



KEPLER AND THE SACREDNESS OF NATURAL SCIENCE

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Some scholars still seem to believe that modern science arose as a revolt against religion. According to them, science and religion can never go together. These two have been engaged in an unending war, with science emerging victorious each time. This is the recurrent theme in books like A.D. White's *A History of the Warfare of Science with Theology in Christendom*.¹ Some other scholars do not subscribe to such a "conflict view," but support a "compartmentalist view," according to which science and religion can coexist with mutual respect, but with no constructive interaction between the two. Well-known sayings like "When Faraday opens the door of his laboratory, he closes the door of his oratory" remind one of this compartmentalistic relationship. However, a close look at the history of the origin of modern science in the sixteenth and seventeenth centuries reveals that the founding fathers subscribed neither to the conflict nor to the compartmentalist view. Copernicus, Kepler, Galileo, Descartes, Leibniz, Newton, etc. were deeply religious persons, who found genuine harmony between their life as successful scientists and faithful religious persons.² It is quite clear in the case of these great scientists that in their life science and religion, far from being a cause of conflict, were a source of enrichment, mutually complementing each other. This was particularly true of Johannes Kepler. He could become an outstanding founder of modern science not by distancing his science from his religion, but rather by integrating the two. For him the universe

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was something sacred, and science, the study of that universe, was a sacred profession. Science, nature, and the sacred formed an unbreakable triad. This paper is a study of Kepler's holistic view of science and its relevance to us today. It seems to me that the conflict view is a later development that arose due to the particularization and consequent impoverization of the initial goals of science for pragmatic and technological gains; recapturing of the genuine Keplerian spirit can counteract this process of impoverization without jeopardizing the positive gains of science.

The Keplerian Program

Kepler was a born scientist. The basic scientific instinct - the desire to understand the structure and operations of nature on the basis of observable data - was an integral part of his personality. At the same time he was a deeply religious person, who placed religion at the very center of his whole life. "I am a Christian," he declared to Herwart, his life-long patron-friend and correspondent. "I have accepted the Augsburg confession (the Lutheran articles of faith), and I adhere to it. I have not learned to be a hypocrite. I am in earnest with my religion, I don't play with it."³ In him science and religion merged almost seamlessly, nurturing and nourishing each other. This fact is at the basis of his synthetic mode of thought. In his thought process the religious, the philosophical, and the empirical (scientific) formed one unified whole. One may say that his basic unit of thought was "interconnected categories," his thought

pattern was of the "interlocking" type. I have argued elsewhere that this holistic approach was the secret of his success in the discovery of the Laws of Planetary Motion.⁴

This synthetic and broad-based approach defined his scientific program as well. The goal of his science was not just to solve some highly specialized, esoteric puzzle, which can hardly have any real relevance to life as a whole. His scientific quest was for nothing less than "to read the mind of God." He wanted to know the plan of God, as he points out right in the beginning of his *Mysterium Cosmographicum*: "It is my intention, reader, to show in this little book that the most grand and good Creator, in the creation of this moving universe, and the arrangement of the heavens, looked to those five regular solids, ... and that he fitted to the nature of those solids, the number of the heavens, their proportions, and the law of their motions."⁵ His physics was not limited to the narrow realm of the measurable and the quantifiable, but extended to the totality of our experiential world. He wanted to know not only how God created the universe, but also when this creation took place. He was the first to suggest a scientific method to calculate the age of the universe. Indeed Kepler was the first scientific cosmologist.

His basic method too was governed by this synthetic spirit. He was ready to accept ideas and data from whatever sources they came, provided they satisfied certain rational criteria. Many of the fundamental ideas of modern science had their origin in the creative and open-minded approach of Kepler's genius.

A careful and sympathetic study of Kepler's life and works reveals that he could accomplish all these extraordinary feats almost single-handedly and without the benefit of helpful precedence because he accepted no fissure between his science and his religion, because he had a positive outlook towards the material world, and because he looked at science as a sacred mission.

Kepler's Idea of Religion and the Sacred

The Keplerian understanding of religion and the sacred was closely linked to his idea of God and hence a short discussion of his God is necessary. His was a God-originated, God guided, and God-oriented view because he believed that God was the source, guide, and sole goal of his thought and works in every detail. Max Caspar, the greatest Kepler scholar of our century, summarizes this idea: "God is truth, and service to truth proceeds from him and leads to him, God is the beginning and end of his scientific research and striving. Therein lies the keynote of Kepler's thought, the basic motive of his purpose, and the life-giving soil of his feeling."⁶ One can hardly thumb through a page of his works (except when he is discussing purely technical points and calculations) without encountering the mention of God, at least indirectly. Several of his major works (especially the ones announcing his most important discoveries) begin and end with a prayer of thanksgiving and praise to the Almighty. For instance, when he broke the news to Michael Maestlin, his most respected and most trusted teacher in Tübingen, for the first time about his very first discovery of the polyhedral theory⁷ he wrote:

"God who is the most admirable in his works may deign to grant us the grace to bring to light and illuminate the profundity of his wisdom in the visible (and accordingly intelligible) creation of this world."⁸

Thus exceedingly excited though he was about this discovery, he took it not so much as a personal victory or achievement as an occasion to admire the profundity of God's wisdom. Again, in his introduction to the *Astronomia Nova*,⁹ his most scientific and highly technical book, he invited the reader to join him

to praise and glorify with me the wisdom and greatness of the Creator, which I have revealed in a deeper explication of the form of the universe, in an investigation of the causes, and in my detection of the deceptiveness of sight. Let him not only extol the bounty of God in the preservation of living creatures of all kinds by the strength and stability of the earth, but also let him acknowledge the wisdom of the creator in its motion, so abstruse, so admirable.¹⁰

According to Kepler, the whole laborious work he accomplished in the AN was directed to the praise and glory of God. It was this sublime goal that made it valuable and worthwhile. The *Harminices Mundi* he considered the highest point of his life, the fulfillment of his life ambition. He made no secret of this fact when he wrote concerning what he had accomplished through this book: "The purpose which drove me to spend the best part of my life in studying astronomy, to seek out Tycho Brahe, and to choose Prague as my home, that with God's help I have finally fulfilled."¹¹ In this book also the same sentiment pervaded. In the very beginning of the most important part of this work (Book V) he quoted Galen, obviously making the latter's words his own: "I

commence a sacred discourse, a most true hymn to God the Founder, and I judge it to be piety, not to sacrifice many hecatombs of bulls to Him and to burn incense of innumerable perfumes and Cassia, but first to learn myself, and afterwards to teach others too, how great He is in wisdom, how great in power, and of what sort in goodness."¹² In the same introduction he affirmed that the "finger of God" was guiding him in this discovery and in an exuberant frenzy he cried out: "I am free to give myself to the sacred madness, I am free to taunt mortals with the frank confession that I am stealing the golden vessels of the Egyptians, in order to build of them a temple for my God, far from the territory of Egypt."¹³ Once more the purpose of all these years of toil was to build a fit temple for his God. Naturally he concluded this long book imitating the royal Psalmist: "Great is our Lord and great his power, and of [the works of] His wisdom there is no number... for from him, through him, and in him are all things both the sensible and the intelligible.... To him be praise, honor and glory, world without end, Amen."¹⁴ Caspar points out that the very last sentence in his last letter was: "Hold fast with confidence along with me to the only anchor of the Church, prayers to God for it and for me."¹⁵

The passages above paint a person who was intoxicated with the idea and experience of God. But I will go further to suggest that the idea and felt-experience of God had a crucial role to play in all his works and thoughts. God played a substantive role in his system. Indeed, God was one of the principal explanatory

factors for him. For instance, he wrote in the *Mysterium Cosmographicum*: "I think that from the love of God for man a great many of the causes and of the features in the universe can be deduced."¹⁶ God was no intruder from outside, nor was God an afterthought cunningly introduced to placate some fanatic censor. The often-quoted and often-imitated Laplacian claim that a scientific system has no need of God would have been utter nonsense for Kepler. Holton suggests this same idea: "In the end, Kepler's unifying principle for the world of phenomena, is not merely the conception of mathematical forces, but God . . ."¹⁷ Indeed the idea of God was fundamental for Kepler because on it was based his understanding of the universe and the laws governing it. Science also became purposeful and meaningful for him because of its relation to God. In short, Kepler's concept of God was at the basis of his science, cosmology, metaphysics, epistemology, and philosophy of man.

Kepler's idea of the sacred arose from this God. His God possessed not only many traditional attributes (the *Optimus Creator*, Trinitarian nature, simplicity, rationality, etc.), but also certain non-traditional ones, at least as far as the Christian tradition went. Thus his God was a geometer and a harmony-loving musician. The presence of these latter attributes revealed the influence of his scientific spirit on his conception of the divine.

The Keplerian Triangle

Being the foundation of his synthetic system, God was

intrinsically linked to both the humans and nature or the visible universe. This idea can be best expressed by what I call the Keplerian triangle. God, the human being, and nature formed the three corners of this triangle. He said in a letter to Herwart written on April 10, 1599: "The world is the corporeal image of God, whereas the soul is the incorporeal, though created, image of God."¹⁸ The human being is created in the image and likeness of God and the universe is the reflection of the same God. Thus God, the human being, and the visible universe are intimately interlinked. God is the creator, the human being is the knower, and the universe is the known. Science is the means par excellence for this process of knowing. In such a view there is absolutely no room for tension between science and religion.

Kepler's Idea of Nature

Kepler had a very positive view towards the material universe. Although today we take such an attitude for granted, this was far from the case in the time of Kepler, when the material world was considered a source of sin and detachment or running away from it prescribed as a necessary condition for leading a virtuous life. That this negative view was quite prevalent in his time was quite evident from the heated exchanges he had with his priest-friend Pistorius. In one of his friendly letters to the astronomer, the ailing old Pistorius mentioned that he hoped that death would free him from the "inaneities of the world" and that he would be led to his true heavenly home to participate in his heavenly heritage.¹⁹ Uncharacteristically, Kepler wrote a mer-

ciless and sharply worded letter to his friend. He did not try logically to refute the old priest's views, rather he unleashed a passionate and sarcastic *ad hominem* attack against Pistorius' Catholic religion. The gist of his reply was that the emphasis on the "inanities of the world" and the disdain for the present world, instead of being a source of sanctity, was, in fact, at the root of the abuses and corrupt practices in the Catholic Church.

Not only the religious tradition of his day, the philosophical tradition also held that the world was imperfect and that we could not have a perfect knowledge of nature. Plato had argued that the Demiurge could not produce a perfect world. It produced the various things in the universe by imposing copies of eternal forms onto matter. But since the forms did not fully fit with matter, the material things produced by this process remained imperfect. Not only that, Plato believed that matter had a tendency to wiggle out of the influence of the infused or imposed forms. Thus, according to his view in the *Timaeus*, the material world was neither perfect, nor could we have a perfect knowledge of it. Aristotle also believed that we could not have perfect knowledge of the physical world because knowledge about it could not yield perfect accuracy. Hence both metaphysically and epistemologically the world was imperfect: metaphysically because it had been produced imperfectly, epistemologically because it was never amenable to accurate scrutiny and investigation.

In sharp contrast to this long-standing tradition, Kepler

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held an extremely sacred and positive view towards the universe. It was the "bright temple of God."²⁰ Involvement in the world was not a burden imposed on the human race in the Garden of Eden. Indeed, he believed that the universe and involvement in it through scientific research was his sure means to reach heaven.²¹ As he wrote to Fabricius, "for me nature aspires to divinity."²² The positive outlook he had toward the created world rendered his scientific work meaningful and purposeful.

According to Kepler the sacredness of nature has a directly divine origin; nature is divine because it is the true reflection of the triune God. As we have seen, he believed in a geometer God, who is perfect and Trinitarian. Hence he argued that our universe, the true reflection of this divine being, must be a perfect sphere, since the sphere is the perfect geometrical body with three fundamental components: "The sphere possesses a threefold quality: surface, central point, intervening space. The same is true of the motionless universe: the fixed stars, the sun and the aura or intermediate aether; and it is also true of the Trinity: the Father, Son, and Holy Ghost."²³

This is about the motionless universe. A similar relationship exists in the case of the mobile universe as well. The mobile universe for him is made up of the sun and the known planets of the day.

The sun in the middle of the moveable, being immoveable itself and yet the source of motion, bears the image of God the Father, the creator. Now what creation is to God, so is motion to the sun. Thus it moves [the bodies in the space within] the fixed stars, just as the Father creates in the Son Again the sun disperses a moving power through the

medium in which are the moveables, and in just this way the Father creates through the Spirit or through the power of the Spirit.²⁴

Thus the general structure of the universe is modeled after the Trinitarian God. Just as the Trinity has three distinct, yet intimately related parts and neither can be complete without the other, the universe too has three parts which are intrinsically interrelated.

Is the similarity just a heuristic one, just an analogy designed to make the mystery of the Trinity intelligible to simple people? Kepler certainly wanted to make the mystery as intelligible as possible, but the Trinitarian model, far from being a figment of the imagination for heuristic purposes, is an archetype of the universe, a real blueprint of the universe. In his own words, "Nor should it be taken as a meaningless resemblance, but it should be reckoned as one of the causes, as a form and archetype of the universe."²⁵ According to him, the universe does literally have a Trinitarian structure.

Kepler saw God's creative work also mirrored in the universe. The passage above made direct reference to it. He compared the creative power of the Father to the motive power of the sun. The "outflow" of the Father gave rise to created beings, the "outflow" of the sun gives rise to planetary motion. The Father carried out his creative work through the Holy Ghost. In the same way, the sun diffuses and expends its motive power through the *intermedium*.

It should come as no surprise that his comparing of the

universe to the Trinity is considered bizarre by present day Kepler scholars, just as it was considered so by his contemporaries. Not a single one of his critics has been highly impressed with such a scheme. Even the often sympathetic Koyr  considers it odd and absurd, although he does point out that this strange view produced positive and beneficial results in Kepler's scientific research. Kepler seems to have had good reasons to expect that the world was created by God after the model of God's own nature. If God found the Trinitarian "structure" the best, then it was only natural that the best and wisest creator who wanted to create the best universe should choose a Trinitarian structure for creation. If geometry is the essence of God,²⁶ if the sphere is the most perfect geometrical structure, then it should not be surprising that the Trinity is spherical in structure.

This view of the universe enabled Kepler to see constantly a parallel between the supernatural and the natural, between the divine and the mundane. He looked for further instances of this parallel in the universe. For him the material world is a reflection of the heavenly or divine one. This situation is analogous to the fundamental Platonic postulate dividing the universe into the worlds of Ideas and material things, the latter being a reflection of the former. However, unlike Plato, Kepler believed that the material world, though a reflection of the divine, is perfectly real. This conviction and this search guided and assisted him significantly in his long Odyssey to the discovery of the laws of planetary motion.²⁷

The Keplerian Idea of Science

Since Kepler's idea of science or study of nature was deeply rooted in his view of God and nature, he had a very positive attitude towards science. It was nothing but the investigation of the "sacred temple of God." Obviously, he was convinced that the study of nature was something sacred. He explained this belief in terms of the ideas on the "Book of Nature" and the "Book of Scripture."

God reveals not only by words, but also by deeds. According to Kepler, nature is a sacred book with a sublime message to all humankind. As he put it in the *Epitome*, "this is the very Book of Nature in which God the creator has proclaimed and depicted his essence and his will toward man in part and in a certain wordless kind of writing."²⁸ Just as we can come to know the personality and greatness of an author through his/her book, we can come to know God through the Book of Nature. In fact, God "wishes to be known through this Book of Nature."²⁹

The specialty of his interpretation of this theme consisted in relating the Book of Nature to the Book of Scripture in an original way. He placed them on a par. Both are aspects of one and the same reality, complementing each other, and thereby giving humans a further and more complete manifestation of God. He argued that since God has mouth and hands, God reveals through both, the word of God proceeding from mouth and the deed of God from hands. The Book of Scripture recounts the word of God, whereas the Book of Nature the deed of God. Hence both are

sacred, both are worthy of our total respect and attention. This conclusion has an extremely significant consequence: science, which is the study of the Book of Nature, becomes a profession very analogous to Scriptural theology. Thus this theme is at the basis of his perception of the nobility of science. Obviously, his belief about the nobility and importance of science followed from his religious ideas.

The theme of the Book of Nature was neither new nor unique to Kepler, since some of his predecessors³⁰ and contemporaries talked about it. For instance, Galileo spoke of the Book of Nature written in the language of mathematics. What was special about Kepler was the distinct way he used this theme and the unique role it played in forming his mode of thinking and acting. This idea in a way revolutionized his whole life, providing it with a new direction. To be a priest of God in the Lutheran Church was his great ambition. Accepting the job of a mathematician-astronomer in Graz he viewed only as a temporary avocation. But the perception of the full significance of the Book of Nature transformed his life vocation. As we will discuss soon, he now realized that he could be both a priest of God and an astronomer.

The Sacred Character of Astronomy

It was obvious to Kepler that if the Book of Nature is something sacred, then the study of nature has to be something sublime, just like the study of Scripture. For a person to whom the universe is the "sacred temple of God" this conclusion has to

follow, since astronomy is nothing but the study of this sacred temple. But the theme of the Book of Nature elevates astronomy to an even higher plane. It is not just the study of the temple or abode of God, it becomes the study of the very person of God manifested in and through nature, just as the study of the Book of Scripture is not just the study of God's verbal communication, but also of God communicating to us. He affirmed this sacredness again and again in his writings. For instance, in AN he asserted that it was "the divine voice that calls humans to learn astronomy."³¹

That the study of astronomy is something noble and sublime also was no new idea. After all, already the Pythagoreans, Plato, and the other ancient Greeks believed that the heavens were the abode of the gods and any study of them could be considered a pious act. An epigram in some of the manuscripts of Ptolemy's treatises confirms this belief: "I know that I am mortal by nature, and ephemeral: but when I trace at my pleasure the windings to and from of the heavenly bodies I no longer touch earth with my feet: I stand in the presence of Zeus himself and take my fill of Ambrosia, food for the gods."³² Copernicus expressed a similar view when he referred to astronomy as "a divine rather than human science, which investigates the loftiest subjects"³³ Thus Pythagoras, Plato, Ptolemy, Copernicus and others had recognized the nobility of astronomy, and hence Kepler's conclusion was nothing new. However, his reasons were new. For him astronomy was not a study of something incidental

and external to God, but was a study of something intimate to God.

Astronomers Are Priests

One of the direct consequences of placing the Book of Nature and the Book of Scripture on a par with each other was that, for Kepler, astronomers became priests of the Almighty. Just as ordinary priests are ministers of the Word of God, astronomers are ministers of the Deed of God. Ordinary priests give glory to God by expounding the mysteries in the Book of Scripture, whereas astronomers do the very same by explaining the mysteries in the Book of Nature. He emphasized this conviction repeatedly in his correspondence with friends: "Indeed I am of the opinion that since astronomers are priests of Almighty God with respect to the Book of Nature, we should concern ourselves not with the praise of our cleverness but with the glory of God."³⁴ This was no merely pious statement, as far as he was concerned. Nor was it offered as a rationalization to justify to him and to his relatives and friends his decision to discontinue his pursuit to become a Lutheran priest. He really meant it, as was evident in the way he lived out his conviction: with the zeal of a priest-missionary, he fully dedicated himself to astronomy with utter selflessness. Even in his most mature age he remained faithful to this conviction, as could be seen from the fact that he wanted the *Epitome* to be interpreted as a hymn that he composed as the "priest of God at the Book of Nature."³⁵ His long reluctance to compose Tycho Brahe's refutation of Ursus too could be under-

stood, at least in part, from this perspective. For, according to him, as an astronomer Tycho must be concerned about the glory of God, not about the gratification of his ego and false pride. It was common knowledge that the principal reason for the Dane's insistence on a refutation even after the death of his victim was to boost his own ego.

This conviction that astronomers are priests of God the Almighty had a crucial influence on his thoughts and works. No one can fully follow his later works and train of thought without fully understanding and appreciating the importance he placed on this conviction. I have already pointed out that in all his major works he had only one goal in view: to praise and glorify God as his priest. This kept him going even when the road was filled with formidable obstacles. This kept him from giving in to disappointments over many failures, because the priest of God does not look for his own comforts and glory, he is happy as long as God is glorified in his efforts. Furthermore, this conviction defined the goal of science or astronomy for him. The aim of science was to discover the plan of God, the thought of God, not to play God over nature, not to have power over nature so as to control it, as Francis Bacon would have it. It was to discover in this plan God's great wisdom and love for humankind so that we can praise the Divine Majesty all the more.

Science and Religion Reconciled

The theme of the Book of Nature and his consequent belief that astronomers are priests of God led Kepler to believe that

science and religion are collaborators rather than contenders. From this theme it followed that both ordinary priests and astronomers have a sublime vocation to perform a sacred function. Their works complement rather than compete with each other. Hence one can be a scientist and a believer, there is no real conflict between science and religion.

This positive view about the interrelationship between science and religion can explain his emphasis on the importance of explanation in terms of physical principles and forces. Kepler was the first to insist on discovering physical causes to explain natural phenomena. Most of his contemporaries and predecessors believed that explanation of natural phenomena by means of physical causes engendered atheism and undermined belief in God because such an explanation attempted to exclude God. Fabricius, for instance, subscribed to this view. However, Kepler argued that such fears were unfounded and arose from a lack of right perspective. Given his view of the universe, it becomes clear that physical principles and forces are the manifestation of God and hence using them redounds to God's glory rather than reduces it. Therefore scientific explanation can and does add to God's glory rather than detract from it. Science is no robber or enemy of God, but a devoted servant and admirer of the divine Master. In this way Kepler could experience no tension between being a faithful believer and a dedicated scientist.

Later Developments: The Particularization of Science

The smooth harmony between science and religion was not

limited to Kepler only. One could see a similar situation in the case of other stalwarts like Descartes, Leibniz, and Newton, though in varying degrees. However the situation changed in course of time and the two got alienated from each other. In the rest of this paper I shall attempt to point out that the alienation came about not because there is anything intrinsically wrong with religion or because it has ceased to be relevant to humans. The tension has arisen because the two tend to emphasize two different aspects of reality: science emphasizes the changing nature of reality, whereas religion stresses its permanent nature. Although change and permanence are ordinarily looked upon as antithetical, in the context of reality they can be complementary, rather than contradictory. It may be noted that the difference is one of emphasis only since science also is concerned with permanence just as a true religion should be open to change.

Science is an ever changing enterprise: everything in science changes: its concepts, laws, theories, methods, criteria, goals, domains, etc. This changing nature has gradually led science to move away from the Keplerian holistic view to one of particularization or extreme specialization.

Mechanical Philosophy of Nature

The most conspicuous and perhaps the most successful step in this process of particularization of science came in the mechanization of nature, which consisted basically in considering the whole universe of our experience as a gigantic machine following the laws of Newtonian mechanics. The tremendous success enjoyed

by Newtonian mechanics lent justification and credibility to this view. In its extreme, the mechanical philosophy of nature held that all meaningful phenomena should be accounted for in terms of laws and methods of mechanics, and whatever could not be so explained was not only non-scientific, but even unreal. In such a narrow perspective of science, religious principles naturally became unwelcome aliens.

According to this view, the scientific domain was limited to the world of the measurable and the quantifiable. Anything that could not be subjected to exact measurement and mathematization became alien to science. Exact predictability became a necessary condition for true scientific knowledge. Since religious knowledge could neither be quantified nor exactly predicted, this trend too contributed to the estrangement between science and religion.

One natural outcome of these developments was the downgrading of feelings and emotions. The mechanical sciences were not at all capable of analyzing and studying emotions and feelings. But this was never regarded as a weakness because of the inferior status accorded by these sciences to the non-rational. Religion was looked upon as belonging to the world of emotions and feelings and hence alien to science.

Although the mechanical philosophy of science has gone out of popularity in the twentieth century, thanks to the exposing of its limitations, the advent of Einstein's relativity, and the development of quantum theory, even today some of its basic

spirit is prevalent in many intellectual circles. It manifests itself in different forms. For instance, some of the claims of contemporary artificial intelligence (AI) are along the lines of the mechanical philosophy of nature, especially when AI hopes to explain the whole of human mental activity in terms of purely material, though highly sophisticated, processes.

No doubt, this process of gradual specialization produced extremely beneficial results for science and for the good of humans. The phenomenal success science has achieved in the past and present should be attributed, to a great extent, to this focussing on very specific and limited aspects of reality.

This process also had harmful consequences on science and humanity. Science has become too much influenced by narrow rationalism, foreclosing entry to everything that fails to fit into the straightjacket of narrow rationality. This has resulted in science missing out several important aspects of reality, such as feelings, emotions, experience of beauty, harmony, etc. Also total independence or isolation from moral and religious principles has, at times, turned science into a frightening monster ready to devour the hands that feed it. Science has become impersonalized, and, in some ways, alienated from real life. From the synthetic view it has become more and more analytical. From a holistic approach to reality, it has turned to a fragmented approach and has begun losing sight of reality as a whole. It looks as though science has become "heartless." All these consequences have led to a tragic "impoverization" of science. Einstein seems

to have echoed this note when he said "Science without religion is lame."²⁴

Religion too had its share of responsibility in building up this unhealthy tension. Although every religion treasures certain permanent values and principles, it is never meant to be unchanging or inflexible. After all, religion is meant for humans, who change constantly. This spirit of flexibility and adaptability is quite noticeable in Christianity. The God of the Old Testament is the same God of the New Testament, but there are significant changes in the religious values and principles when one moves from the Old to the New. This is very clear from Christ's words, especially in St. Mathew's Gospel, chapter 5: "You have heard that people were told in the past.... But now I tell you...." Scholars of other religions may point out the same dynamism in other religions also.

Unfortunately this spirit of openness to changing conditions in the world was not always practised by religious people. History of religions tells us that certain powerful agents in different religions frequently attempted to stifle this dynamism and flexibility. This has resulted in the failure of religions to recognize the need to change in order to adapt themselves to the evolving situation. I believe that this was one of the major reasons for the tension between science and religion, not the claim that religion is wrong-headed.

Often it is argued that the alienation of religion from science has come because of the superstitions and false beliefs

in religion. Proponents of this view seem to hold that science opposes superstition and untruth, whereas religion seems to foster such beliefs. Indeed, there were superstitious and incorrect beliefs in religions and a process of purification was (and, in some cases, still is) often necessary for them. But this is no reason enough for a divorce between science and religion. After all, in the time of Kepler and Newton also there were such beliefs in religion, even to a higher degree than today. That did not stop Kepler from having a harmonious view between the two. It will be presumptuous for us to think that he was less aware of this problem or less critical of it. Indeed there is clear evidence that Kepler was highly critical of the religions of his day: he refused to go along with the doctrine of Ubiquity³⁷ of the Lutherans, he refused to accept the doctrine of predestination of the Calvinists, he rejected the doctrine of infallibility of Roman Catholics.

It should be noted that science too had its share of mistaking incorrect beliefs for truth. History of science can present many illustrative cases. After the so-called crucial experiment by Foucault and Fizeau in 1850 most scientists believed that light was nothing but waves and that the particle theory was completely wrong. But in 1905, thanks to Einstein's theory of the photoelectric effect, they had to accept their mistake. In the second half of the nineteenth century ether was thought to be a real thing. But today we know that it was only an illusion. There is no reason to believe that such mistakes will not be repeated in

science. Just like religion science too has the need to purify itself from false beliefs.

Our brief study of Kepler reveals that the Keplerian spirit unhesitatingly recognized the need for change without undermining the importance of permanent values. The desire for change and permanence blended harmoniously in his thoughts and works. He emphasized rationality and was firmly convinced that the universe was governed by rational laws; he opposed whatever he thought to be irrational. At the same time, he found a valid place for mysteries in our universe; he recognized the importance of emotions and feelings in human life and activities, as manifested in his emphasis on harmony and beauty in creation. This ability to harmonize the two essential aspects of life enabled him to become a successful scientist and a devoted believer. A rediscovery of the Keplerian spirit can open the doors for a genuinely constructive and fruitful interaction between science and religion.

Notes

1. (New York: Dover, 1960).
2. This is true of Galileo also, albeit his confrontations with the Church authorities. To the end he remained a devout Catholic.
3. Letter dated Dec 16, 1598, in *Gesammelte Werke*, ed. Von Dyck, Max Caspar (München: C.H. Beck'sche Verlagsbuchhandlung, MCMXLV), Vol 13, nr. 107, ll. 195-199. Hereafter this series will be referred to as GW.

4. See my book *The Discovery of Kepler's Laws: The Interaction of Science, Philosophy, and Religion* (Notre Dame: University of Notre Dame Press, 1994).
5. *Mysterium Cosmographicum*, tr. A.M. Duncan (New York: Abaris Books 1981), p. 63.
6. *Kepler*, tr. Doris Hellman (New York: Dover, 1993), p. 374.
7. The Theory which explains the arrangement of the different planets in the solar system in terms of the five regular solids which are nested within a series of concentric spheres. Kepler found that by placing appropriately the five regular solids within concentric spheres, one could closely approximate the spacing of the planets.
8. Letter to Maestlin, dated August 2, 1595, in GW XIII, nr. 21: ll. 60-63.
9. GW III. Henceforth this book will be referred to as AN.
10. GW III, p. 33: ll. 10-16, tr. O. Gingerich and W. Donahue, "Astronomia Nova," in *Great Ideas Today*, ed. Mortimer Adler and John van Doren (Chicago: Encyclopedia Britannica, 1983), pp. 321-322.
11. GW VI, p. 289: ll. 7-10, tr. Rudolf Haase.
12. GW VI, p. 287, tr. Charles Glenn Wallis, in *Ptolemy, Copernicus, Kepler*, Great Books of the Western World, vol. XVI, ed. Mortimer J. Adler (Chicago: Encyclopedia Britannica, 1982), p. 1009.
13. Ibid., p. 290: ll. 3-6, tr. *Ptolemy, Copernicus, Kepler*, p. 1010.
14. Ibid., p. 368: ll. 14-22.
15. Kepler's letter to Mathias Bernegger, dated October 21, 1630, in GW XVIII, nr. 1145: ll. 34-35. See also *Johannes Kepler: Life and*

- Letters*, ed. Carola Baumgardt (New York: Philosophical Library, 1951) p. 192.
16. *Mysterium Cosmographicum*, p. 107.
17. "Johannes Kepler's Universe: Its Physics and Metaphysics," *American Journal of Physics* 24 (1956), 350.
18. GW XIII, nr. 117: ll. 295-296.
19. See Pistorius' letter to Kepler, written on March 14, 1607, in GW XV, nr. 413: ll. 1-28.
20. *Johannes Kepler, Life and Letters*, p. 32.
21. Here one can see clearly the influence of Pythagoreanism and Neoplatonism. The former believed that engaging in the study of nature was a sure way to attain salvation, while the latter looked upon the universe as the manifestation of the Supreme Being.
22. Letter to Fabricius, dated July 4, 1603, in GW XIV, nr. 262: ll. 495-496.
23. Kepler's letter to Maestlin, dated October 3, 1595, in GW XIII, nr. 23: ll. 72-74.
24. *Ibid.*, nr. 23: ll. 78-84.
25. *Mysterium Cosmographicum*, p. 71.
26. Or it constitutes at least part of the essence of God.
27. This came about because he believed that the Bible revealed to us the true nature of God. Since this nature should be reflected in the universe, in his investigations he looked for such characteristics in the universe. It can be shown that he arrived at the need for a central motive cause for planetary motion by this method. Many scholars believe that this was the beginning of the Newtonian idea of

- force.
28. GW VII, p. 25: ll. 29-31.
29. Kepler's letter to Maestlin, written on October 3, 1595, in GW XIII, nr. 23: l. 254.
30. Long before Kepler it was known to some of the Neoplatonist scholars.
31. GW III, p. 108: l. 3.
32. Quoted by Gingerich, in *Great Ideas Today*, p. 139.
33. *De Revolutionibus*, tr. Edward Rosen (Baltimore: Johns Hopkins University Press, 1978), p. 7.
34. Kepler's letter to Herwart, written on March 25, 1598, in GW XIII nr. 91: ll. 182-184. See Nicholas Jardine, *The Birth of History and Philosophy of Science: Kepler's A Defense of Tycho Against Ursus* (Cambridge: Cambridge University Press, 1984), p. 9.
35. GW VII, p. 9: l. 12.
36. *Ideas and Opinions* (New York: Bonanza Books, 1954), p. 46.
37. A doctrine proposed by Luther, which claims that Christ is omnipresent at every enactment of the Lord's Supper.

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