between Theology and Science in which the two have something important to contribute

to each other. On the other hand, a theologian of Science does not merely incorporate - apart from a theological view of Science - the intellectual traffic that runs from Science to Theology. In other words, a theologian does not seek a mere understanding of the world or Science in terms of Science itself. Instead, he or she makes an effort to grasp the meaning of Nature, scientific rationality and epistemic values in a more comprehensive and deeper manner than Science does. Briefly put, while the theology of science relies upon science to provide an understanding of certain phenomena, it delivers more than science alone can offer. A revelatory source of knowledge is combined with what is learned about Creation and rationality through Science. Now, we would like to formulate some proposals on how this type of theological reflection can be developed.

The randomness of evil raises an ontological question in the post-Auschwitz way of thinking about God. Can God allow random evil to serve good purposes? What is the connection between God and world events? Can God bring evil upon his people, sometimes affecting one person and sometimes another? First of all, it is necessary to say that the role of science is to govern randomness, hence vaccine research is a way to counter a dramatic reality. Then, there is a second interesting aspect to the scientific experience of the pandemic. Science progressively induces one to generalize phenomenal regularities and derive conclusive knowledge from them, although this path to understanding is a long one. If, however, the focus is shifted from the result to the process, and if the process is worth more than the result [Francis, *Apostolic Exhortation Evangelii Gaudium*, https://www.vatican.va/content/francesco/en/apost_exhortations/documents/papa-francesco_esortazione-ap_20131124_evangelii-gaudium.html, 222-225], then the most appropriate way to speak of God is not in terms of an ordering and resolving God, but rather in terms of a God who reveals himself progressively and in terms of the nature created by Him. This progressive knowing demands a collective dimension of knowledge. Rarely, even in this pandemic, has the individual scientist been correct. If anything, it is the responsibility - at least a shared one - of the scientific community to first make possible and then make meaningful the insight of an individual researcher. Science produces good results only when it enforces community rules. Theology, then, can reflect on the role of the community that responds to evil by seeking possible solutions in an attitude of humble and passionate research. It can also attempt to further explore the question of why scientific work can find solutions.

This progressive knowing, however, calls into question the notion of nature as intelligible: even when the mechanisms that govern the functioning of phenomena are not precisely determined, scientists continue to work with the implicit conviction that it will be possible to gain at least partial understanding of what is happening.

While we are sympathetic to such a theological project, it seems to us that there are at least two problems which deserve deeper reflection within the theology of science: 1) the epistemic aspects of partial scientific knowledge and 2) the ontic aspects of partially comprehensible nature.

3.1. Epistemic aspects of partial scientific knowledge: Science as a map

To make explicit the first point, we will begin by invoking R. Giere's famous map metaphor that illuminates the issue of scientific representation [37]. Maps represent spatial regions from particular perspectives determined by various human interests. According to the philosopher, the operative notion to describe the relationship between models and the world is not truth but similarity or fit between a model and the world. The map analogy shows that maps are always partial but they are nevertheless maps of something.

We think that this metaphor is well-suited to express the uncertainty of scientific predictions and explanations and their impact on social life in the time of the pandemic. An average person has been made aware of the precarious state not only of human life but also of Science, especially in the case of health sciences and Epidemiology. Science has presented itself as open, inconclusive and in need of continuous refinement of methods and data. During the pandemic, it has been noted that there is no firm line between complete and partial scientific models or explanations; instead, they undergo a continuous process of articulation and refinement [38, 39]. Science is like a map: while partial, it is nevertheless the best one available at the moment and one without which we cannot move forward for the public good.

From a theological point of view, the issue of limited scientific knowledge strongly evokes the virtue of humility [40, 41]. From an epistemic point of view, in turn, humility means that we may provide a certain type of knowledge, but we must accept that what we have already acquired may not have been at all necessary and that it is not clear whether we will ever know what is still unknown to us. The virtue of humility may be seen as a moral and, at the same time, religious value that expresses this partial and limited character of our cognitive capacities. Although the object of Theology is the living God, humble obedience to the truth is what - according to theological tradition - purifies the mind and heart of a person. Such purification means that as people searching for the truth, we are on a path of gradual and partial acquisition of further knowledge about reality. In this scientific or philosophical quest for knowledge of the world, its limited character (when compared to God's omniscience) presents itself as an unproblematic fact. The abundance of explanatory frameworks and the variety of ways in which reality can be described determine a style of practicing intellectual reflection in which there is no single universally binding scientific vocabulary. In other words, this means that the same problem can be expressed in a number of ways. This, in fact, underlines our cognitive limits and the partial character of scientific reasoning. The theological reflection on 'epistemic humility' can serve two purposes: on the one hand, it is a way of emphasizing the limits of our human knowledge, and on the other, it may enforce perseverance in searching for an explanation to what we need to know.

3.2. Ontic aspects of partially comprehensible nature

One might ask what makes it possible to obtain reliable scientific knowledge if such knowledge proves to be partial rather than complete. The limited character of scientific knowledge means that our comprehension of the world is not the matter of a single, immutable method or model [42]. On the contrary, dealing with an *explanandum* forces us to employ various contextually-sensitive epistemic strategies capable of explicating the ontic counterpart. The source of confusion when it comes to distinguishing the ontic and epistemic aspects of scientific knowledge may be the assumption that they represent two competing conceptions of explanation rather than two complementary aspects of explanation with regard to the phenomenon in question. This controversy may be resolved by considering these aspects in a reconciliatory and diachronic perspective, recognizing that they are complementary in the case of explanations aimed at grasping the complexity of natural phenomena.

It can be noted that in Science, rationality changes over time. At certain points in the course of history, scientific theories have changed and so have the objects of Science [43]. It is these issues that have made the Philosophy of science of the 20th century recognize that rationality is always expressed contextually, or historically. From a theological point of view, it should be particularly emphasized that what remains invariant is not the specific way in which a phenomenon is described but the fact that Nature has revealed itself in a way that is, to some degree, intelligible. For a theologian of Science, the intelligibility of the world is not the result of scientists' efforts but a metaphysical condition offered to them in order to enable them to explain the intelligible structure of the world. Science starts by registering the external reality, whose order and intelligibility are presupposed by scientists in their practice.

The idea of the intelligibility of the world is often combined with the theological view that Nature is well ordered and that this order is open to human rationality. The presupposition of order in Nature is expressed by such notions as causal order, teleology, regularity, patterns, organizational principles, laws of nature, etc. However, the bold assumption of order in Nature in the face of the casual character of viral transmission requires some further critical evaluation. On the one hand, Nature is capable of revealing an order which can be expressed by laws, models and various inferences [44], but on the other, our understanding of this order is the result of a long intellectual journey. What we are referring to is not the mere assumption that Nature is ordered and that, as a result, we obtain a proper understanding of it, but rather the awareness that an arduous path of intellectual work is needed. In short, the fact that we seek well-ordered explanations does not necessarily mean that the phenomena in question are themselves well-ordered.

In the painful context of the pandemic, the truth about a loving God has once again been put into question. However, neither an unmoving mover nor a God of harmony and order has been eminently sought after, but instead a God

who is (or at least should be) in some way present in the world affected by the dramatic experience. The time of the pandemic has shown that the concept of freedom of created reality can have positive or negative dynamics of development. Therefore, a theological synthesis based on the simple idea of separation between ordered nature and scientific knowledge (or between primary and secondary causality, that is between Nature and human action aimed at improving or overcoming the former) does not seem to stand up to the theological challenges brought by the pandemic.

A reflection on the partial and temporal character of the comprehensibility of nature and the complex character of natural phenomena can help us better understand the relationship between the eternal God and the temporal world [45]. It is probably the multifaceted character of suffering that reveals something important to Theology. The limited character of our knowledge (the epistemic suffering), the deep *pathos* of causality (the unpredictable character of viral transmission or mutation) and finally the suffering of human beings (since "two will be in the field; one will be taken and one will be left" (Matthew 2.:40) during the pandemic) show that in the time of the pandemic, Theology itself is being deeply questioned by such experiences. Theology allows itself to be questioned not only in the ecclesiological sense (that is, with respect to the way in which Christian communities should reform themselves in order to bear witness to the Gospel in the context of the global experience of the fragility of human life), but also in the doctrinal, dogmatic direction that touches the truth of Christianity. The latter can be formulated in the following manner: how did the Trinitarian God create a world marked by dramatic and incomprehensible experiences? Being particularly sensitive to what Science has suffered during this time, the theology of science is ready to evaluate the relationship between God and the world not only in the conceptual matrix of primary and secondary causality, but also through the concept of freedom and man's limited understanding of reality. Creation enjoys freedom (with a certain capability for self-determination), which opens up the possibility of development to creatures while accepting the potential regressive implementations. Although the world is potentially comprehensible, the point is not to obtain an orderly understanding of nature. Christian thinking - oriented by theology of science - is invited to support faith in a loving Creator in the face of the evil that marks the existence of living forms in the evolving ontic and epistemic universe.

4. Conclusions

At least in its ideal dimension, the scientific enterprise can appear open, collective and accessible. While some people have developed a hostile attitude towards Science, others have been conducive to this idea of knowledge in the time of the pandemic, and the same people may be inclined to listen to the theological proposals of today. Science can be characterized as a human endeavour that describes humanity which, even when torn by pain, does not hesitate to search for solutions, strives together to find them, speculates, refutes

opposing positions or theories but does not give up. If Science can be viewed as a gift from God, then Theology can seize its humanizing opportunities.

There was the time of determinism and the ordering God. There was the time of indeterminism and the God of unpredictable freedom. So, it is now perhaps the time of complexity and the God of the intelligibility of Nature.

On March 27, 2020, Pope Francis ventured to take up the dialogue with people again, beyond the fear-filled silence and struggle to read what was happening in the first weeks of the lockdown. The pope said: "We have realized that we are on the same boat, all of us fragile and disoriented, but at the same time important and needed, all of us called to row together, each of us in need of comforting the other" [Francis, *Extraordinary moment of prayer presided over by pope*, https://www.vatican.va/content/francesco/en/homilies/2020/documents/papa-francesco_20200327_omelia-epidemia.html]. He emphasized that the pandemic had cornered the pride of a society based on the autonomous individual, proving that man does not find whole meaning in himself alone, but in love and responsibility for one another.

However, this responsibility has a dimension of instinctive human pietàs, a humanistic regard for life displayed in the time of the pandemic through the daily courage of many professionals and volunteers who risked their lives for others. Our analysis has also shown the theological dimension of scientific research whereby science provides partial but fundamental truths relevant to collective health. The pandemic has demonstrated how science calls for responsibility and helps us understand how much human beings share in determining the evolution of events. When we are faced with the complexity of occurrences such as the pandemic, only an attitude of humility and critical and intelligent collaboration can bring solutions. By adopting this attitude, it is possible to find the face of the incarnate God and begin to listen to the message of the Gospel with the same epistemic logic.

Acknowledgment

This research was funded in part by National Science Centre, Poland, 2021/41/N/HS1/01338. For the purpose of Open Access, the authors have applied a CC-BY public copyright licence to any Author Accepted Manuscript version arising from this submission.

References

[1] L. Spinney, *Pale Rider: The Spanish Flu of 1918 and How it Changed the World*, Public Affairs, New York, 2017.

[2] J. Renn, *The Evolution of Knowledge. Rethinking science for the Anthropocene*, Princeton University Press, Princeton, 2020, 37-142.

[3] F. Chirico, J.A. Teixeira da Silva and N. Magnavita, Croat. Med. J., **61(3)** (2020) 300-301.

[4] F. Chirico and N.L. Bragazzi, Perspectives in Clinical Research, **12(1)** (2021) 60-61.

[5] L. O'Sullivan, L. Ma and P. Doran, Scholarly Assessment Reports, **3(1)** (2021) 1-11.
[6] S. Horbach, Res. Evaluat., **30(3)** (2021) 231-239.
[7] I. Ampollini and M. Bucchi, Sci. Eng. Ethics, **26(1)** (2020) 451-474.
[8] K. Bickerstaff, I. Lorenzoni, M. Jones and N. Pidgeon, Science, Technology & Human Values, **35(4)** (2010) 474-500.
[9] A. Irwin, *Citizen science and scientific citizenship: same words, different meanings?*, in *Science Communication Today - 2015: Current Strategies and Means of Action*, B. Schiele, J.L. Marec & P. Baranger (eds.), Éditions Universitaires de Lorraine, Nancy, 2015, 29-38.
[10] G. Caniglia, C. Jaeger, E. Schernhammer, G. Steiner, F. Russo, J. Renn, P. Schlosser and M.D. Laubichler, Hist. Phil. Life Sci., **43(59)** (2021) 1-6.
[11] E. Durkheim, *The rules of sociological method and selected texts on sociology and its method*, S. Lukes (ed.), The MacMillan Press LTD, New York, 1982, 50-84.
[12] A. Schutz, *The common-sense and scientific Interpretation of Human* Action, in *Collected papers*, Vol. I: *The Problem of Social Reality*, M. Natanson (ed.), Martinus Nijhof, The Hague, 1962, 3-47.
[13] R.K. Merton, *The normative structure of science*, in *The Sociology of Science: Theoretical and Empirical Investigations*, R.K. Merton (ed.), University of Chicago Press, Chicago, 1973, 267-278.
[14] M. Bucchi, Journal of Classical Sociology, **15(3)** (2015) 233-252.
[15] T.S. Kuhn, *The Structure of Scientific Revolutions*, University of Chicago Press, Chicago, 2012, 122-161.
[16] I. Lakatos, *Falsification and Methodology of scientific Research Programmes*, in *Criticism and the Growth of Knowledge*, I. Lakatos & A. Musgrave (eds.), Cambridge University Press, Cambridge, 2014, 91-196.
[17] P. Feyerabend, *Against Method: Outline of an Anarchistic Theory of Knowledge*, NLB, London, 1975, 14-267.
[18] L. Laudan, *Progress and its problem. Towards a Theory of Scientific Growth*, University of California Press, Berkeley, 1978, 11-222.
[19] U. Beck, *Risk Society: towards a New Modernity*, Sage Publications, London, 1992, 155-236.
[20] B. Adam, U. Beck and J. Loon (eds.), *The risk society and beyond critical issues for social theory*, Sage Publications, London, 2005.
[21] N. Oreskes, *Why Trust Science?*, Princeton University Press, Princeton, 2019, 15-159.
[22] M. Matos, K. McEwan, M. Kanovský, J. Halamová, S.R. Steindl, N. Ferreira, M. Linharelhos, D. Rijo, K. Asano, S. Gregório, M.G. Márquez, S.P. Vilas, G. Brito-Pons, P. Lucena-Santos, M. Oliveira, E.L. De Souza, L. Llobenes, N. Gumiy, M.I. Costa, N. HabibShow, R. Hakem, H. Khrad, A. Alzharani, S. Cheli, N. Petrocchi, E. Tholouli, P. Issari, G. Simos, V. Lundig-Gregersen, A. Elklit, R. Kolts, A.C. Kelly, C. Bortolon, P. Delamillieure, M. Paucsik, J. E. Wahl, M. Zieba, M. Zatorski, T. Komendzinski, S. Zhang, B. Jaskaran, A. Kagialis, J. Kirby and P. Gilbert, Clin. Psychol. Psychot., **28(6)** (2021) 1-17.
[23] T. Cohen and P. White, *Transmission-dynamic models of infectious diseases*, in *Infectious Disease Epidemiology*, I. Abubakar, H.R. Stagg, T. Cohen & L.C. Rodrigues (eds.), Oxford University Press, Oxford, 2016, 237.
[24] H.W. Hethcote, Society for Industrial and Applied Mathematics Review, **42(4)** (2000) 599-653.

[25] M.T. Giraudo, M. Falcone, E. Cadum, S. Deandrea, S. Scondotto, A. Mattaliano, C. Di Pietrantonj, L. Bisceglia, P. Duca and C. Cislaghi, Epidemiologia e Prevenzione, **44(5-6/Suppl 2)** (2020) 42-50.
[26] B.S. Turner, *The Political Theology of Covid-19: A Comparative History of Human Responses to Catastrophes*, in *Pandemics, Politics, and Society. Critical Perspectives on the Covid-19 Crisis*, G. Delanty (ed.), De Gruyter, Berlin-Boston, 2021, 139-156.
[27] A. Village and L.J. Francis, Religion & Culture, **24(5)** (2021) 463-477.
[28] U.M. Agbo and G.C. Nche, J. Asian Afr. Stud., (2022) 1-22, online at https://doi.org/10.1177/00219096211069645.
[29] O. Kowalczyk, K. Roszkowski, X. Montane, W. Pawliszak, B. Tylkowski and A. Bajek, J. Relig. Health, **59(6)** (2020) 2671-2677.
[30] A. Perciaccante, A. Coralli and P. Charlier, Ethics, Medicine and Public Health, **18** (2021) 100674.
[31] N. Barney Pityana, Religion and Theology, **27(3-4)** (2020) 329-358.
[32] J. Dupré and S. Guttinger, Studies in History and Philosophy of Biological and Biomedical Sciences, **59(October)** (2016) 109-116.
[33] L. Oviedo, Scientia et Fides, **10(1)** (2022) 49-71.
[34] M. Heller, *Nowa fizyka i nowa teologia*, Copernicus Centre Press, Kraków, 2014, 147-161.
[35] M. Heller, *Wstęp do teologii nauki,* in *Teologia nauki*, J. Mączka and P. Urbańczyk (eds.), Copernicus Center Press, Kraków, 2015, 13-22.
[36] M. Oleksowicz, Aisthema, **6(1)** (2019) 203-227.
[37] R.N. Giere, *Science without Laws*, University of Chicago Press, Chicago, 1999, 81-82.
[38] W.S. Parker, Philos. Sci., **87(3)** (2020) 457-477.
[39] F. Tretter, O. Wolkenhauer, M. Meyer-Hermann, J.W. Dietrich, S. Green, J. Marcum and W. Weckwerth, Frontiers in Medicine, **8(March)** (2021) 640974.
[40] I.M. Church and P.L. Samuelson, *Intellectual Humility. An introduction to the philosophy and science*, Bloomsbury Academic, London, 2017, 3-71.
[41] D.G. Myers, *The Psychology of Humility*, in *God, Science, and Humility. Ten Scientists Consider Humility Theology*, R.L. Herrmann (ed.), Templeton Foundation Press, Philadelphia, 2000, 153-175.
[42] E. Agazzi, *Scientific Objectivity and Its Contexts*, Springer, Cham, 2014, 313-428.
[43] M. Friedman, *Dynamics of Reason*, CSLI Publications, Stanford, 2001, 3-129.
[44] F. Russo and J. Williamson, International Studies in the Philosophy of Science, **21(2)** (2007) 157-170.
[45] H.U. von Balthasar, *Theologie der Geschichte. Ein Grundriss*, Znak, Kraków, 1996, 19-132.