religions

MDPI

Article

Catholic Education and the Study of Science: The Mysticism of Scientific Pursuit

Elisabetta Canetta

Faculty of Sport, Allied Health, and Performance Science, St Mary's University—Twickenham, London TW1 4SX, UK; elisabetta.canetta@stmarys.ac.uk

Abstract: In the past forty years, science has been gradually relegated to technology and utilitarian knowledge. To avoid forgetting what science truly is, it is paramount to train students to discern the difference between scientific knowledge and technological progress. Catholic education possesses the necessary tools to achieve such a goal and to give back, to science, its rightful place in human knowledge as a mystical instrument that can demonstrate the logic in the existence of a Creator beyond creation and enable humanity to climb the mountain of truth. The starting point of this ascent is to use scientific approaches to unravel the laws that govern the natural world. At the top of the mountain, the climber will contemplate the hidden mysteries of the Creator and His creation. In this paper, the development of science, from a united body of knowledge to a compartmentalized ensemble of different disciplines, will be presented. The difference between science as liberal knowledge and technology as utilitarian knowledge will also be discussed, and the fundamental role that Catholic education has to play in the restoration of scientific knowledge, as a liberal endeavour of the human mind, will be considered. The necessity of using the dialogue between faith and reason as a tool to train students in understanding the essence of scientific pursuit will be presented.

Keywords: catholic education; utilitarian knowledge; liberal knowledge; science education; mysticism; scientific inquiry; technology; pure science

Citation: Canetta, Elisabetta. 2022. Catholic Education and the Study of Science: The Mysticism of Scientific Pursuit. *Religions* 13: 528. https://doi.org/10.3390/rel13060528

Academic Editors: Leonardo Franchi and Liam Francis Gearon

Received: 6 January 2022
Accepted: 6 June 2022
Published: 8 June 2022

Publisher's Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.

1. Introduction

What do we understand when we say *science*? Etymologically, the word science derives from the Latin *scientia*, which has the primary meaning of knowledge. However, science—and more specifically, *scientific knowledge*—is a term that had different meanings in different historical periods. The Greek philosopher Aristotle (384–322 BC) defined scientific knowledge—ἐπιστήμη—(Angioni 2016) as the ability to know a phenomenon through its cause once we have ascertained (1) that its cause is, indeed, what causes the phenomenon and (2) the necessity of the phenomenon, namely that the phenomenon cannot be something other than what it is (Barnes 1994, Book I.II; 71b9-12). In the *Posterior Analytics*, Aristotle posited that scientific knowledge had to start with an *axiom*—that is, an initial principle, which was acquired, inductively, from experience, and that needed to be accepted before anything could be learnt—and continued with demonstrative syllogism until it produced knowledge (Barnes 1994, Book I.II; 71b1). Aristotelian deductive logic was used to build scientific knowledge for almost two thousand years until the English philosopher Sir Francis Bacon (1561–1626) rejected this axiomatic approach and developed a new scientific method. Bacon was convinced that, to achieve full knowledge of the laws of nature, it was necessary to understand the structure of matter that the naked eye could not see—what, nowadays, we would define as the nanoscopic structure of matter. Bacon's view of science was rooted in *interpretatio naturae* (interpretation of nature), a new approach to reasoning based on further penetrating the inner workings of nature and conquering "nature in operation" (Bacon 2004, p. 75). According to Bacon, a true interpretation of nature is rooted in "true and legitimate induction" (Bacon 2004, p. 215) because we start with observing

natural phenomena, and then, we synthesize these observations in general theories. The Baconian scientific method constitutes the foundation of the modern definition of science as "knowledge of the physical and natural world, based on observation and experiment" (Oxford 2009, Science). This scientific method was further refined in its experimental and modern aspect by the Italian scientist Galileo Galilei (1564–1642) and the English scientist Richard Boyle (1627–1691). Galileo was the first scientist to adopt a scientific methodology based on the dialectic experimental/mathematical hypothesis, according to which experimental knowledge and mathematical theory constitute an objective unity (Drago 2017). Boyle approached the scientific method from a different angle than Galileo; he was committed to a philosophical approach to experimental science, which maintained that the formulation of accurate scientific understanding was equally based on experimental observation and logical thinking (Banchetti-Robino 2020). It is important to notice that, although Aristotelian deductive logic and the Baconian inductive method are two very different approaches to the acquisition of scientific knowledge, they are both based on the assumption that science means knowledge: scientific knowledge is not just any knowledge but a more robust and less fallible knowledge, regardless of how it is derived (Ross 1962).

Notwithstanding our contemporary understanding of the nature of scientific knowledge as being rooted in the Baconian scientific method, in the past forty years or so, scientific understanding has evolved to indicate technological advancements (Torpey 2020). Hence, the quality and importance of scientific pursuits and their outcomes are judged, primarily, on the socio-economic impact that they would have in the short (from six months to one year) and long-term (from five to ten years); this trend can already be perceived in the role played by information and communication technologies (ICT) in our society (Roztocki et al. 2019). Similar trends can be observed in how science is taught in schools, colleges, and universities, where the focus of the curriculum is mainly on technological progress and on the practical applications of scientific knowledge for the benefit of humanity (Svendsen 2021). It is unfortunate that students in schools and universities are not always given the opportunity to fully appreciate the importance of pure science and its interplay with technological advancements. Sometimes, this can be caused by science teachers not being sufficiently well-trained in the difficult task of teaching science in an engaging and inspiring way (Hatch 2018; Ofsted 2021). In recent years, pure and fundamental science (substantive knowledge, in curricular terms)—as opposed to applied science and technology (disciplinary knowledge, in curricular terms)—has been considered difficult and with no obvious application to everyday life (Ofsted 2021). Examples of this perceived difficulty are the quantum weirdness of subatomic particles popping in and out of existence or the majestic and breathtaking beauty of the *Pillars of Creation* tendrils of cosmic dust sitting at the centre of the Eagle Nebula.

In this paper, I will argue, first, that it is possible to consider pure science as true scientific knowledge, distinct from technological progress, and that it is important to support students in rediscovering the mystical attributes of science. This approach, I suggest, will empower them, and human beings in general, to claim back their true identity as seekers of the hidden truths of creation, bringers of peace, and custodians of the harmony and love that make up the very fabric of the universe. Following this, the effect that the unity and universality of knowledge has on science will be evaluated. The fundamental role that Catholic education has to play in the teaching of science will then be critically explored, with particular emphasis on the importance of training students in the sciences to value the relationship between faith and reason and, thereby, see it as intrinsic to the study of science. Finally, there will be a discussion of how the concept of science as a *Jacob's ladder* enables the human mind and soul to ascend from the understanding of the hidden workings of the natural world to the contemplation of the Creator.

2. Clearing the Ground: From Natural Philosophy to the Modern Concept of Science

2.1. From Unity to the Division of Science

The shift from a theoretical/intellectual to a practical/skill-based view of science led to its move from an idealised and romantic love affair to a materialistic relationship with knowledge, namely, from a philosophical/spiritual endeavour to a professional/salary-driven activity. Furthermore, the rapid advancements in the realm of physical sciences that occurred in the 19th century stripped the word 'science' of its philosophical meaning, as an all-encompassing and universal knowledge, and relegated it to the narrower areas of natural and physical sciences (Ross 1962). This trend led to a clear-cut separation between the sciences and the humanities, which, in turn, brought increasing friction between different disciplines and is a situation clearly described by the English polymath and philosopher John Ruskin (1819–1900), who, in his Oxford's lectures on wood and metal engraving (so-called *Ariadne Florentina*), tells us, somewhat controversially, that "it has become the permitted fashion among modern mathematicians, chemists, and apothecaries, to call themselves "scientific men", as opposed to theologians, poets, and artists. [. . .] There is a science of Morals, a science of History, a science of Grammar, a science of Music, and a science of Painting; all these are quite beyond comparison higher fields for human intellect, and require accuracies of intenser observation, than either chemistry, electricity, or geology" (Ruskin 1903, p. 396).

The separation between sciences and humanities, as outlined by Ruskin—as well as the branching within sciences, with consequent divisions of one science into a myriad of compartments—was a consequence of that loss of unity of knowledge that Whewell outlined in 1834:

> "the tendency of the sciences has long been an increasing proclivity of separation and dismemberment. Formerly, the 'learned' embraced in their wide grasp all the branches of the tree of knowledge. [. . .] But these days are past. [. . .] If a moralist, like Hobbes, ventures into the domain of mathematics, or a poet, like Goethe, wanders unto the fields of experimental science, he is received with contradiction and contempt. [. . .] But the disintegration goes on, like that of a great empire falling to pieces. [. . .] And thus science [. . .] loses all traces of unity" (Whewell 1834, pp. 58–59).

Arguably, specialisation has fractured the unity of knowledge. Nonetheless, specialisation in the sciences is essential to increase a scientist's chances of making important contributions to the advancement of knowledge in that particular domain. However, the conundrum is that, if narrowing down the area of scientific knowledge is advantageous for the career and personal achievements of an individual scientist, can the same be said for the quality and value of pure and fundamental scientific knowledge? From what has been said so far, the answer would appear to be "yes, it is".

In 1951, the Austrian theoretical physicist Erwin Schrödinger (1887–1961) asked in the booklet *Science and Humanism*: "has the sum total of achievements in all the several branches of one science—say of physics, or chemistry, or botany, or zoology—any value in itself [. . .] and what value has it?" (Schrödinger 2014, p. 105). Many people would answer that the value is in the great technological advancements that have completely changed our lives—in particular, in the past 30–40 years—but is this true? Are these achievements truly great from a scientific—not technological—point of view? To answer this question, it is necessary to consider the separation that ancient Greeks made between ἐπιστήμη (knowledge) and τέχνη (art/craft), where knowledge indicated a theoretical/abstract—with no practical application—understanding of something, whereas craft pointed to a concrete/applied use of knowledge from where profit and gain could be acquired. To our contemporary minds, ἐπιστήμη could be equated to pure mathematics or theoretical physics, while τέχνη could be conceived as technology or applied science. Hence, the most recent breakthroughs and progress in scientific knowledge are a clear and undeniable advancement in technology (τέχνη) but not necessarily in pure/fundamental science (ἐπιστήμη). It is the growing

expansion in technological progress and the accompanying surge of interest in profit and gains that is causing the shift of scientific knowledge from being liberal (i.e., not concerned with the development of professional skills) to becoming utilitarian (i.e., knowledge that is useful, that can be applied to real situations, and that can improve the condition and the life of human beings) that our contemporary society is witnessing (Pogukaeva et al. 2016).

Science, in its purest form, belongs to the sphere of liberal knowledge because it is an end in itself in that it does not have any practical and immediate application, and it is not used to achieve a materialistic end. Science, as liberal knowledge, concerns *contemplation* and understanding of hidden truths. It sheds light on the true identity and the true scope of humankind. Hence, pure science—as opposed to technology and applied science—can be considered as a bridge between what is hidden and what is manifest between the Creator and creation. Science has the ability to free the human mind from the fetters of materialism and to show humanity where it comes from, as well as how and why the cosmos was formed. Thus, the study of pure science within Catholic education can train students to become liberal thinkers and true scientists—rather than only applied scientists and technologists—and it can lead them to what Father Wilfrid Stinissen OCD (1927–2013) defines as *true freedom*, namely a "deep will [. . .] [which] is at the service of love, [and that opposes] the superficial will [. . .] [which] is usually at the service of egoism [. . .] [and] egotistically seeks profit and gain" (Stinissen 2011, p. 68).

2.2. Emergence and Change of Science Disciplines in University Education

The academic science disciplines, as we know them, began to develop in the 20th century when the discipline *Natural Philosophy* was divided into individual sciences, namely physics, chemistry, and mathematics (Gare 2018). Biology was the product of the transformation of *Natural History* that occurred in the 19th century (Farber 1982). Disciplines such as physics, engineering, medicine, and chemistry became highly popular, and the universities, in turn, developed curricula aimed at training applied scientists (Odden et al. 2021). This trend has accelerated, in the 21st century, with the transformation of some countries into a technologically advanced civilization and the consequent increase in the market demand for highly specialized and qualified expertise (Enders and Christine 2008).

Technology permeates every aspect of our lives, and this is reflected not only on current industrial developments and advancements but also on the higher education system. In fact, university teaching is, more and more, relying on technology to deliver technology and science-based curricula (Røe et al. 2022). The science syllabi of a 21st century university are still based on the fundamental knowledge developed in the last two centuries; what has changed is not only the mode of delivery but also the adoption of a multidisciplinary approach to curriculum development, so that each science discipline encompasses aspects of other disciplines. As a result, some argue that the graduates of the 21st century are more skilled and have a more diversified cultural awareness (Farah and Montepare 2019).

3. Unity and Universality of Knowledge: What Does This Mean for Science?

Could the disintegration of the unity of knowledge be seen as a backward rather than forward advancement of humankind? As the English theologian St. John Henry Newman (1801–1890) clearly articulated in his seminal book *The Idea of a University* (1852),

> "all branches of knowledge are connected together, because the subject-matter of knowledge is intimately united in itself, as being the acts and the work of the Creator. [. . .] Sciences [. . .] complete, correct, balance each other. This consideration must be taken into account as regards the attainment of truth, which is their common end" (Newman 1996, p. 76).

Newman continues by saying that to give prominence and importance to one area of knowledge is to break the perfect balance between the different disciplines and to interfere with their actions in the pursuit of truth. Newman's idea of university has sometimes been considered irrelevant to the 21st century education system because of its anti-utilitarian approach and its focus on a united knowledge (Roberts 1990; Reddings 1996; Collini 2012;

Willets 2017). However, his vision of a university is not considered false by his critics but simply irrelevant because "it is not only that Newman's idea of a university fails to hold true of contemporary universities, but that anyone who thought that it might hold true would have grossly misunderstood the nature and functioning of the contemporary university" (MacIntyre 2009, p. 347).

Notwithstanding the criticisms, Newman's idea of a university is still valid and applicable when it comes to developing students into global citizens. In fact, the core of Newman's message concerned the ability of education to develop and cultivate the mind of students in order to enable them to become free thinkers capable of judging things, correctly, through a connected view and understanding of the world and its inhabitants (Ker 2011). Newman viewed education as inclusive and holistic—to use some contemporary terms—and this is also the contemporary vision of what education must aspire to be because "a university should in principle be open to teaching anything that is knowable" (Ker 2011, p. 28).

Newman's ideas on the universality of knowledge and the interconnectedness between the different subject-matters were later shared by Schrödinger, who thought that it is only when all the sciences are united and work together that scientific pursuits have any value because they allow each human being "to obey the command of the Delphic deity, γνῶθι σεαυτόν, get to know yourself" (Schrödinger 2014, p. 108). If we follow the Greek philosopher Plotinus (ca. 204–270 AD) and ask "but we ourselves, what are We?" we could answer that "before we had our becoming Here we existed. There, men other than now, some of us gods: we were pure souls, Intelligence inbound with the entire of reality, members of the Intellectual, not fenced off, not cut away, integral to that All" (Plotinus 1991, Book VI.4.14). Those who believe in the existence of a Divine Creator live in the present moment and a particular physical reality and want to understand it, to know how it works and why it works in that particular way, and to seek the face of the Creator who made all that exists. This is what science is all about, and it is this longing to know as much as possible about the spatio-temporal reality that we find ourselves in, as well as its hidden workings, that drives every spiritual pursuit of humanity. The fact that the pursuing of scientific knowledge can be considered as a form of worship is the position of the American Jesuit astronomer Br. Guy Consolmagno (1952–) who, in an interview with *Crux* in 2018, explained that "worship is a way that we come closer to God; and that's what we do when we study the cosmos. I do not rely on the Bible to tell me the answers to my scientific questions, but I do rely on the authority of Scripture to be reassured that those answers can be found and are worth pursuing" (Consolmagno, in Camosy 2018).

The importance of achieving a union between science and faith, to be better equipped for unravelling the secrets of the natural world, is clearly posited by St. John Paul II (1920–2005) in the letter that he wrote in June 1988 to the then-Director of the Vatican Observatory, the American Jesuit astronomer Fr George Coyne (1933–2020):

> "a divided community fosters a fragmented vision of the world; a community of interchange encourages its members to expand their partial perspectives and form a new unified vision. Yet the unity that we seek, as we have already stressed, is not identity. The Church does not propose that science should become religion or religion science. On the contrary, unity always presupposes the diversity and the integrity of its elements. Each of these members should become not less itself but more itself in a dynamic interchange, for a unity in which one of the elements is reduced to the other is destructive, false in its promises of harmony, and ruinous of the integrity of its components. We are asked to become one" (John Paul II 1988, p. 5).

It is the concept of a united and universal knowledge that has attracted most of the criticism of Newman's idea of a university because it is considered not only an impossible task but it also presupposes a static culture, which is inconceivable in our contemporary society. In fact, as the English historian J.M. Roberts (1928–2003) posited, "for most students it is impossible fully to understand and make one subject their own. [. . .] To understand

its interconnections with all others is unimaginable" (Roberts 1990, p. 196). If universal knowledge has its detractors, it also has its supporters, one being the English Roman Catholic theologian Nicholas Lash (1934–2020), who thought that interconnectedness between different subjects is paramount to unveiling the unity of truth and knowledge (Lash 1990). In fact, since Newman set out his philosophy of education, a clear shift in intellectual focus has occurred that, in the 20th century, has led "towards the instrumentalism and pragmatism of 'pure experience'" (Lash 1990, p. 193), and times have dramatically changed, what unifies knowledge should not be discarded lightly as irrelevant or impossible; on the contrary, as Lash tells us,

> "the university [. . .] is not a collection of libraries and lecture-rooms, departments and faculties, seminars and field-trips, playing fields and late-night resolutions of the problems of mankind. The 'idea' of a university is that there is one unifying formal feature or aspect of those things which explains and justifies the university's existence and its purposes when considered precisely in abstraction from the myriad activities, institutions and enterprises which go (materially) to make it up" (Lash 1990, p. 195).

To conclude this section, a Catholic education should ensure that scientific knowledge is not merely transformed into technology but is kept true to itself, namely, a voice singing in unison with the voices of all the sciences, the hidden truths, and the sacred mysteries of the natural world. This difficult task can be achieved either by teachers familiar with scientific and theological knowledge or by science teachers and RE teachers working, collaboratively, to support the students in appreciating the interplay between science and faith (Billingsley and Nassaji 2020). What is fundamental when teaching science in Catholic schools and universities is to train students to discern between pure science and applied science, to make them aware of and able to appreciate the importance of both types of sciences, and understand their interplay in shaping the true identity of human beings as contemplative and material creatures. This is not a utopian aim. In fact, the national curriculum in England and Wales, for science, already distinguishes between substantive knowledge (similar to the concept of pure science because it concerns scientific laws, models, and theories) and disciplinary knowledge (close to the idea of applied science, as it deals with how scientific knowledge is generated and applied). In particular, the latest review research series for science, carried out by Ofsted (the Inspection agency for England and Wales), has highlighted the importance of keeping these two sides of science separate to ensure that the students' progress, from novice to expert, in the sciences (Ofsted 2021). However, the same report warns against the peril of a curriculum that promotes either substantive knowledge or disciplinary knowledge to the detriment of the other and does not take into the account the importance of interplay between the two to allow students to successfully progress in their scientific studies and have a robust understanding of science in its different aspects (Ofsted 2021).

4. Faith, Reason and Science: A Working Relationship

To ensure that students in Catholic schools and universities are trained to appreciate and understand the full extent of pure science, the main pedagogical tool that needs to be adopted in the classroom is the faith-reason dialogue because "knowledge is called science or philosophy when it is acted upon, informed, [. . .] impregnated by Reason" (Newman 1996, p. 84). The type of faith that successfully works with reason is that modelled by the *special knowledge model* of faith because it ensures the existence of a rational faith (Plantinga 2000). In fact, the rationality of faith stems from those *special* cognitive faculties of our human nature, that not only go beyond the sources of evidence but whose outcomes can also become part of the believer's experiential evidence, because this would allow Christian faith to comprise beliefs that can be considered as knowledge, which, in turn, would ensure the rationality of faith. The strong relationship between faith and reason is clearly outlined in St. John Paul II's Encyclical Letter *Fides et ratio*, where we are told that "faith and reason are like two wings on which the human spirit rises to the contemplation of truth"

(John Paul II 1998, Blessing). The importance of this document lies in the fact that it aims to explore and describe, from a Catholic viewpoint, the boundaries "within which reason and faith are able to retain their rightful integrity and so flourish, and how they are mutually to support and so assist one another in performing their respective tasks to the mutual benefit of both" (Weinandy 2000, p. 227). However, since its publication, the Encyclical has attracted a lot of attention, and it has had both supporters and detractors. The latter criticized the appropriateness of proposing that theology needs philosophy (Webster 2000). In addition, the Encyclical was accused of failing to explain, clearly, what the relationship between philosophy and theology is, while offering only an assurance that such a relation exists and "needs to be taken very seriously" (Webster 2000, p. 74). If the critics of the Encyclical disagreed with the importance of communal activities and unification of knowledge for the success of the faith-reason relation in the pursuit of truth, its supporters praised the pluralist approach of *Fides et ratio*, which "emphasizes the importance of contemporary philosophy, rejects univocal answers, and seeks new and creative syntheses to express the truth of the Christian faith" (Guarino 2001, p. 686). Regardless of the issues that some may have with the Encyclical, this document is of particular importance in our contemporary educational system because it not only promotes an open dialogue and cooperation between different disciplines but it also "acts centripetally to counteract otherwise under-constrained or centrifugal tendencies in secular knowledge" (Hampson 2006, p. 482). Furthermore, if taken separately, theology, science, and philosophy can lead to a knowledge of the world that is fragmented. It is only when these very different disciplines are approached within the *milieu* of Christian faith that they can work together harmoniously, while preserving their autonomy and individuality, and lead humanity to the truth (Hampson 2006).

The faith and reason dialogue is still open and alive in our scientific-technological society. Many scientists have explored the nuances of the science and religion interface and tried to tackle some of the most difficult big questions that arise when stepping into the faith and reason realm (De Chardin 1933; Davies 1982; Polkinghorne 1988; Winston 2005; Consolmagno 2012). The majority of these questions pertain to the domain of physics and evolutionary biology. In the physics domain, two areas are particularly involved in the science and religion interrelationship, namely, quantum physics and cosmology. For example, cosmology tries to understand how the universe began, if it started from nothing or from something (Aczel 2014), how the cosmos evolves over time, and how the universe will end (Polkinghorne 1988). Answering these questions requires some leaps of faith because we do not have sufficient experimental evidence of what happened soon after the universe began (Ward 2008). The interdependence of science and religion, as well as its role in the exploration of the meaning of natural laws and phenomena, including the human mind, is clearly described by Rabbi Lord Jonathan Sacks (1948–2020) when he says that

> "science takes things apart to see how they work. Religion puts things together to see what they mean. They speak different languages and use different powers of the brain. [. . .] Once we recognize their difference we can move on, no longer thinking of science and religion as friends who became enemies, but as our unique, bicameral, twin perspective on the difference between things and people, objects and subjects, enabling us to create within a world of blind forces a home for humanity that is neither blind nor deaf to the beauty of the other as the living grace of the living God" (Sacks 2011, p. 77).

The faith and science reason interrelationship can, therefore, be seen as playing the role of the bringer of order and harmony in our chaotic and highly complex society. This is achieved through an interpersonal communion between God and humanity, where the latter accepts God's unconditional love, and God fulfils His need to give His love to humankind so that humans can develop and grow into fully developed beings (Sanda et al. 2017). This becomes clear when observing the world from a scientific viewpoint because science shows us a world which has

> "ragged edges, where order and disorder interlace each other and where the exploration of possibility by chance will lead not only to the evolution of systems of increasing complexity [. . .] but also to the evolution of systems imperfectly formed and malfunctioning. [. . .] The presence [in the world] of physical evils (earthquakes, genetically induced malformations, disease) reflects the untidiness of disorder, just as the presence in it of physical good (healthy conscious beings, a rich variety of plant and animal life) reflects the organizing power of order" (Polkinghorne 1988, p. 49).

The disorder and chaos that we witness in the world makes many of us doubt God's existence because if God does exist how can He allow the horrors of wars, famines, diseases, etc., to happen? The French Catholic theologian Pierre Teilhard de Chardin (1881–1955) addressed this question when he posited that evil and its unspeakable horrors are inevitable in a dynamic and evolving world because a world without disorder is a static and non-evolving universe (De Chardin 1933). In our modern society, the dialogue between faith and scientific reason is even more important, as failing to understand and admit the limitations of our scientific knowledge can lead humankind to disaster because "science will never quite explain [humanity's] personal existence, or the far-flung universe beyond [humanity's] grasp" (Winston 2005, p. 336). To make up for what science cannot explain, we need to consider the possibility of the existence of a Divine Being; the beauty of it is that, even if we admit God's existence, we do not violate any of the laws of physics (Davies 1982). Hence, handling scientific pursuits with the tools of Christian faith can unlock the mystical attributes of science and enable pure scientists and students of science to shed light not only on *how* nature works but also on *why* it works as it does (Polkinghorne 2011; Consolmagno 2012). Faithful reason is instrumental in facilitating the gain of a profound understanding of the sacred mysteries, which underpin and give life to nature, its wondrous phenomena, and its inhabitants. Therefore, faithful reason is what transforms living creatures into true human beings, into fully self-conscious beings who understand the revealed mysteries, as well as the intricacies and beauties of creation.

The universal attributes of Catholic education and its liberal curriculum make it well equipped to teach students the true meaning of science and scientific inquiry because, as the German theoretical physicist Albert Einstein (1879–1955) tells us: "all religions, arts and sciences are branches of the same tree. All these aspirations are directed toward ennobling man's life, lifting it from the sphere of mere physical existence and leading the individual toward freedom" (Einstein 2011, p. 6). A similar idea was posited by St. John Paul II when he stated that science can benefit from a dynamic interchange with theology because

> "science develops best when its concepts and conclusions are integrated into the broader human culture and its concerns for ultimate meaning and value. Scientists cannot, therefore, hold themselves entirely aloof from the sorts of issues dealt with by philosophers and theologians. By devoting to these issues something of the energy and care they give to their research in science, they can help others realize more fully the human potentialities of their discoveries. They can also come to appreciate for themselves that these discoveries cannot be a genuine substitute for knowledge of the truly ultimate. Science can purify religion from error and superstition; religion can purify science from idolatry and false absolutes. Each can draw the other into a wider world, a world in which both can flourish" (John Paul II 1988, p. 7).

5. Understanding the Natural World as the Beginning of the Ascent of the Soul to God

An example of how science can act as a *Jacob's ladder* to enable the mind and soul of human beings to ascend from the observation of the material world to the contemplation of the hidden mysteries of the universe and, ultimately, of its Creator, is the *itinerarium* (journey) of the human mind to God, laid down by the Italian Franciscan friar and theologian St. Bonaventure (1221–1274) in his famous treatise *Itinerarium mentis in Deo*. Bonaventure tells us that we can ascend from the reality outside of us—that which we can see and perceive

all around us—to what is hidden inside us—the Spirit that gives us life and, ultimately, God—through six steps, namely, "senses, imagination, reason, understanding, intelligence, and the summit of the mind" (Bonaventure 1993, chp. 1.6). Going through these six steps allows the mind to be elevated by the contemplation of the created world. The *Itinerarium* is a complex work where symbols, science, mysticism, and philosophy intertwine to lay out six areas of contemplation, leading to a spiritual *ecstasis*, which culminates in the *transitus* of the soul, namely, in "its participation in the ecstatic, self-negating time and space of the Christocentric cosmos" (Davis 2017, p. 91). The intellectual and rational powers of the soul are refined by the divine light until the soul has the capacity to "know the most pure Being itself [. . .] as the *primum* upon which all knowledge depends [because it] is the ultimate ground intelligibility because God's Being is the ultimate ground of creation itself" (Hammond 2009, p. 316). What drives the soul to make this ascent to God, by progressing through this order, is desire (Davis 2017). The starting point of the *Itinerarium* is to consider God through the *vestiges* of the cosmos. This is done by observing the natural world by means of our bodily senses, which "serve the intellect when it investigates rationally, or believe faithfully, or contemplates intellectually" (Bonaventure 1993, chp. 1.10).

Bonaventure tells us that the investigation of the reality surrounding us is in three steps:

(1) *rational investigation*: "the observer considers things in themselves and sees in them weight, number, and measure" (Bonaventure 1993, chp. 1.11). Hence, in this first step we need to perform experiments and carry out observations of natural phenomena;
(2) *way of faith*: we have to consider where the natural world comes from, where it is headed to, and how it is developing and evolving. "For *by faith we understand that the world was fashioned by the Word of God*; by faith we believe that the periods of the three laws—of nature, of the Scripture, and of grace—followed one another and have flowed on in a most orderly way; by faith we believe that the world must come to an end in the final judgement" (Bonaventure 1993, chp. 1.12).
(3) *contemplative reasoning*: we must use our mind to see that there are different types of "things" in nature, namely things that exist but are not alive—for example, rocks—others that exist and are alive but do not discern—for example, plants and animals—and finally things that exist, are alive, and discern—for example, human beings (Bonaventure 1993, chp. 1.13).

However, Bonaventure warns us that, to be able to perceive the Creator through the reflections of His image in the universe that He created, the observer—in our case, the pure scientist—needs to know God because "whoever is not enlightened by such great splendor in created things is blind" (Bonaventure 1993, chp. 1.15). This does not mean that a scientist must also be a believer but that scientists must have the humility to admit that science is limited and that there might be something beyond the natural world that scientific language is unable to define and describe.

Bonaventure continues by saying that natural phenomena and all that exists and lives in the universe "are exemplars, or rather illustrations offered to souls as yet untrained, and immersed in the senses, so that through these sensible things that they see they may be transported to the intelligible which they do not see" (Bonaventure 1993, chp. 2.11). Hence, the goal of scientific inquiry within Christianity, and of the study of science in Catholic education, is not to prove the existence of God by using scientific theories and ideas; instead, it is to show that an ordered, beautifully crafted, and logically designed universe can only have a logical Creator because we can "behold God in the mirror of visible creation" (Bonaventure 1993, chp. 2.1).

The road that the soul follows in the *itinerarium*, not only, leads to a clear demonstration of the logic in admitting the existence of a Creator that is beyond the created natural world, but it also leads to peace, the same goal to which the path of pure and fundamental scientific inquiry should bring the scientist. These two types of *peace* are the same because they both refer to the union of the traveller, or the scientist, with the Creator and His creation. To be united with the creation means to be at peace with it, namely, to be in a harmonious relationship with the natural world and everything in it because

> "if we approach nature and the environment without this openness to awe and wonder, if we no longer speak the language of fraternity and beauty in our relationship with the world, our attitude will be that of masters, consumers, ruthless exploiters, unable to set limits on their immediate needs. By contrast, if we feel intimately united with all that exists, then sobriety and care will well up spontaneously" (Francis 2015, Chp. 11).

Furthermore, the ascent of the soul to God, described by Bonaventure, is not different from the steps that each scientist is to take when stepping into the unknown of the mysteries of the natural world because

> "as we solve each scientific problem, we have new knowledge to add to our understanding of the mysteries. As we dig deeper into each mystery, we can be inspired to new questions, some of which may be amenable to scientific analysis. And each step bringing us closer to the Truth, brings us closer to the Creator of Truth" (Consolmagno 2008).

6. Conclusions

Many contemporary scientists are in awe of the beauty of nature; they marvel at the complex perfection of life and the natural world, but perhaps, the focus on empirical knowledge limits their capacity for a more mystical approach. The contemporary scientists who embrace an apparently utilitarian approach to science resemble those who

> "were unable from the good things that are seen to know Him who exists, nor did they recognize the craftsman while paying heed to his works. [. . .] For as they live among [God's] works they keep searching, and they trust in what they see, because the things that are seen are beautiful" (Wis 13: 1, 7).

From a Catholic perspective, true scientific inquiry goes beyond what our senses and the instruments we use to observe nature show us. It aims to understand the hidden and sacred mysteries of the cosmos and, ultimately, to seek the face of the Creator because "from the greatness and beauty of created things comes a corresponding perception of their Creator" (Wis 13: 5).

The fact that contemporary society perceives science as utilitarian has had a dramatic impact on university teaching. This change in the university landscape has influenced how science is taught, with technology-based delivery becoming the preferred choice for technology and science curricula. Despite the strong emphasis on utilitarian education demonstrated by contemporary universities, Newman's ideas about liberal education and universal knowledge are shared by many contemporary educators who desire to promote a holistic vision of the university. Teaching the interplay between pure science and applied science (i.e., technology) is not a utopia because the distinction between pure science (so-called substantive knowledge) and applied science (or disciplinary knowledge) is already achieved by introducing the faith-reason dialogue in the classroom, namely, by taking into consideration the rationality of faith. This can be ensured by adopting the special knowledge model of faith and, in so doing, by exploiting the special cognitive faculties of our human nature that go beyond the sources of evidence and whose deliverances can become part of the believer's experiential evidence. Maintaining the faith-reason dialogue, open and active in the classroom, not only contributes to engaging students in the science classroom with controversial religious questions, such as the purpose of life and bioethical issues, but also empowers students to attain knowledge of the Divine Creator of such beauty and perfection, knowledge that, in turn, sheds light on our own identity and the purpose of our lives on this earth. The cross-seeding that the interrelationship between faith and scientific reason can introduce in the classroom is necessary if we want to empower students of science to become the next generation of true scientists because, as Einstein famously said, "science without religion is lame; religion without science is blind" (Einstein 2011, p. 19).

The universal and liberal attributes of Catholic education make it the perfect environment for teaching students what pure science is and to enable them to appreciate what true scientific knowledge is, so they can enjoy the *mysticism* of science. When teaching students science, it is paramount to make them aware of the fundamental difference between pure science and technology. If the primary scope of technology and applied science is to benefit humankind and to seek profit and gain—even if this means damaging natural resources and the inhabitants of the natural world (including other human beings)—it is problematic. Conversely, the primary aim of pure science is to enable the human mind and soul to be raised, from the material world, to the contemplation of the Divine Creator who made the incomparable beauty that surrounds us "since the creation of the world [God's] invisible nature, namely His eternal power and deity, has been clearly perceived in the things that have been made" (Rom 1: 20).

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Conflicts of Interest: The author declares no conflict of interest.

References

Aczel, Amir D. 2014. *Why Science Does Not Disprove God*. New York: Harper Collins Publishers.
Angioni, Luigi. 2016. Aristotle's Definition of Scientific Knowledge (APo 71b 9–12). *History of Philosophy & Logical Analysis* 19: 140–66.
Bacon, Francis. 2004. Novum organum. In *Instauratio Magna Part II: Novum organum and Associated Texts*. Edited by Graham Rees and Maria Wakely. Oxford: Clarendon.
Banchetti-Robino, Marina. 2020. *The Chemical Philosophy of Robert Boyle: Mechanicism, Chymical Atoms, and Emergence*. New York: Oxford University Press.
Barnes, Jonathan. 1994. *Aristotle: Posterior Analytics*, 2nd ed. Oxford: Clarendon Aristotle Series.
Billingsley, Berry, and Mehid Nassaji. 2020. Perceptions of the relationships between science and religion held by upper-secondary school students in Church of England schools. *International Journal of Christianity & Education* 24: 153–78.
Bonaventure, Saint. 1993. *The Journey of the Mind to God*. Translated by Philotheus Boehner. Indianapolis: Hackett Publishing Company.
Camosy, Charles. 2018. Vatican Astronomer Says Studying Cosmos Is 'Worship'. *Crux*. Available online: https://cruxnow.com/interviews/2018/04/vatican-astronomer-says-studying-cosmos-is-worship (accessed on 21 April 2022).
Collini, Stefan. 2012. *What Are Universities for?* London: Penguin.
Consolmagno, Guy. 2008. God and the mysteries of the universe. *Thinking Faith*. Available online: https://www.thinkingfaith.org/articles/20080411_1.htm (accessed on 2 May 2022).
Consolmagno, Guy. 2012. The new physics and the old metaphysics: An essay for the use of Christian teachers. *International Studies in Catholic Education* 4: 111–21. [CrossRef]
Davies, Paul. 1982. *The Edge of Infinity: Where the Universe Came from and How it Will End*. New York: Simon and Schuster.
Davis, Robert Glenn. 2017. *The Weight of Love: Affect, Ecstasy, and Union in the Theology of Bonaventure*. New York: Fordham University Press.
De Chardin, Pierre Theilard. 1933. La signification et la valeur constructice de la souffrance. In *Oeuvres VI*. Paris: Seuil.
Drago, Antonio. 2017. What was the role of Galileo in the century-long birth of modern science. *Philosophia Scientiae* 21: 35–54. [CrossRef]
Einstein, Albert. 2011. *Out of My Later Years*. New York: Open Road Integrated Media.
Enders, Jürgen, and Musselin Christine. 2008. Back to the future? The academic profession in the 21st century. In *Higher Education to 2030 (Vol. 1): Demography*. Paris: OECD Publishing, pp. 125–50.
Farah, Kimberly S., and Joann M. Montepare. 2019. Communities by design. *Journal of College Science Teaching* 48: 24–29. [CrossRef]
Farber, Paul L. 1982. The Transformation of Natural History in the Nineteenth Century. *Journal of the History of Biology* 15: 145–52.
Francis. 2015. *Laudato Si'*. Encyclical Letter. Citta' del Vaticano: Libreria Editrice Vaticana.
Gare, Arran. 2018. Natural Philosophy and the Sciences: Challenging Science's Tunnel Vision. *Philosophies* 3: 33. [CrossRef]
Guarino, Thomas. 2001. Fides et ratio: Theology and contemporary pluralism. *Theological Studies* 62: 675–700. [CrossRef]
Hammond, Jay M. 2009. Bonaventure's "Itinerarium": A "Respondeo". *Franciscan Studies* 67: 301–21. [CrossRef]
Hampson, Peter. 2006. Credible Belief in Fides et Ratio: I Explanatory constraints in philosophy, science and religion. *New Blackfriars* 87: 482–504. [CrossRef]
Hatch, Joshua. 2018. Building better science teachers. *Nature* 562: S2–S4. [CrossRef] [PubMed]

John Paul II. 1988. *Letter of His Holiness John Paul II to Reverend George V. Coyne, S.J. Director of the Vatican Observatory*. Citta' del Vaticano: Libreria Editrice Vaticana.
John Paul II. 1998. *Fides et Ratio*. Encyclical Letter. Citta' del Vaticano: Libreria Editrice Vaticana.
Ker, Ian. 2011. Newman's idea of university and its relevance for the 21st century. *Australian eJournal of Theology* 18: 19–32.
Lash, Nicholas. 1990. "A Seat of Wisdom, A light of the World": Considering the University. *Louvain Studies* 15: 188–202. [CrossRef]
MacIntyre, Alasdair. 2009. The very idea of a university: Aristotle, Newman, and us. *British Journal of Educational Studies* 57: 347–62. [CrossRef]
Newman, John Henry. 1996. *The Idea of a University*. New Haven: Yale University Press.
Odden, Tor Ole, Alessandro Marin, and John L. Rudolph. 2021. How has Science Education changed over the last 100 years? An analysis using natural language processing. *Science Education* 105: 653–80. [CrossRef]
Ofsted. 2021. Research Review Series: Science. Available online: https://www.gov.uk/government/publications/research-review-series-science/research-review-series-science#organising-knowledge-within-the-subject-curriculum (accessed on 20 April 2022).
Oxford. 2009. *Oxford Dictionary*, 3rd ed. Oxford: Oxford University Press.
Plantinga, Alvin. 2000. *Warranted Christian Belief*. New York: Oxford University Press.
Plotinus. 1991. *The Enneads*. Translated by Stephen MacKenna. London: Penguin Books.
Pogukaeva, Nataliya V., Natalia M. Pancova, and Evgeniya V. Syryamkina. 2016. Innovation strategies for education: Liberal and utilitarian educational tendencies in the higher education system. *SHS Web of Conferences* 28: 01082–01087. [CrossRef]
Polkinghorne, John. 1988. *Science and Creation: The Search for Understanding*. Bristol: SPCK.
Polkinghorne, John. 2011. The incompleteness of science: Reflections for Christian teachers and for other interested in science-religion relationship. *International Studies in Catholic Education* 3: 136–44. [CrossRef]
Reddings, Bill. 1996. *The University in Ruins*. Cambridge: Harvard University Press.
Roberts, J. M. 1990. 'The Idea of a University' Revisited. In *Newman after a Hundred Years*. Edited by Ian Ker and Alan G. Hill. Oxford: Clarendon Press.
Røe, Yngve, Slawomir Wojniusz, and Annette Bjerke Hassen. 2022. The digital transformation of higher education teaching: Four pedagogical prescription to move active learning pedagogy forward. *Frontiers in Education* 6: 784701–784707. [CrossRef]
Ross, Sydney. 1962. The Story of a Word. *Annals of Science* 18: 65–85. [CrossRef]
Roztocki, Narcyz, Piotr Soja, and Heinz Roland Weistroffer. 2019. The role of information and communication technologies in socioeconomic development: Towards a multi-dimensional framework. *Information Technology for Development* 25: 171–83. [CrossRef]
Ruskin, John. 1903. Ariadne Florentina. In *The Complete Works of John Ruskin*. Edited by E. T. Cook and Alexander Wedderburn. London: George Allen, pp. 291–462.
Sacks, Jonathan. 2011. *The Great Partnership: Science, Religions and the Search for Meaning*. New York: Schoken Books.
Sanda, Dragos C., Luana A. Smarandoiu, and Costea Munteanu. 2017. The dialogue between science and religion: A taxonomic contribution. *Religions* 8: 35. [CrossRef]
Schrödinger, Erwin. 2014. Science and Humanism. In *Nature and the Greeks and Science and Humanism*. Cambridge: Cambridge University Press, pp. 103–72.
Stinissen, Wilfrid. 2011. *Into Your Hands, Father: Abandoning Ourselves to the God who Loves Us*. San Francisco: Ignatius Press.
Svendsen, Bodil. 2021. The nature of science and technology in teacher education. In *Teacher Education: New Perspectives*. Edited by Ulas Kayapinar. London: IntechOpen.
Torpey, John. 2020. A sociological agenda for the tech age. *Theory and Society* 49: 749–69. [CrossRef] [PubMed]
Ward, Keith. 2008. *The Big Questions in Science and Religion*. West Conshohocken: Templeton Foundation Press.
Webster, John. 2000. 'Fides et Ratio', articles 64–79. *New Blackfriars* 81: 68–76. [CrossRef]
Weinandy, Thomas. 2000. Fides et Ratio: A Response to John Webster. *New Blackfriars* 81: 225–35. [CrossRef]
Whewell, William. 1834. On the Connexion of the Physical Sciences; By Mrs. Somerville. *Quarterly Review* LI: 54–68.
Willets, David. 2017. *A University Education*. Oxford: Oxford University Press.
Winston, Robert. 2005. *The Story of God*. London: Bantam Press.