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## **Mathematics as a Way Towards the Creative Logos: Joseph Ratzinger/Benedict XVI’s Understanding of Scientificity**

**Abstract:** The article presents Joseph Ratzinger/Benedict XVI’s view on mathematics as a way towards the creative Logos, and at the same time shows the understanding of scientificity presented by the present Pope Emeritus. For Joseph Ratzinger/Benedict XVI, mathematics is not only a tool of empirical sciences. The Pope looks at mathematics as: (1) a product of human intelligence, which, when reflected upon more deeply, also (2) leads to wonder and amazement at the mathematical character of created nature. Joseph Ratzinger/Benedict XVI considers the latter phenomenon as a way that can lead one towards the creative Logos. In this way, he presents a view on mathematics that goes against the current approach, which often tends towards the self-limitation of reason, towards accepting as the criterion of scientificity only that what is a result of mere cooperation between mathematics and empirics. According to the Pope, it is not science that redeems humans; they are redeemed by Love, by the incarnate Logos. Joseph Ratzinger/Benedict XVI shows the primacy of creative Reason as the decisive and indelible foundation of Christian faith.

**Keywords:** Benedict XVI, mathematics, Logos, reason, science

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### **Introduction**

There is no doubt that modern man, through the application of mathematics, with the help of science and technology, has extended his dominion over almost all of nature available to him; what he formerly expected mainly from “higher powers” he now obtains through his own action.<sup>1</sup> At the same time, this progressive “expansion” of the sciences, and especially their ability to subjugate

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<sup>1</sup> Cf. Vaticanum II, *Gaudium et spes*, no. 33.

nature by means of technology, that is, the growth of man's capabilities, raises further questions that go beyond the specifics of the sciences using mathematics as a tool. The questions concerning the mathematical and natural sciences seen from the Christian point of view – both in the contemporary perspective and in the perspective of past centuries – are the subject of many studies and publications. These problems are also present among the issues taken up by Joseph Ratzinger/Benedict XVI. Moreover, it should be noted that the Pope also conducts reflections focusing on the meaning and specificity of mathematics itself and on the mathematicality of nature, which is unique among papal teachings. He reflects on mathematics as a creation of the human mind, its application in the natural sciences, and their interrelationship. This paper will present Joseph Ratzinger/Benedict XVI's view of mathematics as a way towards the creative Logos, and at the same time it will show the understanding of scientificity presented by the present Pope Emeritus.

### **1. Regarding the issue of the mathematicality of nature**

It is worth noting that Benedict XVI repeatedly speaks of mathematics as a science in his teaching, which in itself is something unusual and thought-provoking. What's more, the Pope sees in mathematics (itself) above all as a source of admiration and great questions.<sup>2</sup> He presents considerations that could be included in the fields of philosophy of science and philosophy of nature. Benedict XVI first of all starts from the fact that mathematics, as such, is a creation of human intelligence.<sup>3</sup> It is an abstract system, an invention of the human mind, which does not exist in pure form in the world. On the one hand, mathematics, as a human intellectual system, is a great, simply brilliant achievement of human reason, and on the other hand, it can always be realized (technically) only approximately.<sup>4</sup> According to the Pope, what is

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<sup>2</sup> Cf. Benedict XVI, "Pastoral Visit."

<sup>3</sup> Cf. Benedict XVI, "Pastoral Visit."

<sup>4</sup> Benedict XVI speaks of mathematics being created by man. It is worth adding that one of the fundamental questions in the philosophy of mathematics is whether mathematics is created or discovered. Cf. Murawski, *Filozofia matematyki*, 23–25.

most surprising is the fact of the rationality (“intelligibility”) of the world<sup>5</sup> and the mathematicalness of nature: the fact that mathematics (an invention of the human mind) is indeed the key to understanding created nature. It is surprising then that nature, too, actually has a mathematical structure, that mathematics, created by the human mind, is the tool that allows us to work on nature and make it serve man, to make it, through technology, his tool.<sup>6</sup> The astonishment that Benedict XVI is writing about was previously expressed by Albert Einstein when he stated that the most incomprehensible thing is that anything can be understood at all.<sup>7</sup> One of the greatest scientists in the history of science asked: “How is it possible that mathematics, which is after all a product of human thinking independent of all experience, should fit so perfectly with the objects of reality?”<sup>8</sup> The problem posed can thus be clearly felt in the overtones of the empirical sciences themselves, which use the method of building mathematical models and fitting them to experimental situations.

The fact of nature’s rationality and mathematicalness (the attribution of some property by which nature lends itself to investigation by means of mathematics) is a basic, “silence” assumption made by the empirical sciences.<sup>9</sup> Why is nature mathematical?<sup>10</sup> – this question

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<sup>5</sup> Nature’s rationality is that property of nature by which it is investigable. Cf. Heller, *Filozofia przyrody*, 224; Heller, *Filozofia nauki*, 81–83. “There is a point in addressing nature with rational questions only if it is expected to give rational answers” (Heller, *Filozofia przyrody*, 224–225).

<sup>6</sup> Cf. Benedict XVI, “Meeting with the Youth.” This statement does not mean that mathematics is only a language for describing reality.

<sup>7</sup> Cf. Heller, *Filozofia przyrody*, 230.

<sup>8</sup> Einstein, *Pisma filozoficzne*, 51.

<sup>9</sup> Cf. Heller, *Filozofia przyrody*, 224–227. The assumption of the mathematical-empirical method is: “If the world exists, then it can be studied (i.e., it is rational at its foundation).” The scientific method assumes that if anything exists, it must be rational. Cf. Heller, *Filozofia nauki*, 81–82.

<sup>10</sup> This question is worth specifying and developing. In other words, it means: why is there any correspondence between mathematical structures and nature at all? Moreover, one has to think further: why do such simple mathematical structures fit nature (i.e., why is nature idealizable to simple situations)? This question is not obvious because one can imagine situations/phenomena that cannot be described by mathematics at all, or situations that could be described only by such complex

is not answered by the empirical method itself (nor by mathematics). Benedict XVI notes that the correspondence of mathematical structures with the actual structures of the Universe is the foundation for all modern scientific and technological achievements. The Pope recalls that this correspondence was already clearly formulated by Galileo in his famous statement that the book of nature is written in mathematical language.<sup>11</sup> For Galileo was convinced that God had given human beings two great and important “books”: the Holy Bible and the book of nature. Nature was considered by the scientist as a book, the reading of which is fundamentally different from the way of reading other books. According to Galileo, the book of nature has a language of its own, distinct from that in which the Scriptures are written – the language of nature is mathematics. “Mathematics is the alphabet by which God has written the Universe.”<sup>12</sup> The mathematical and natural sciences thus consist in reading the book of nature. The development of these sciences is a gradual exploration of page after page of the book of nature. Nature created by God has a mathematical structure. A scholar from the turn of the sixteenth and seventeenth centuries – who had to suffer a lot from the people and institutions of the Church<sup>13</sup> – drew the conclusion that mathematics, as the language of created nature, is the language of God, the Creator.

Man-made mathematics actually gives access to the structure of the Universe and, at the same time, makes nature useful. The convergence of the structure of the created human intellect with the objective structure of created reality is, according to the Pope, an almost unbelievable thing.<sup>14</sup> The Pope notes, “I think that this coincidence between what we thought up and how nature is fulfilled and behaves is a great enigma and a great challenge, for we see that, in the end, it is ‘one’ reason that links them both. Our reason could

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mathematical models that the human mind would be too weak to deal with them. Cf. Heller, *Filozofia przyrody*, 227.

<sup>11</sup> Cf. Benedict XVI, “Pastoral Visit.”

<sup>12</sup> Cited in *Matematyka. Encyklopedia*, 113; cf. also: “The book of nature is written in mathematical language” (Galileo, quoted in Tatarkiewicz, *Historia filozofii*, II, 52.)

<sup>13</sup> Cf. Heller, *Bóg i nauka*, 97–111.

<sup>14</sup> Cf. Benedict XVI, “Meeting with the Youth.”

not discover this other reason were there not an identical antecedent reason for both.”<sup>15</sup> Mathematics points to the rational structure of the Universe. Benedict XVI thus concludes that there is a subjective rationality and an objectified rationality in matter, and that they coincide. For in this context, according to the Pope, the question inevitably becomes: is there not by chance one primary intelligence that is their common source?<sup>16</sup> This opens the way for a reflection that transcends the realm of facts, that transcends the possibilities of the mathematical-natural sciences themselves, and that relates to human freedom. It is not possible to “prove” (experimentally) that the two rationalities (of mind and of nature) really originate in a single intelligence,<sup>17</sup> but, according to Benedict XVI, it seems that “this unity of intelligence, behind the two intelligences, really appears in our world.”<sup>18</sup> This manifested unity of the two intelligences, points to the presence of the divine-creative Reason (Logos): the Logos that rationally creates the world and the rational man – thus created man finds a real reflection of reason in himself and in the world, which can also be experienced when man makes nature serve him.

It should be noted that the statements of Benedict XVI quoted here have primarily pastoral significance, and one of them is addressed directly to young people. Their purpose, therefore, is not to enter into a polemic with past and present philosophical views on a given issue or to present an exhaustive answer to the question – “why is nature mathematical?”<sup>19</sup> –but only to show how reflection on mathematics and the mathematicalness of nature can lead man to questions that

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<sup>15</sup> Benedict XVI, “Meeting with Youth.”

<sup>16</sup> Cf. Benedict XVI, “Pastoral Visit.”

<sup>17</sup> A physicist Christopher Meissner puts the issue as follows: “The fact [...] that the material world is orderly and logical is utterly inexplicable and should arouse our utmost amazement. If someone were to ask me what in science can be an indication that there is some transcendence, I would say that the very fact that science in general can exist. What this transcendence is, whether it is a personal God, remains in each case a question of faith.” Meissner, “Granice poznania,” 47.

<sup>18</sup> Benedict XVI, “Encounters with Youth.”

<sup>19</sup> In philosophy there have been and still are various attempts to answer this question. For example, Immanuel Kant explained the fact of the mathematicalness of nature by reducing it to rationality of human cognition. For more on this topic: cf. Heller, *Filozofia przyrody*, 228–230.

exceed the methodological possibilities of empirical sciences. In a famous lecture at the University of Regensburg, the Pope expresses this point as follows: “Modern scientific reason with its intrinsically Platonic element bears within itself a question which points beyond itself and beyond the possibilities of its methodology. Modern scientific reason quite simply has to accept the rational structure of matter and the correspondence between our spirit and the prevailing rational structures of nature as a given, on which its methodology has to be based. Yet the question why this has to be so is a real question, and one which has to be remanded by the natural sciences to other modes and planes of thought – to philosophy and theology. For philosophy and, albeit in a different way, for theology, listening to the great experiences and insights of the religious traditions of humanity, and those of the Christian faith in particular, is a source of knowledge, and to ignore it would be an unacceptable restriction of our listening and responding. Here I am reminded of something Socrates said to Phaedo. In their earlier conversations, many false philosophical opinions had been raised, and so Socrates says: ‘It would be easily understandable if someone became so annoyed at all these false notions that for the rest of his life he despised and mocked all talk about being – but in this way he would be deprived of the truth of existence and would suffer a great loss.’”<sup>20</sup> Benedict XVI points out that for a long time the West has been threatened by just such an aversion to fundamental questions about its own rationality, which can only do it serious harm.<sup>21</sup> The methodology of the empirical sciences involves making plausible hypotheses, and so the foundations of that knowledge can always be questioned by science itself.

Furthermore, Benedict XVI notes that considerations of the rationality of the world and the mathematicality of nature can lead to a definitional question, an unambiguous choice; confronting an exclusionary alternative – for or against the Logos – either God is, or He is not: “There are only two options. Either one recognizes the priority of reason, of creative Reason that is at the beginning of all

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<sup>20</sup> Benedict XVI, “Faith, Reason.”

<sup>21</sup> Cf. Benedict XVI, “Faith, Reason.”

things and is the principle of all things – the priority of reason is also the priority of freedom – or one holds the priority of the irrational, inasmuch as everything that functions on our earth and in our lives would be only accidental, marginal, an irrational result – reason would be a product of irrationality.”<sup>22</sup> It is impossible to definitively “prove” any of these hypotheses, but Christianity chooses rationality, the primacy of reason – this is, according to the Pope, “the great option of Christianity.”<sup>23</sup> Joseph Ratzinger states: “the rationality of the universe cannot be rationally explained on the basis of irrationality. For this reason, the Logos, who is at the beginning of every thing, now more than ever remains a better hypothesis, even though he continues to be only a hypothesis, but certainly requires on our part to give up our position of dominion and risk an attitude of humble listening.”<sup>24</sup> Benedict XVI unequivocally rejects the tendency to give primacy to irrationality, chance and necessity. On these grounds it becomes possible again to expand the field of rationality.<sup>25</sup>

The immense intellectual potential of man leads, as it were, “from below” to the affirmation of the existence of the creative Reason, the Logos. The discovery of the marvelous possibilities of human reason can lead to a deeper reflection. The Pope points out that the

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<sup>22</sup> Benedict XVI, “Meeting with the Youth.” Michał Heller (“Czy bozon”) writes about the choice between rationality and irrationality as follows: “If I encounter a mathematical problem and it has such and not other mathematical solutions, there is nothing I can do about it. I have no power over it. This gives me a sense of mystery, but not meaninglessness. And then I have a choice: either to accept that I live in a meaningless world because I can’t understand it, or that it makes sense, though incomprehensible to me. The choice of meaninglessness would be disharmony, a clash with the rationality of the world. The world would be schizophrenic if it remained rational in its natural layer and irrational in man, who is a special, conscious part of nature. Through man this senselessness would creep in everywhere. This, of course, is logically acceptable, it can be so, but I, personally, reject such disharmony, I stand for sense, even if I do not understand it fully.”

<sup>23</sup> Benedict XVI, “Meeting with the Youth.” Furthermore, “the postulate of being guided by rationality is a choice that humanity made when it began to pose the first questions to the world and to seek rationally based answers to them. [...] Rationality is a certain value.” Heller, *Filozofia nauki*, 83.

<sup>24</sup> Ratzinger, *Europa Benedykta*, 122.

<sup>25</sup> Cf. Benedict XVI, “Pastoral Visit.”

Logos is for believers not only the original, eternal Reason, but is precisely Love, Incarnate Love, in Jesus Christ uniting God and man, eternity and time, spirit and matter: “If we look at the great options, the Christian option today is the one that is the most rational and the most human. Therefore, we can confidently work out a philosophy, a vision of the world based on this priority of reason, on this trust that the creating Reason is love and that this love is God.”<sup>26</sup> Benedict XVI proclaims the primacy of the Logos, the Creative Reason, and points to Christ, the Logos Incarnate, the Word who is the unity of Love and Reason.<sup>27</sup> “As the religion of the *Logos*, Christianity does not relegate faith to the sphere of the irrational, but attributes the origin and sense of reality to creative Reason, which, in the crucified God, is expressed as love and invites us to take the way of the *quaerere Deum*: ‘I am the way, the truth, and the life’”<sup>28</sup> – the Pope points out. He thus shows how reflection on mathematics, on the development of science, leads to the creative Logos.<sup>29</sup> Joseph Ratzinger states: “The world comes from the Logos, and therefore: the world is full of meaning, it is the creation of the meaning that it expresses itself. Even before we begin to act in a meaningful way, the sense already exists. It surrounds us. We find ourselves in it. Meaning is not a function of our creation, but a prior enabling of it, i.e., the question of our ‘why’ is answered by our ‘wherefore.’ This ‘wherefore’ is already the ‘why’ itself, the why. Creation is not just information about a one-time event, but an expression of what the world is here and now, and a statement about what its future will be. This whence of the world is at the same time the basis of its hope.”<sup>30</sup> Joseph Ratzinger/Benedict XVI shows the primacy of the Logos as

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<sup>26</sup> Benedict XVI, “Meeting with the Youth”; cf. Bachanek, “Racjonalność wiary,” 114–116.

<sup>27</sup> Cf. Szymik, *Theologia Benedicta*, II, 12–51; Gózdź, *Logos i Miłość*; Szymik, “Cicha oczywistość,” 276–278.

<sup>28</sup> Benedict XVI, “Visit to the Catholic.” Christianity does not degrade faith by reducing it and relegating it to the realm of the irrational.

<sup>29</sup> Cf. Benedict XVI, “Pastoral Visit.”

<sup>30</sup> Ratzinger, *Kościół – Ekumenizm*, 72; cf. Bachanek, “Znaczenie prawdy,” 239–240.



the conclusive and indelible foundation of Christian faith.<sup>31</sup> He also justifies that Christianity is far from being irrational.

## 2. The modern self-limitation of reason

Through the compatibility of mathematical structures with the actual structures of nature – and the application of mathematics to the world – man has made immeasurable scientific and technological advances concerning the physical world. Joseph Ratzinger already points out in his *Wprowadzenie w chrześcijaństwo* [*Introduction to Christianity*] that, as a consequence, it is now characteristic of the scientific attitude – modeled on the natural sciences – to limit itself to phenomena, to what is tangible, to what can be touched or measured.<sup>32</sup> He notes that in modern thinking and existence a new concept of truth and reality has gradually emerged – man no longer seeks what “the thing in itself” is, no longer wants to explore the essence of being, because it seems to him to be a fruitless attempt.<sup>33</sup> In this context Ratzinger points to the limits of the modern understanding of reality.<sup>34</sup>

In his lecture at the University of Regensburg<sup>35</sup> – which is one of the strongest defenses of reason in the entire Christian tradition<sup>36</sup> – Benedict XVI questions the essentiality of the modern self-limitation of reason, manifested by taking as the criterion of scientificity only that which results “from the interplay of mathematical and empirical elements.”<sup>37</sup> He points out that the narrowed understanding of the role of reason was “classically expressed in Kant’s ‘Critiques’”<sup>38</sup>

<sup>31</sup> Cf. Szymik, “Cicha oczywistość,” 275; Gózdź, “Logosowy charakter,” 47–49.

<sup>32</sup> Cf. Ratzinger, *Wprowadzenie w chrześcijaństwo*, 50.

<sup>33</sup> Moreover, it also happens that the effectiveness and success of empirical science leads to the hubris of reason, which is convinced that it can answer all questions – including those previously addressed by philosophy and religion: who is man, where did he come from and where is he going? Meanwhile, scientific, empirical hypotheses are always only probable.

<sup>34</sup> Cf. Ratzinger, *Wprowadzenie w chrześcijaństwo*, 49–58.

<sup>35</sup> Cf. Benedict XVI, “Faith, Reason.”

<sup>36</sup> Cf. Woźniak, “Foreword,” 18.

<sup>37</sup> Benedict XVI, “Faith, Reason.”

<sup>38</sup> Benedict XVI, “Faith, Reason.”

and was further radicalized by thought based solely on the natural sciences. The concept of limited reason challenged by the Pope and the resulting vision of all science is based on a synthesis of Platonism (Cartesianism) and empiricism, and it is grounded in the achievements of technology. It assumes that nature is mathematical (a Platonic element), so that it can be studied theoretically, and the knowledge gained can be used technically. Moreover, experimental verifiability, empirical “certainty” of a physical type is assumed as a determinant of truth or falsity. Here the aspect of the functional treatment of nature and looking at the known reality from the perspective of only human usefulness for one’s own purposes is revealed. Benedict XVI notes that “the weight between the two poles can, depending on the circumstances, shift from one side to the other.”<sup>39</sup> According to the concept presented, only the kind of “certainty” that flows from the combination of experience and mathematical method would allow one to pronounce scientific. “Anything that would claim to be science must be measured against this criterion,”<sup>40</sup> the Pope states.

The Holy Father reflects on the consequences of the above canon of scientificity self-limited to the possibilities of man. First, the sciences that speak of the question of man and his affairs (such as history, psychology, sociology, and philosophy) have tried to use the mathematical-empirical method in order to be within the circle of what is scientific. Thus, there have been considerable reductionist misunderstandings. Among other things, they reduced man, a bodily-spiritual being, to an entity that was indistinguishable from animals and purely material creatures. Moreover, the method used excludes the question of God from the outset, treating it as an unscientific or pre-scientific issue. Theology as a science is not possible in this perspective. Thus, it can be seen that by remaining within the above criterion of scientificity, one arrives at a sharp narrowing of the field of science itself.<sup>41</sup>

Benedict XVI outlines a critique of the criterion under discussion for considering something scientific. He states: “if science as a whole

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<sup>39</sup> Benedict XVI, “Faith, Reason.”

<sup>40</sup> Benedict XVI, “Faith, Reason.”

<sup>41</sup> Cf. Benedict XVI, “Faith, Reason.”

is this and this alone, then it is man himself who ends up being reduced.”<sup>42</sup> This is because the questions inherent in man as a person, such as – who am I? where do I come from? where am I going? – are pushed out of the realm of rational inquiry, the realm referred to as “scientific.” Similarly, all questions concerning religion and ethics are – in this view – among the subjective, the “unscientific.” Moreover, according to Benedict XVI, one cannot succumb to the temptation of closing the whole identity of a human being in the mathematical and natural sciences, and humanities. The Pope rejects the positivistic idea of science, which limits it only to experimental, natural sciences, because they do not explain the existential problems of man, such as his dignity, origin, destiny and the sense of life.<sup>43</sup> To know the mystery of man anthropological, philosophical and theological research is also necessary.<sup>44</sup> According to Benedict XVI reason needs faith because without faith it is limited – only reason that opens itself to faith is fully itself. Faith widens the space of rationality. To illustrate the mutual relation between reason and faith the Pope uses a metaphor. He compares reason to a tree whose roots are in danger of being deprived of the water necessary for life: “If reason, out of concern for its alleged purity, becomes deaf to the great message that comes to it from Christian faith and wisdom, then it withers like a tree whose roots can no longer reach the waters that give it life.”<sup>45</sup> In such a situation, reason becomes diminished, degenerated, because it loses the courage of truth and is incapable of a search beyond itself. He who wishes to build only on his own arguments and convictions, and who, moreover, cuts himself off from the roots from which he lives, with the aim of preserving pure thought, encounters disaster.

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<sup>42</sup> Benedict XVI, “Faith, Reason”; cf. also: Warzeszak, “Benedykta XVI wizja,” 252.

<sup>43</sup> Cf. Benedict XVI, “To the Board”; Warzeszak, “Polifonia nauk,” 43.

<sup>44</sup> Cf. Benedict XVI, “To Participants in an Interacademic.”

<sup>45</sup> Benedict XVI, “Lecture at the University.”

### 3. Positive results of the application of mathematics

Although Benedict XVI carries out a critique of self-limiting modern reason,<sup>46</sup> he does not mean to say that one should make a backward move and go back to the pre-Enlightenment era. Moreover, the current Pope Emeritus is considered the most forceful defender of reason in the postmodern apotheosis of weak thinking.<sup>47</sup> In his view, one should not reject the entirety of the beliefs of modern times, but it is worthwhile precisely to recognize the greatness of human achievement in what is good in development.<sup>48</sup> “We are all grateful for the marvellous possibilities that it has opened up for mankind and for the progress in humanity that has been granted to us.”<sup>49</sup> The Pope points out: “in fact, the modern development of the sciences brings innumerable positive effects, as we all see, that should always be recognized.”<sup>50</sup> However, he notes that one cannot stop at naive, carefree and unreflective joy: “while we rejoice in the new possibilities open to humanity, we also see the dangers arising from these possibilities and we must ask ourselves how we can overcome them.”<sup>51</sup> This is why Benedict XVI proclaims the need to broaden the concept of reason and its unreflective application.<sup>52</sup> It is worth noting that the postulate to open up reason and expand the boundaries that modern times have artificially imposed on it, is one of Ratzinger’s central postulates.<sup>53</sup>

The achievements of the mathematical and natural sciences are the work of man, and therefore he also bears responsibility for their results. Man must give them the right moral direction, which, according to the Holy Father, is the concern for the full human good: “all science must always safeguard man and promote his aspiration for the authentic good.”<sup>54</sup> Above all, according to Benedict XVI, true

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<sup>46</sup> Cf. Benedict XVI, “Faith, Reason.”

<sup>47</sup> Cf. Woźniak, “Foreword,” 16.

<sup>48</sup> Cf. Warzeszak, “Polifonia nauk,” 50–53.

<sup>49</sup> Benedict XVI, “Faith, Reason.”

<sup>50</sup> Benedict XVI, “Angelus 28 January.”

<sup>51</sup> Benedict XVI, “Faith, Reason”; Cf. Warzeszak, “Polifonia nauk,” 50.

<sup>52</sup> Cf. Benedict XVI, “Faith, Reason.”

<sup>53</sup> Cf. Woźniak, “Foreword,” 17.

<sup>54</sup> Benedict XVI, “Visit to the Pontifical Lateran.”

science, in order to protect man, must maintain criteria derived from the broadest possible vision of reality<sup>55</sup>, which manifests itself in a holistic, integral presentation of the human person and in the recognition and respect of the dignity of all communities in the world. It is more important “to prevent science from becoming the criterion of good and to ensure that man is respected as the centre of creation.”<sup>56</sup> Moreover, to reject the sphere of faith and religion, to omit and not draw from it, would be to narrow reality considerably. If one forgets this vast perspective and succumbs to a blind fascination with the limited achievements of the mathematical and natural sciences, the drama and “catastrophe” of which the ancient myth of Daedalus and Icarus tells us can occur. In this myth, young Icarus soars into the air on wings made of wax. He is delighted with his flight and the possibilities of his invention. Forgetting the warnings of his father Daedalus, he wants to soar higher and higher. However, the sun melts the wax from which the wings are made, and Icarus falls and dies. The illusion he succumbs to leads him to his tragic death. The Pope points out that this ancient story contains a truth that is always relevant. “In life there are other illusions that one cannot trust without risking disastrous consequences for the existence of oneself and others.”<sup>57</sup> Intentions must therefore be reviewed so that they ultimately serve the integral good of man, always respecting his dignity.<sup>58</sup> In the Holy Father’s view, this is the first guiding condition for science to protect and not to endanger. Fields of limited knowledge and technology cannot claim complete independence from moral norms.<sup>59</sup> Man – the creator of science and inventions – above them bears “a specific capacity for discerning what is good and right. Affixed in him as a seal by the Creator, synderesis urges him to do good.”<sup>60</sup>

Benedict XVI deplores the fact that nowadays priority is sometimes given to artificial intelligence, which is increasingly subordinated to experimental technology, thus forgetting that all science is meant to

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<sup>55</sup> Cf. Benedict XVI, “Visit to the Pontifical Lateran.”

<sup>56</sup> Benedict XVI, “To Participants in an Interacademic.”

<sup>57</sup> Benedict XVI, “Visit to the Pontifical Lateran.”

<sup>58</sup> Cf. Benedict XVI, “To the participants at the 20<sup>th</sup>.”

<sup>59</sup> Cf. Benedict XVI, “To the participants at the 20<sup>th</sup>.”

<sup>60</sup> Benedict XVI, “To Participants in an Interacademic.”

protect man and to support him in the pursuit of true good.<sup>61</sup> This phenomenon is also due to the attribution of excessive importance to “doing,” at the expense of “being.” In turn, an excessive concentration on potentialities of a material kind disturbs that balance which “everyone needs in order to give their own existence a solid foundation and valid goal.”<sup>62</sup> The Pope believes that one cannot be uncritical of scientific research. Science itself confirms this by constantly revising its basic assumptions.

Through the application of mathematics to the natural sciences, human power has grown and continues to grow.<sup>63</sup> Unfortunately, at the same time it often turns into a danger threatening people and the world. Benedict XVI stresses that scientific and technical knowledge should always be applied with a sense of responsibility and for the common good. Serving the common good is therefore also a proper criterion for true science, that is, science that supports man in his pursuit of authentic good. The Pope draws particular attention to this during his address on the International Atomic Energy Agency,<sup>64</sup> “instituted with the mandate to accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world.”<sup>65</sup> He sees its tasks as non-proliferation, nuclear disarmament, and the safe use of nuclear technology that promotes development, taking into account the poorest populations. It is important, therefore, to have the full good of all communities in mind and to consider more than just the present. Science “must never be employed against human life and its dignity, but always placed at its service, at the service of this and future generations.”<sup>66</sup>

It is worth mentioning a danger to which the Pope draws attention by quoting a statement of the Second Vatican Council: “Indeed the danger is present that man, confiding too much in the discoveries of today, may think that he is sufficient unto himself and no longer seek

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<sup>61</sup> Cf. Benedict XVI, “Visit to the Pontifical Lateran.”

<sup>62</sup> Benedict XVI, “Visit to the Pontifical Lateran.”

<sup>63</sup> Cf. Benedict XVI, “To the Members of the Roman”

<sup>64</sup> Cf. Benedict XVI, “Angelus 29 July.”

<sup>65</sup> Benedict XVI, “Angelus 29 July.”

<sup>66</sup> Benedict XVI, “To the Members of the Pontifical.”

the higher things.”<sup>67</sup> Therefore, an important indicator for a science that wants to contribute to human well-being is to open itself to the perspective of faith. “Faith in that God, who is in person the creative Reason of the universe, must be accepted by science in a new way as a challenge and a chance.”<sup>68</sup> Opening to God, drawing on religion, is by no means some external constraint imposed on human action, but flows from the fact that the world and its rationality also come from the Creator-Logos. Similarly, the mathematical and natural sciences alone are incapable of fathoming the whole truth about reality, and their methods of investigation cannot be regarded as the highest, only valid rule of conduct. These fields of knowledge “cannot replace philosophy and revelation by giving an exhaustive answer to man’s most radical questions: questions about the meaning of living and dying, about ultimate values, and about the nature of progress itself.”<sup>69</sup>

Benedict XVI draws attention to the problem of a kind of apparent contradiction between the truths of faith and the truths of developing science. It sometimes happened (especially in the last century) that the latter were “so rapid as to make it very difficult to discern whether they are compatible with the truths about man and the world that God has revealed.”<sup>70</sup> Such a situation is encountered even today: “science is making very rapid progress today and all too often this is presented as being in contradiction to the affirmations of faith, causing confusion and making the acceptance of the Christian truth more difficult.”<sup>71</sup> For this reason, the Pope encourages us not to ignore the questions and doubts that are raised by the new discoveries of modern science. He points out that it is important to meet them. One must deepen one’s knowledge of the truths explored by reason and confront them with what is given through faith.

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<sup>67</sup> Vaticanum II, *Gaudium et spes*, no. 57; cf. Benedict XVI, “To the Members of the Pontifical.”

<sup>68</sup> Benedict XVI, “To the Members of the Roman.”

<sup>69</sup> Benedict XVI, “To the Members of the Pontifical.”

<sup>70</sup> Benedict XVI, “To the Participants of the Plenary.”

<sup>71</sup> Benedict XVI, “To the Participant at the Ecclesial Convention.”

#### 4. Progress in mathematical and natural sciences

According to Benedict XVI, authentic, full progress of science is possible only when it meets the criteria of protecting man and supporting him in his pursuit of the true good. “Every scientific approach must also be a loving approach, called to be at the service of the human being and of humanity and to make its contribution to forming the identity of individuals,”<sup>72</sup> the Pope states. Progress should never compromise the integral good of the human person; on the contrary, it is precisely to serve that good. “Progress becomes true progress only if it serves the human person and if the human person grows: not only in terms of his or her technical power, but also in his or her moral awareness.”<sup>73</sup> The Pope also draws attention to the interdependence between intended ends and the means of achieving them. He reminds us that even a good end cannot justify evil, wicked methods of action. In the field of scientific research, one cannot violate fundamental human rights, especially human dignity.<sup>74</sup> One must act according to conscience, which the Holy Father calls “an act of reason aims at the truth of things.”<sup>75</sup> “The good of human beings should not only be sought in universally valid goals, but also in the methods used to achieve them,”<sup>76</sup> the Pope states.

Benedict XVI deals with the question of progress, what it really means, what it promises and what it does not promise, in detail in his encyclical *Spe salvi*. First of all, he shows how, throughout the centuries, the development of science and its progress have been connected with man’s hope, and this phenomenon began in modern times. A new scientific method took shape, and experiment played an increasingly important role. Man could reach an understanding of nature and the laws that govern it. Francis Bacon, a philosopher and scientist from the turn of the 16th and 17th centuries, who developed an empirical theory of science, saw inventions as its highest goal.<sup>77</sup> Moreover, he believed that the interdependence of science and

<sup>72</sup> Benedict XVI, “To Participants in an Interacademic.”

<sup>73</sup> Benedict XVI, “To the Participants in the Symposium.”

<sup>74</sup> Cf. Gacka, *Znaczenie osoby*, 241–247.

<sup>75</sup> Benedict XVI, “To the Participants in the General.”

<sup>76</sup> Benedict XVI, “To the Participants in the Symposium.”

<sup>77</sup> Cf. Tatarkiewicz, *Historia filozofii*, II, 25–27.



practice and its effectiveness opened up a new vision of the world. “This is also given a theological application: the new correlation [...] would mean that the dominion over creation – given to man by God and lost through original sin – would be reestablished.”<sup>78</sup> Thus came the belief in progress. People began to see in science a power capable of transforming man and his life. This was also combined with a theological perspective. According to the thought pioneered by Bacon, “redemption” was to come not from faith, but from the newfound connection between science and practice. “Thus hope too, in Bacon, acquires a new form. Now it is called: *faith in progress*.”<sup>79</sup> Inventions “helped” to believe that the dominion of science was expanding and that the predicted further development of technology would soon make a new world a kingdom of man. Benedict XVI shows that the above concept was not a one-off, isolated view, but had a continuous continuity in the following centuries. “As the ideology of progress developed further, joy at visible advances in human potential remained a continuing confirmation of *faith in progress* as such.”<sup>80</sup>

Benedict XVI criticizes the belief in progress. It existed already in the 19th century, and in the 20th century this issue was dealt with by Theodor W. Adorno, whom the Pope refers to. Adorno formulated the issue in an articulate way, he spoke of progress from the slingshot to the megabomb.<sup>81</sup> At the same time – according to Adorno and the Pope – one must keep in mind that progress, by opening up new possibilities that did not exist before, also creates a situation of choosing between good and evil. Thus, a certain bipolarity or two-layeredness of progress becomes apparent. “We have all witnessed the way in which progress, in the wrong hands, can become and has indeed become a terrifying progress in evil. If technical progress is not matched by corresponding progress in man’s ethical formation, in man’s inner growth, then it is not progress at all, but a threat for man and for the world.”<sup>82</sup> The Holy Father therefore maintains

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<sup>78</sup> Benedict XVI, *Spe salvi*, no. 16.

<sup>79</sup> Benedict XVI, *Spe salvi*, no. 17.

<sup>80</sup> Benedict XVI, *Spe salvi*, no. 17.

<sup>81</sup> Cf. Benedict XVI, *Spe salvi*, no. 22.

<sup>82</sup> Benedict XVI, *Spe salvi*, no. 22.

that a necessary condition of progress must be the moral growth of humanity. It is impossible to put an equal sign between what is potentially possible in practice and what is good for man. To act without prior moral judgment is to put oneself and others in danger. Benedict XVI thus comes to define two layers or aspects of progress, dependent on two spheres: material and moral. Physical, aggregate progress is possible only within the first of these. It is connected with an ever-better knowledge of the structures of matter and with new inventions, and it is characterized by a certain continuity. On the other hand, “in the field of ethical awareness and moral decision-making, there is no similar possibility of accumulation for the simple reason that man’s freedom is always new and he must always make his decisions anew.”<sup>83</sup> The Pope argues that it is absurd to believe that man can be saved by science. Those who shared the idea of liberating and transforming nature by science for the world and people, were wrong. “Man can never be redeemed simply from outside”<sup>84</sup> (without taking into account his interior, his soul) – human freedom is something indelible, it cannot be replaced by any external structures.

The mathematical and natural sciences are certainly helpful in the process of humanizing the world and humanity, but they cannot be expected to do what is beyond their reach, which they set for themselves within the world. “Science, however, while giving generously, gives only what it is meant to give. Man cannot place in science and technology so radical and unconditional a trust as to believe that scientific and technological progress can explain everything and completely fulfil all his existential and spiritual needs.”<sup>85</sup> If one intends to make science the primary object of hope, it must inevitably fail. Without being directed by forces transcendent to it, it may even come to the destruction of man and all that surrounds him, so also of science itself.

According to Benedict XVI, today’s culture is marked by “a lack of wisdom and reflection, a lack of thinking capable of formulating

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<sup>83</sup> Benedict XVI, *Spe salvi*, no. 24.

<sup>84</sup> Benedict XVI, *Spe salvi*, no. 25.

<sup>85</sup> Benedict XVI, “To the Members of the Pontifical.”

a guiding synthesis.”<sup>86</sup> In this context, it is all the more important to assert that “it is not science that redeems man: man is redeemed by love.”<sup>87</sup> Without love, even science loses its nobility and humanism.<sup>88</sup> However, the Pope does not mean only human love, for it is fragile and destructible by death. What is needed, therefore, is Love that is unconditional and absolute, and such can only come from God. “The development of modern science has always confined faith and hope to the private and individual sphere, so that today it appears in a clear and sometimes dramatic way that man and the world need God – the true God! – otherwise, they remain deprived of hope.”<sup>89</sup> Authentic acquisitions of human knowledge are valuable in many ways. Not only do they help “to understand the mystery of creation better and has profoundly marked the awareness of all peoples,”<sup>90</sup> but they can also contribute to the overall good of man. The Pope points out that science – precisely as called to service – can be an expression of love. Love allows us to transcend ourselves in order to acknowledge the other.<sup>91</sup> The achievements of empirical science cannot be ignored. To ignore them would be to turn away from the objectivity and realism of the world in which man lives, and thus to condemn himself to a kind of isolation from reality.

## Conclusion

The analyses carried out show that in the Pope’s teaching, reflections on the importance of mathematics, which to many might seem completely marginal, have important implications. J. Ratzinger/Benedict XVI’s reflection on mathematics, and on the sciences and scientificity in general, is rooted in the question of the relationship between faith and reason, which is one of the most important themes

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<sup>86</sup> Benedict XVI, *Caritas in veritate*, no. 31; Benedict XVI, “To the Communities.”

<sup>87</sup> Benedict XVI, *Spe salvi*, no. 26.

<sup>88</sup> Cf. Benedict XVI, “Visit to the Catholic.”

<sup>89</sup> Benedict XVI, “Angelus 2 December”; cf. Pagacz, *Życie konsekrowane*.

<sup>90</sup> Benedict XVI, “To the Participants of the Plenary”

<sup>91</sup> Cf. Benedict XVI, “To Participants in an Interacademic.”

addressed by the Pope.<sup>92</sup> Throughout Benedict XVI's teaching, his call for a clear demonstration of the transcendent dignity of the human being is clearly evident<sup>93</sup> – interestingly, the Pope's reflection on mathematics also leads to a deep appreciation of it. For Joseph Ratzinger/Benedict XVI, mathematics is not primarily just a tool of empirical science. The Pope looks at mathematics as a product of human intelligence, which, when subjected to deeper reflection, also leads to wonder and amazement at the mathematicalness of nature. The latter is seen by Joseph Ratzinger/Benedict XVI as a way that can lead man to the Creative Logos. He thus presents a view of mathematics that goes against the modern approach, which often tends towards the self-limitation of reason, towards accepting as the criterion of scientificity only that which is the result of the interaction of mathematics and empirics. For the Pope, mathematics is not just something that serves to make better use of nature and to develop technology more effectively. Joseph Ratzinger/Benedict XVI is far from looking at reality only in terms of utility, pragmatism and relying on what is feasible from the point of view of the human person – this approach of his is also highlighted in his relation to that science which is mathematics. According to the Pope, it is not science that redeems man; he is redeemed by Love, by the incarnate Logos, the Word who is the synthesis of Love and Reason. The key to reading the mystery of the Universe, which comes from the Logos and its full meaning, is mathematics. It is one of the ways of reaching the truth about the Logos, the creative Reason.

### **Matematyka drogą do stwórczego Logosu. Josepha Ratzingera/Benedykta XVI rozumienie naukowości**

**Abstrakt:** Artykuł przedstawia spojrzenie Josepha Ratzingera/Benedykta XVI na matematykę jako drogę do stwórczego Logosu, a zarazem ukazuje rozumienie naukowości prezentowane przez obecnego papieża emeryta. Dla Josepha Ratzingera/Benedykta XVI matematyka nie jest tylko narzędziem nauk empirycznych. Papież patrzy na matematykę jako na wytwór ludzkiej inteligencji, który – poddany głębokiej refleksji – prowadzi również do zdumienia i zdziwienia nad matematycznością

<sup>92</sup> Cf. Benedict XVI, *Ostatnie rozmowy*, 28; Benedict XVI, *Światłość świata*, 90; Szymik, "Logos and Ratio," 5.

<sup>93</sup> Cf. e.g., Benedict XVI, *Caritas in veritate*, no. 53.

przyrody. Tę ostatnią Joseph Ratzinger/Benedykt XVI uważa za drogę mogącą prowadzić człowieka do stwórczego Logosu. Tym samym prezentuje on spojrzenie na matematykę, które idzie na przekór nowożytnemu podejściu, często zmierzającemu do samoograniczenia się rozumu, do przyjmowania za kryterium naukowości tylko tego, co jest wynikiem współdziałania matematyki i empirii. Zdaniem papieża to nie nauka odkupuje człowieka; zostaje on odkupiony przez Miłość, przez Wcielony Logos. Joseph Ratzinger/Benedykt XVI ukazuje prymat stwórczego Rozumu jako rozstrzygającego i nieusuwalnego fundamentu chrześcijańskiej wiary.

**Słowa kluczowe:** Benedykt XVI, matematyka, Logos, rozum, nauki ścisłe

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