

## Reconnaissance, familiarising, incorporation – the place of photography in the popular scientific narrative and the plans for space domination at the turn of the nineteenth and twentieth centuries\*

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The beginning of the twentieth century marked a period of extraordinary dynamic development in the sciences, including astronomy. The special, and later general theory of relativity formulated by Einstein, or discoveries by Hubble and Eddington, not only completely change (almost with the force of another Copernicus revolution) the human imaginings of the Universe, but also determine civilisational practices allowing one to think of a gradual conquest, or at least taming thereof, of including the more and more vast areas of space surrounding the Earth into the circle of our life. In this process, physics and astronomy work closely together, as inseparably connected disciplines of science. This is also a time of vibrant expansion of photography, changing its status: from an illustrative and supportive in the nineteenth century, into a fully-fledged source of knowledge of the 'oddities and wonders of the Cosmos', not merely equal to the human eye (which had, of course, already been supported for a long time by earlier scientific inventions such as the spyglass and telescope), but also far surpassing it.

This is evident in the treatment of photographs of cosmic objects in scientific books, as well as in books designed to popularize astronomical topics (which were not as clearly distinct disciplines as they are today). This issue can be illustrated with the example of the two most well-known and eagerly read popularisers of astron-

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omy from the second half of the nineteenth and first half of the twentieth century: Camille Flammarion and Sir James Jeans.<sup>1</sup> In Flammarion's works, *Wielość światów zamieszkiwanych* [The plurality of inhabited worlds], *Opowiadania o nieskończoności* [*Lumen by Camille Flammarion*], *Astronomia czyli Nauka o wszechświecie* [Astronomy, or the science of the Universe] (published in Polish translations in Warsaw between 1873 and 1901), there are predominantly illustrations made by observers, based on spyglass or telescopic pictures of the Moon, planets, and stars. On the other hand, in Jeans's works (such as *The Mysterious Universe*, *Eos, or the Wider Aspects of Cosmogony*, *Through Space and Time* – published in 1929–1935),<sup>2</sup> photographs of cosmic objects play a considerable, if not key, role.<sup>3</sup> It is not a coincidence that the author of an American review of the *Eos*... thesis published in the *Times Literary Supplement*, an excerpt of which was included in the original edition as a publicity blurb, states that sir Jeans 'has given us in simple and attractive language a fascinating summary of his tremendous conclusions, illustrated by some stunning photographs'.<sup>4</sup>

This does not mean, however, that at the time Jeans wrote and published his books, there were no doubts over the credibility of the photographs depicting cosmic objects, especially in the case of the controversy between what could be seen with a naked eye and the photographic image. An opportunity for such reflection arose, of course, with the well-known case of the so-called canals on Mars, supposedly discovered on that planet by Italian astronomer Giovanni Schiaparelli in 1877. This gave rise to interpretations linking these structures with planned activity by intelligent beings (Martians). In the ensuing debate on the topic, the hypothesis was eventually dropped, explaining the creation of the 'canals' as products of the systematising (and, at the same time, illusion-creating) activity of the human eye.<sup>5</sup> This became even more probable as Schiaparelli also discovered analogous

1 Of course, this does not mean that in both these periods Polish territories lacked literarily dexterous, talented and knowledgeable local popularisers of astronomy. They were, among others: Stanisław Kramsztyk, Maurycy Straszewski, Krzysztof Jabłczyński, Karol Hertz, Wojciech Niewiadomski, Witold Łassota. For more on this, see: my article titled "Brakująca granica. Wizualność a estetyczna wzniosłość w tekstach popularnonaukowych przełomu XIX i XX wieku" [The missing border. Visuality and the aesthetic sublime in the essays and popular treatises in the late nineteenth and early twentieth century], in: *Napis* issue 20 (2014), pp. 199–220.

2 See: J. Jeans, *The Mysterious Universe* (Cambridge: 1930); idem, *Eos or the Wider Aspects of Cosmogony* (London: 1928); idem, *Through Space and Time* (New York–Cambridge: 1935).

3 One proof of this could be that they are often included by Jeans into the narrative of the Cosmos (that is, objects in the photographs are simultaneously discussed in the book), and references to those constitute a significant part of the argument.

4 Quotation from the English edition of the book: J. Jeans, *Eos or the Wider Aspects of Cosmogony* (London: 1928), p. 120 [23 [no pagination]], <https://archive.org/details/dli.ministry.12450/page/23/mode/2up?view=theater> (accessed 9 April 2025).

5 See: J.E. Evans, E.W. Maunder, "Experiments as to the actuality of the 'canals' observed on Mars",

‘canals’ on Mercury. On this planet, life could never come into being due to the very high temperatures and lack of atmosphere.

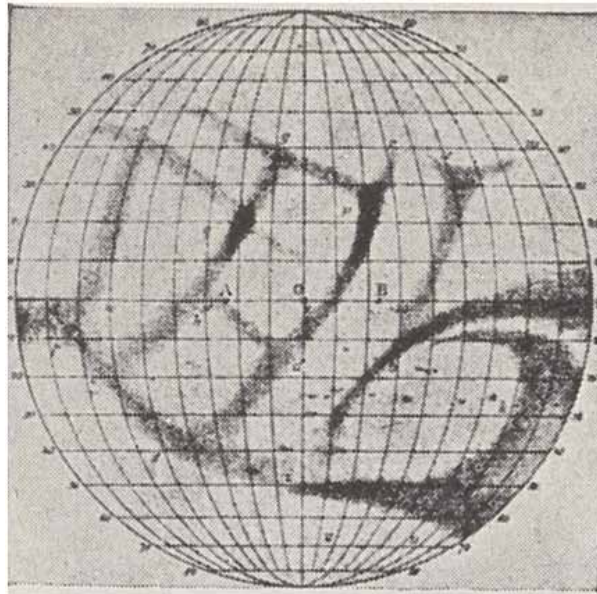


Fig.1. A drawing of ‘canals’ on Mercury by Schiaparelli (J. Jeans, *Through Space and Time*, New York–Cambridge: 1935, p. 145).

As Jeans points out, there is a significant difference here between a drawing re-created based on a seen image and a photograph, though, interestingly, the scholar does not unambiguously settle this controversy in favour of the picture ‘written with light’:

» The camera is usually supposed to provide the final test of reality, and, although photographs of Mars show quite definite markings, these do not resemble the supposed systems of canals. Perhaps this is not conclusive evidence, because photography is, for technical reasons, unsuited to the recording of excellent markings, and it is quite possible, as the canal observers claim, that the eye best sees these.<sup>6</sup>

As it turns out, the lack of photographs of cosmic objects in the books by Flammarion and other popularisers of science from the turn of the century was

*Monthly Notices of the Royal Astronomical Society*, v. 63, pp. 488–499, <https://adsabs.harvard.edu/full/seri/MNRAS/0063/0000488.000.html> (accessed 9 November 2023).

<sup>6</sup> J. Jeans, *Through Space and Time*, p. 180.

not just due to technical limitations, but also (which can seem strange today) due to a certain distrust towards this method of recording experiences of the subject exploring. This does not mean that aspects of photographic technology with potential applications in astronomy were not acknowledged. Still, it would seem that, at the beginning, they were linked primarily with technical issues, with a more efficient and mechanical registering of the image seen through a spyglass or telescope:

Nieskończoność zaludniona jest gwiazdami, każda zaś z gwiazd jest słońcem. Miliardy słońc są środkami nieznanym systemów planetarnych. Katalogi i mapy niebieskie zawierają już położenie dokładne przeszło miliona gwiazd. Posługiwać się teraz będziemy sposobem szybszym niż obserwacje teleskopowe, mianowicie fotografią, dla oznaczenia gwiazd na niebie aż do jedenastej wielkości, czyli blisko dziesięciu milionów gwiazd odfotografowanych na 40 000 płyt.

Stars inhabit infinity, and every star is a sun. Billions of suns are centres of unknown planetary systems. Celestial catalogues and maps already feature the exact location of over a million stars. We shall now use a way faster than telescopic observations, that is photography, to mark stars on the sky up to the power of eleven, and so nearly ten million stars photographed on 40,000 plates.<sup>7</sup>

However, from the beginning of the era of development of literary popularisation of astronomy that is of interest to us here, photography functioned in those texts also as a kind of synecdoche relating to the questions of the nature of light, human vision and mind, their significance in the study of the Cosmos and the paths of their cooperation. For example, this is true in perhaps the most 'poetic' of Flammarion's books, *Lumen*<sup>8</sup>, written in the form of dialogue, where virtually all images 'made available' to us by the Universe turn out to be peculiar photographs:

» 'Your illustration shows me that you have lifted the veil which shrouded it' says one of the participants in the dialogue, by the symbolic name of Lumen. 'In order to be still more exact, the light represents a courier who brings, not written news, but p h o t o g r a p h s [emphasis by M. P.], or, strictly speaking, the real aspect of the country from whence he came. We see this living picture such as it appeared, in all its aspects, at the moment when the luminous rays shot forth from the distant orb. (...) In short, the rays of light that proceed from the stars do not reach us instantaneously, but occupy a certain time in crossing the distance which separates us from them, and show us those stars not as they are now, but such as they were at the moment

7 C. Flammarion, *Niebo* [The Sky], transl. by M. Stefanowska (Warsaw: 1907), p. 192. [Quotation in English translated from the Polish edition].

8 Idem, *Récits de l'infini* (Paris: 1872, 1873). English translation of this book was published in New York in 1897 under the title *Lumen* by Camille Flammarion (see footnote 9).

in which those rays set out to transmit the aspect of the stars to us. Thus we behold a wondrous transformation of the past into the present. (...) As the aspect of the worlds change from year to year, almost from day to day, one can imagine these aspects emerging into space and advancing into the infinite, and thus revealing their phases in the sight of far-distant spectators. Each aspect or appearance is followed by another, and so on in endless sequence. Thus a series of undulations bears from afar the past history of the worlds which the observer sees in its various phases as they successively reach him'.<sup>9</sup>

The later dialogue between Quaerens and Lumen leads towards a reflection on the paradox of an observer's ability to see (after millions or billions of years of the light's circulation around the Cosmos) oneself (of childhood age) on the seen-again Earth.<sup>10</sup> One can therefore propose an analogy between the human observer of the Cosmos and someone who, with melancholy, looks through old photographs in a family album and sees themselves in them. This is wholly consistent with the message of Flammarion's popularising deductions, which create an atmosphere of familiarity with the cosmic abyss, its potential inhabitation by beings (perhaps) wiser than us, and a friendly disposition towards all forms of life.<sup>11</sup> A certain 'untouchability' of cosmic objects, an unattainability thereof, means that the Universe is by no means devoid of its 'magic' in the eyes of Flammarion.

9 *Lumen by Camille Flammarion*, authorised translation by A.A.M and R.M (New York: 1897), pp. 38–39 (<https://www.gutenberg.org/cache/epub/43835/pg43835-images.html>, accessed 29 August 2025).

10 It is worth noting that such a possibility exists also in the light of the findings of contemporary science (the concept of the curved spacetime, related to Einstein's theory of relativity, allows for such an eventuality, of course on the caveat that the observer would look in a strictly determined direction for billions of years, and had optical equipment of sufficient resolution).

11 Flammarion wrote in his book *Wielość światów zamieszkiwanych* [The plurality of inhabited worlds], transl. by J. Waga (Warsaw: 1868): 'Długo czas człowiek zostawał odosobnionym na tym padole, nie znając swojej przeszłości, ani przyszłości, ani swego przeznaczenia; długo miał niepewne fałszywe wyobrażenie tak o swoim bycie właściwym, jak i o całym utworze Wszechświata. Czas, aby się rozbudził z wiekowego odrętwienia, aby rozważył dzieło Boskie i uznał jego wspaniałość i majestat; niech bacznie słucha nauczającego głosu natury, a urojone jego odosobnienie zniknie i dozwoli mu ujrzeć Ludzkości postępujące w odległych przestrzeniach niebios!' [For a long time man was isolated on this Earth, not knowing his past or future, or his destiny; for a long time he had an uncertain and false view both of his very being, and of the entire creation of the Universe. It is time that he woke up from the centuries-long stupor, that he considered the Divine work and acknowledged its brilliance and majesty; let him listen closely to the didactic voice of nature, and then his imaginary isolation will vanish and will allow him to see the Humankinds progressing in the faraway spaces of the skies!'] (ibidem, p. 15). This last phrase attests to the interesting attitude of Flammarion as writer and researcher: he linked his conviction of a 'familiarity' of the beyond-human world and its relationship to man with a certainty of the objectivity of progress ('progressing Humankinds'). He ascribed a para-religious form to these convictions, much like the later Auguste Comte. [Quotation in English translated from the Polish edition].

In the book *Astronomia czyli Nauka o Wszczęświecie* (printed initially in Paris as *Astronomie populaire* in 1880) by the same author, the narrator dreams of a journey to the Moon, and an inspiration for those visions is a photograph of this celestial body, bringing it somewhat closer to the observer on Earth:

Zbadano ten dziwny kraj księżycowy jak najdokładniej; obliczono, odmierzone, odrysowano każdą dolinę, każdą równinę i górę. Zrobiono mapy księżycyca podobnie jak mapy geograficzne ziemi. W ostatnich czasach nawet odfotografowano księżyc, tak jak się fotografuje osobę jakąś lub gmach. Powiedzieć można prawie, że znamy księżyc tak, jak gdybyśmy na nim byli. [...] – Dostać się na księżyc! Ach, cóżby to była za ciekawa podróż! [...] Lecz niestety jest to niemożliwe. Już kilka mil ponad ziemią nie ma powietrza do oddychania, ani do podniesienia balonu. A więc nigdy nikt na księżyc się nie dostanie. Co za szkoda!

The strange lunar country has been studied in utmost detail; every valley, plain, and mountain has been calculated, measured, and drawn. Lunar maps have been created, much like those of Earth's geography. In recent years, the Moon has even been photographed in the same way as one photographs a person or an edifice. It could almost be said that we know the Moon as if we have been there (...) – To get to the Moon! Oh, what a fascinating journey that would be! (...) Although, unfortunately, that is impossible. Already, several miles above the Earth, there is no air to breathe, nor to lift a balloon. Therefore, no one will ever make it to the Moon. What a shame!<sup>12</sup>

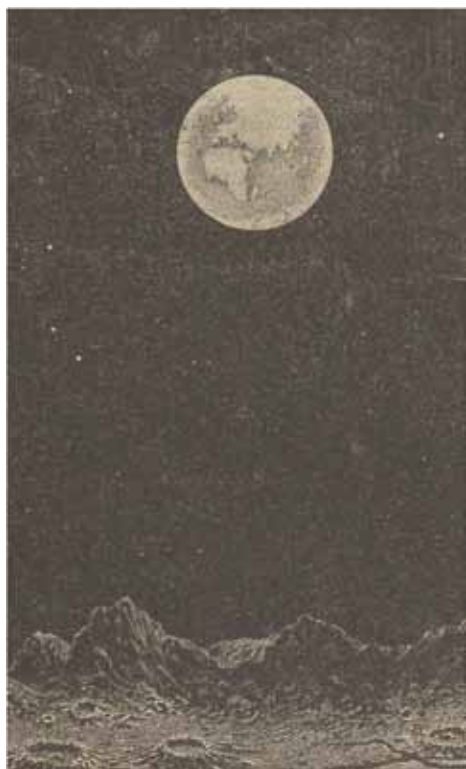


Fig. 2. 'Vehicle of imagination' in action. An illustration of the Earth seen from the Moon from Flammarion's *Astronomie populaire* [Astronomy, or the science of the Universe] (p. 2) and a photograph of the Earth from a distance of 180,000 kilometres, by the crew of the Apollo 11 spaceship (copyright by NASA).

12 C. Flammarion, *Astronomie populaire* [Astronomy, or the science of the Universe], transl. by K. T. (Lviv: 1901), p. 96. [Quotations in English translated from the Polish edition].

Therefore, it is not so much an aggressive desire to conquer, but ordinary curiosity that leads us to dream of setting foot on the Moon. The fact that this dream is not merely an empty vision (and Flammarion remains halfway between romantic fantasy and scientific planning) is demonstrated in the following discussions by the astronomer, which lean towards more practical and implementable technical solutions for such travel. Then, however, the writer's attention returns to the fastest vehicle that is known to us: the light, in some sense commensurate with human thought:

Gdybyśmy użyli do tej podróży kolei żelaznej, pociągu pospiesznego (który przebiega 10 mil na godzinę), potrzebowalibyśmy na przebycie tej drogi przeszło 200 dni, około 7 miesięcy. Gdybyśmy się uczepili kuli armatniej, która robi kilometr w dwu sekundach, potrzebowalibyśmy zawsze jeszcze prawie 9 dni. Są to rzeczy niemożliwe, nie dające się nigdy urzeczywistnić, ale dające nam jasne pojęcie o odległości księżyca od ziemi. Lecz światło biegnie o wiele prędzej od kolei i kuli! Promień światła z księżyca przychodzi do oczu naszych w czasie trochę większym niż sekunda. Myśl nasza z równą szybkością przebiec może tę przestrzeń. A więc spieszmy!... Przybyliśmy.

If we used an iron railway for this journey, a fast train (one that goes at a speed of 10 miles per hour), we would need over 200 days, or approximately 7 months, to cover that distance. If we were to hold on to a cannonball, which travels one kilometre in two seconds, we would still need almost 9 days. These are impossible things that cannot become reality, but they give us a clear sense of the distance between the Moon and the Earth. But light travels a lot more quickly than a rail or a cannonball! A ray of light from the Moon reaches our eyes in just a little over a second. Our thoughts can cross that distance with similar speed. And so, let us make haste!... We have arrived.<sup>13</sup>

It turns out that the journey to the Moon (which was impossible from the perspective of the state of engineering at the time) is possible with the use of imagination, which travels at least as fast as light, and photography becomes a catalyst for it. And here we encounter another potential aspect of the flourishing of scientific and intellectual human abilities (alongside photographic technology and Einstein's theory of relativity), which occurred in the first half of the twentieth century. Interestingly, it was an aspect that had long been forgotten and relegated to the sidelines of the history of thought and the development of science due to dramatic political events and the related dynamic development of technology.<sup>14</sup>

Getting slightly ahead of later findings, it should be noted that the tumultuous historical and political events (the outbreak and course of the First and then the Second World War), which provoked this shift in the cognitive paradigm of phys-

13 Ibidem, p. 97. The estimated time of travel from the Earth to the Moon atop a cannonball (9 days) is quite close to the actual duration of this step of the Apollo 11 mission: it was 4 days.

14 By dynamic development of technology, I mean, of course, military technology, expanded during the First and Second World War, which not only created the foundations of technological progress of the entire twentieth century, but also served many civilian uses. (A classic example is the application of knowledge and skills of the German creator of V-2 rockets, Werner von Braun, by the American NASA, in, among other things, the Moon landing project). The same flourishing of 'pragmatic' and practical science, however, diverted the attention, to a great extent, away from the philosophical foundations and social consequences of science, which had definitely been more actively considered before World War II.

ics, also influenced photography. Already during the first of these significant conflicts, photographs were used as a military element of reconnaissance and espionage (taken, for example, from aeroplanes). Photographic technology was also perfected, as it proved helpful on the frontline, in industry, medicine, and education in the broad sense, which was becoming increasingly mass and uniform.

Astronomy, physics, and related sciences (and the popularisation of their advancements among the masses of readers) benefited from these achievements, and books on these topics published in the 1930s and 1940s were enriched with more and more photographs of distant cosmic objects. Perhaps it was not so much the way they were captured in pictures, but the accompanying commentary (which was becoming more and more concrete, factual, pragmatic) that attested also to the decline of the atmosphere of mystery (attached to those pictures as a specific message from a different, incomprehensible world), which gave way to the growing certainty that the objects presented are precisely what we regard them as, and they do not depict anything that could speak to our experiences, emotions, or raise concern or embarrassment. They are precisely what they are presenting themselves to be in the ever-more-perfect photographs.

What did the change in the cognitive paradigm of science entail, however: the change which appeared in the first half of the twentieth century, directly after the formulation of the theory of relativity and discoveries of quantum physics, and later abandoned, but not forgotten? As written bluntly by contemporary philosopher Philip Goff in the recently published *Galileo's error*: 'In 1623, Galileo took the sensory qualities out of the physical world. Three hundred years later, in 1927, Russell and Eddington finally found a way of putting them back.'<sup>15</sup>

The author refers here to the work of Galileo, *The Assayer*, where the 'father' of contemporary sciences formulated the subject of its interest, which is to be merely the mathematically determined numbers and geometrical shapes, while immaterial qualities are to become, from now on, situated in the human soul and be permanently excluded from the area of scientific scholarship.<sup>16</sup> The wide-reaching negative consequence of such an approach was, according to Goff and other scholars he cites, an exclusion of the conscience of the researcher/observer from the scholarly perspective, and thus a 'creation of the problem of consciousness', which has plagued Western science from that point onwards and up until today.<sup>17</sup> This

15 P. Goff, *Galileo's error. Foundations for a new science of consciousness* (London: 2019), pp. 308–309.

16 See: Galileo Galilei, *Il Saggiatore* [1623] *Excerpts from The Assayer*, in: *Discoveries and Opinions of Galileo*, transl., introduction and notes by S. Drake (New York: 1957).

17 P. Goff, *Galileo's error*... The view according to which consciousness (being a 'receptor' of quality) can constitute an incontestable element of the physical world (and also the physical world outside of us, or more precisely, outside of our brain cells), is referred to as 'panpsychism'.



problem is not merely about the shortage of reliable studies on human consciousness. Still, it is also about the presence of an error that is hard to determine, a certain deviation from the reliable cognitive effects of the sciences, which is a product of the preclusion of that part of reality that is accessible to our senses precisely under the guise of 'quality'.<sup>18</sup>

The weight of this issue is easily underestimated due to, among other things, a deep 'imprinting' of Galileo's (and Descartes's) templates of perceiving reality onto the Western style of thought. Such an approach, however, results primarily in stripping the object studied of any characteristics of quality, the possibility of conscious existence, and the perception of the world, and in concentrating these characteristics solely in the subject experiencing. One effect of this is not only a strengthening of the 'subject – object' opposition, which today constitutes an uncomfortable restriction of scientific methodologies, but also an inexplicability of phenomena, which (according to common sense evaluation) seem to be an inherent element of physical reality, and yet are pushed aside into subjectivity.<sup>19</sup>

The first, though very significant (according to Goff) break from the consistent depriving the phenomena of consciousness (including experience and quality) of their 'objectivity' was brought about by quantum mechanics, in light of which it became impossible to explain the phenomenon of 'collapse of the state vector'. This phenomenon consists of a given elementary particle exiting the state of 'superposition',<sup>20</sup> defining its momentum and location in space by the intervention of the observer's consciousness.<sup>21</sup> However, there have been many solutions acknowl-

18 This is mostly about such simple qualities as colour, taste or smell. It is not, of course, about the contemporary 'post-Galilean' physics being unable to explain the origin of these qualities (e.g. colour as a result of the refraction of light on the surface of a given texture, or smell as a result of specific molecules reaching sensory receptors), but rather, it is powerless in the face of the question of: 'what is it like to experience qualities and why are they being experienced in this specific way, and not another?'.

19 A classic example of this kind of solution could be the adherence of contemporary physicists (even such broad-minded ones as Stephen Hawking) to the notion of 'psychological arrow of time'. According to this view, the vector of the passage of time (past – present – future) could, from a physics point of view, run the opposite way (from the future to the past) or even 'perpendicularly' to real time, which would not change the sense or coherence of physical processes. Physicists extend this understanding of the 'arrow of time' to, at best, the phenomenon of life (because it entails the opposition of living organisms towards the common increase of entropy, progressing in time), not explaining why the 'inanimate world' seems to be subjected to the same temporal logic. (See: S. Hawking, *A brief history of time: from the big bang to black holes* (Toronto, London: 1988)). Of course, the philosophical influence of Immanuel Kant played a great role in the adoption of such a conclusion by physics.

20 According to Goff: 'Nobody really knows what a superposition is, but we can think of it as a sort of refusal on the part of reality to be definitely one way or the other. A particle in a superposition between location X and location Y is in a strange state of being both at X and at Y while being definitely at neither' (P. Goff, *Galileo's error...*, p. 51).

21 Fritz London and Edmond Bauer, quoted by Goff, state: 'When the province of physical theory was extended to encompass microscopic phenomena, through the creation of quantum mechanics, the concept of consciousness came to the fore again: it was not possible to formulate the laws of quan-

edging the possibilities of creative blurring of the 'subject-object' difference, proposed earlier, in the period of a certain 'small Renaissance' of philosophy of science in the 1920s and 1930s. This is why, in the above quotation, Philip Goff mentions the year 1927 as a symbolic end of the 'post-Galilean era' in science. It is in that year that well-known British philosopher and Nobel prize laureate, Bertrand Russell, proposed an innovative solution to the issue of the relationship between consciousness and the objects of cognition, which allowed for an avoidance of pitfalls of Descartes's dualism ('extended substance' and 'thinking substance'), as well as materialism, determining the qualities perceived subjectively as illusions.<sup>22</sup> He concluded that the foundation of any physical observations, or that which matter truly *is*, has to be a specific substrate, different from what science considers as matter (a collection of 'objects' of particular characteristics and abilities to influence other objects), and from human consciousness: closer, nevertheless, to that, which constitutes our inner world (the reality of thoughts, feelings, experiences of quality and their reflective continuity), rather than to 'matter that exists objectively'.<sup>23</sup> The famous British astronomer, physicist, and mathematician, Sir Arthur Stanley Eddington, supportive of Russell in this regard, pointed to the simplicity of such a resolution, as one that enables one to move beyond the 'tainting' of Western science by the 'pragmatic' deformation of optics:

» We are acquainted with an external world because its fibres run into our consciousness; it is only our own ends of the fibres that we actually know; from those ends we more or less successfully reconstruct the rest, as a palaeontologist reconstructs an extinct monster from its footprint.<sup>24</sup>

The argument of a material reconstruction of reality modelled on the remnants (residuals) it leaves over the continuity of our conscious lives, goes far beyond a pragmatic template of science (to experience in order to be able to predict how material objects will behave in a given situation, or as a result to our actions). Following this argument can lead us either towards a Husserl-like phenomenology (if we take

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tum mechanics in a consistent way without reference to consciousness' (F. London, E. Bauer, *The theory of observation in quantum mechanics*, in: *Quantum theory and measurement*, eds. J.A. Wheeler, W.H. Zurek (Princeton: 1983), pp. 217–260).

22 Goff rightly points out not just the inconsistency of this outlook (regarding a part of reality as 'false' a priori), but mainly its unethical nature. It leads logically to ignoring human feelings and emotions, and, at the same time (indirectly) allows, for example, for the excesses of racial anthropology of the Third Reich and the criminal practices associated with it.

23 This relates to Bertrand Russell's book *The Analysis of Matter* (London: 1927). The outlook presented in this work by the author is referred to as 'neutral monism'.

24 A.S. Eddington, *Nature of the physical world* (New York: 1928), p. 278.

consciousness as strictly 'subjective' quality), or towards a particular 'ontology of matter' (if, showing humility, we apportion some of our subjective, conscious world of 'qualities' to that, which lies beyond us). According to Goff, the simplest solution, which fulfils the logic criterion of 'Occam's razor', is to choose the other side: 'the simplest hypothesis concerning the intrinsic nature of matter *outside of brains* is that it is continuous with the intrinsic nature of matter *inside of brains*, in the sense that both inside and outside of brains matter has an intrinsic nature made up of forms of consciousness'.<sup>25</sup> In this approach, the brain (especially in humans) is not distinguished by any specific characteristics. Instead, it concentrates certain traits of a correctly understood matter, much like a lens focuses light.

Regardless of the reasons behind the re-emergence of this style of thinking (referred to in the 1970s as the 'Gnosis of Princeton'<sup>26</sup>), I believe it is worth returning, for now, to the representatives of such outlooks from the beginnings of that century and their earlier, nineteenth-century forerunners.<sup>27</sup> It is also worth reflecting on whether the use of photography in astronomical research and its illustrative use in books on the Cosmos had any influence on the direction of progress in this discipline and its philosophical foundations. Could photography (constituting a visualisation of infinitely remote objects) have strengthened the suggestion of their radical strangeness, invoking respect and humility, subverting cognitive dogmas, or quite the opposite: did it serve the rising de-mystification of the Universe? Even the initial remarks in this article, relating to the use of photography in popular science books, suggest that the role of photography (as is the case for virtually any human invention) was ambivalent. On the one hand, images of cosmic objects, made with ever greater accuracy, made man realise the infinity of the cosmos; they distracted the reader or viewer from their ordinary chores. On the other hand, through an element of unrestrained curiosity typical of us, they suggested the possibility of undertaking a journey and conquering these spaces, thereby including them in the human 'empire' in a manner modelled on overseas colonies.

25 P. Goff, *Galileo's error...*, p. 301 [emphasis by Philip Goff].

26 This stream of thought (interdisciplinary, though inspired by quantum mechanics) appealed to such revered scientists as Abraham H. Maslow, Wolfgang Pauli, Karl Friedrich von Weizsäcker. It cannot be omitted that this trend was criticised by the Catholic church apologetics, due to its being associated with the New Age movement and the gnosis of the first centuries in the development of Christianity. Today, scholars such as, for example, Goff, distance themselves strongly from New Age inspirations, stating that their views (like the views of the early twentieth-century precursors: Eddington, Russell, and others) are located within the discipline of philosophy of science, not including customary-cultural trends (in which the New Age movement was realised in the most distinct way). See, for example, the issue of *Literatura na Świecie* [World Literature] journal devoted to the 'Gnosis of Princeton' no. 3/4 (128/129) (1982).

27 For the history of panpsychism in Western philosophy, see the book by David F. Skrbina, *Panpsychism in the West* (Cambridge: 2007).

It can be said that sir James Jeans, probably the most revered populariser of astronomy in the 1920s and 1930s, was also included in the trend of active discussion on philosophy of science. In the aforementioned *The Mysterious Universe*, Jeans speaks (more cautiously than Russell or Eddington) against Newtonian mechanism, instead coming closer to panpsychism:

» On this view, we need find no mystery; like the rolling contact of our consciousness with the empty soap-bubble we call space-time, for it reduces merely to a contact between mind and a creation of mind – like the reading of a book, or listening to music (...) Today, there is a broad measure of agreement, which on the physical side of science approaches almost to unanimity, that the stream of knowledge is heading towards a non-mechanical reality; the universe begins to look more like a great thought than like a great machine.<sup>28</sup>



Fig. 3. From a classification of observations to aesthetic contemplation: an illustration of remote nebulae from Flammarion's book *Niebo* [The Sky] (p. 193) and a photograph of the Abell S0740 galaxy cluster made by orbital Hubble telescope (by NASA, ESA, and The Hubble Heritage Team [STScI/AURA]; J. Blakeslee, Washington State University – public domain).

28 J. Jeans, *The Mysterious Universe*, pp. 143–148.

The ambitious philosophical intention that accompanies Jeans's musings in this book is revealed already by its motto. It is an extensive quotation from Plato's dialogue, *The Republic*, encompassing the famous metaphor of the cave and the people sitting in it, watching the shadows of real objects cast by the light behind them onto the surface in front of them. Thus the author foreshadows his plan (in line with the ideals of Russell and Eddington, though more orthodox in a theological sense) of realising the dream of rendering the image of the Cosmos more uniform, which could, thanks to the correct theory of physics, become simple, straightforward, and governed by one rule. It turns out that the liminal position of light (as well as its particles, photons, which, according to the findings of physics, do not have any intrinsic mass, and thus are not 'matter' in the strict sense) within our image of the Cosmos predestines it to fulfil the role of the missing 'foundation' of reality, an appropriate answer to Kant's question of 'what is the thing-in-itself?'. Jeans writes:

» Modern physics tends to resolve the whole material universe into waves, and nothing but waves. These waves are of two kinds: bottled-up waves, which we call matter, and unbottled waves, which we call radiation or light. If annihilation of matter occurs, the process is merely that of unbottling imprisoned wave-energy and setting it free to travel through space. These concepts reduce the entire universe to a world of light, potential, or existence, so that the whole story of its creation can be told with perfect accuracy and completeness in the six words: 'God said, Let there be light'.<sup>29</sup>

The fact that the irritating incompleteness of the image of reality (which Goff calls the 'problem of consciousness' in science, and which was known earlier – in the nineteenth century – as the aforementioned issue of Kant's agnosticism) constitutes a continual area of concern for Jeans, is testament to the fact that he does not stop at the bold hypothesis of reducing any forms of matter to radiation, seeking also other explanations for the existence of this gap.<sup>30</sup> It turns out that, in trying to eliminate areas of uncertainty (such as, for example, the issue of super-

29 Ibidem, pp. 97–98.

30 As physicists and science enthusiasts will know, the main issue which reveals itself in the system of contemporary physics (seemingly unrelated to the 'problem of consciousness') is the inability to marry up the findings of Einstein's theory of relativity with quantum mechanics. This is expressed through the significant difficulties during the process of creating the so-called theory of quantum gravity (which Einstein himself tried to formulate).

position), moving in the dark, we are almost stuck with the information relayed via photography, not knowing precisely *what* it actually depicts.<sup>31</sup>

» Or again, it may be that our consciousness should be compared to the feeling in the finger of the painter; as he guides the brush forward over the still unfinished picture (...) At present, science can tell us very little as to how our consciousness apprehends the picture (...) the waves of a single electron are real enough to record themselves on a photographic plate (...) We can only regain complete consistency by supposing all the waves, those of two electrons, those of one electron, and the waves on Professor Thomson's photographic plate, to have the same degree of reality or unreality. Some physicists meet this situation by regarding the electron waves as waves of probability.<sup>32</sup>

Apparently, photography here takes on the form of something of a 'residue' of conscious experience (which was posited by Eddington). Still, it is questioned at the same time, and accused of 'subjectivism'.<sup>33</sup> In endeavouring to suggest possible solutions, Jeans reaches for a different perspective, very widespread in the first quarter of the twentieth century: reflections on the higher dimensions of space, of which there could be more than four (even if we consider time as a dimension which, as it would seem, is still not a commonly accepted model today).<sup>34</sup> The author returns here to Plato's metaphor of the cave, quoted in the motto of the book, using it as a specific framing device for his reflections:

» Just as the shadows on a wall form the projection of a three-dimensional reality into two dimensions, so the phenomena of the space-

31 The issue of the indeterminate nature of an object registered through photography relates especially to images of the so-called Wilson chamber (also known as cloud chamber, see: <https://encyklopedia.pwn.pl/haslo/komora-Wilsona;3924523.html>, accessed 7 December 2023) or the so-called bubble chamber which was used later (see: <https://encyklopedia.pwn.pl/haslo/komora-pecherzykowa;3924513.html>, accessed 7 December 2023), where, in both cases, we are dealing merely with a trace of an object (the identity of which stems from mathematical calculations of the geometry of registered trajectory, made on the basis of the theory of elementary particles), but we cannot ever see it in a literal and unambiguous sense. Mathematical calculations also tell us that what we can see in an image from a Wilson chamber or a bubble chamber is only a trace of some possibility of the existence of an object, not the object itself.

32 J. Jeans, *The Mysterious Universe*, pp. 119–122.

33 The author writes: 'Heisenberg and Bohr have suggested that electron-waves must be regarded merely as a sort of symbolic representation of our knowledge as to the probable state and position of an electron. If so, they change as our knowledge changes, and so become largely subjective. Thus we need hardly think of the waves as being located in space and time at all' (ibidem, p.124).

34 On the topic of such reflections, also in the first quarter of the twentieth century, see the book by Michio Kaku (contemporary American physicist and populariser of science), *Hyperspace. A scientific Odyssey through parallel universes, time warps and the tenth dimension* (Oxford: 1994).

time continuum are four-dimensional projections of realities which occupy more than four dimensions, so that events in time and space become 'no other than a moving row of Magic Shadow-shapes that come and go'.<sup>35</sup>

Of course, it does not mean that Jeans (together with other astronomers of his age) did not often use photography as a source of reliable information, which allows for an enrichment and completion of the image of reality for the purpose of practical science, interpreting and foreseeing events. One special role in this work was played, in his opinion, by spectroscopic photography, which allowed for the identification of chemical elements constituting distant celestial bodies, because 'the light which travels (...) to us brings with it a message as to what substances are producing the light'.<sup>36</sup>

The basic message carried in this way by light is the news of the chemical uniformity of Space, of a universal reign of the same order of origin and coming together of atoms, which we know from Earth:

» It is very significant that practically all the thousands of lines in the spectra of the sun and stars can be identified with the lines of substances which are known on Earth. This, of course, shows that the sun and stars are built up of the same kind of atoms as we are familiar with on Earth – hydrogen, oxygen, nitrogen, iron, copper, gold, and so forth. If we travel to the sun or stars, we shall expect to see many strange sights, but we must not expect to discover any new substances. The universe appears to be built of the same kinds of bricks throughout.<sup>37</sup>

The message of a basic uniformity of Space brought by light (and given to us, perhaps, by a transcendental God) directs Jeans, and other popularisers of astronomy, towards a specific beaten track of reflections, suggesting a possibility of a future exploitation of the Cosmos' goods, even if such a course of events seems just as hard to imagine as it was in Flammarion's times. Indeed, this way of demonstrating the might of the Universe to the readers, by juxtaposing it with the Earthly endeavours of humanity, is very often used by Jeans. It allows one to at least dream of the future use of infinite sources of energy and riches offered by Space. For example, when discussing the diversity of stars and classification there-

35 J. Jeans, *The Mysterious Universe*, p. 125.

36 Idem, *Through Space and Time*, pp. 165–166.

37 Ibidem, pp. 167–168.

of, the British astronomer refers to their 'spectral class' (signifying the presence of specific elements in their atmosphere and on their surface, as well as temperature), after which he states:

» The spectra which lie at the remote end of the sequence indicate temperatures of perhaps 60,000 or 70,000 degrees Centigrade, so that each square inch of the star's surface will give out anything from 500,000 to 1,000,000 horse-power of energy – the amount of star that we could cover with a postage-stamp radiates out enough energy to run all the liners on the Atlantic Ocean.<sup>38</sup>

The intensity of philosophical-scientific 'brainstorm', which took part (obviously in the positive form of dialogue between scientists and honourable competition between them) in the 1920s and 1930s, is attested to by the fact that Jeans, when publishing the book *Eos or the wider aspects of cosmogony* in 1930, defined the nature of the most common nuclear reactions occurring in centres of stars with unwavering certainty not as the fusion of hydrogen into helium (which is the universally accepted version today, and was officially proclaimed by Arthur Eddington in 1926),<sup>39</sup> but as a disintegration of supermassive nuclei of elements heavier than uranium, but unknown on Earth.

In Jeans's work, we also come across an image similar to that delineated in the aforementioned dialogue of Lumen and Quaerens (from *Lumen by Camille Flammarion*): a collection of pictures, sent by cosmic objects into space, which 'conserve' the past and allow to be read in any place where an observer is present. However, for the English astronomer, this vision is no longer an opportunity for a nostalgic remembering of childhood (which could perhaps be resurrected once one has caught up with the right ray of light), but allows for a profound, pragmatic insight into the history of the Universe, thanks to the fact that light shows us cosmic objects at various stages of their evolution (which has been going on for billions of years). If the Universe were ordered in a different way (for example, if the speed of light turned out to be infinite), we could no longer see, for instance, quasars (the forms in between stars and galaxies), which were present in the early Universe.

Can one, therefore, trust the light, the human eye, and photography, which is the technical derivative thereof? It would seem that one can, but... not entirely.

38 Ibidem, p. 182.

39 I refer to Eddington's book *Internal constitution of the stars* (Cambridge: 1926) (see: <https://euro-fusion.org/fusion/history-of-fusion/>, accessed 10 September 2023).



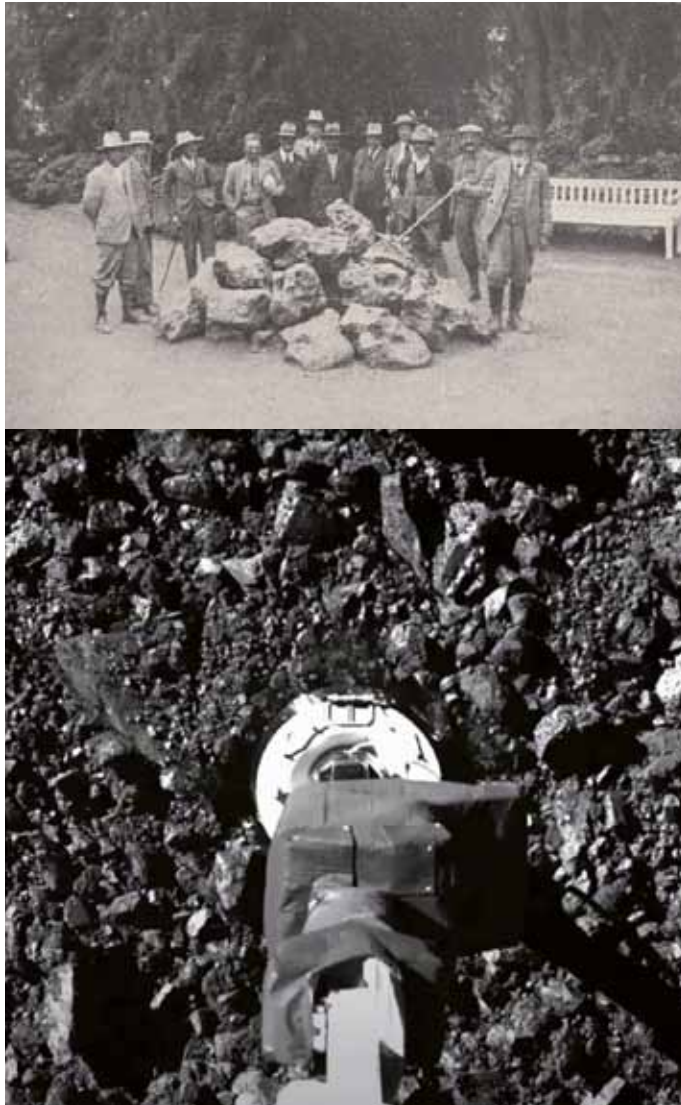


Fig. 4. Between the 'gift of the heavens' and the avant-garde of exploitation. A pile of iron meteorites collected in the Gibeon region in South-West Africa, present territory of Namibia (photo by W.T. Gordon; in: J. Jeans, *Through Space and Time*, p. 85); a robotic arm of the NASA probe 'OSIRIS-REx' touches the surface of Bennu asteroid (copyright by NASA).

Jeans states as follows, invoking a known astronomer, who became really famous thanks to the telescope orbiting the Earth that bears his name:

» Dr Hubble found it necessary to end his classification of nebulae with clouds of stars. At one end of his continuous sequence is a nebula,

shaped like a mass of rotating gas, in which not a single star is visible; at the other end, a star-cloud such as the Greater Magellanic Cloud (...) in which nothing but stars are visible. Our galactic system of stars is probably the final product of just such a transformation (...) <sup>40</sup>

From today's perspective, however, such an outline of the evolution of nebulae (from independent, enormous gas cloud to galaxy comprising billions of stars) turns out to be false (stars originate locally, in established galaxies, and especially near their nuclei, where there are concentrated clouds of interstellar matter), <sup>41</sup> while the error in the astronomer's thinking occurred precisely due to the fallibility of human eyesight, weak telescopes and insufficient resolution of images. <sup>42</sup>

It is apparent, therefore, that photography (as a tool aiding human sight and memory) also bears the cost of its role as the not entirely trustworthy 'middleman' between the knowledge of the Cosmos relayed to us by the benevolent ray of light and the human eye. This quirk of photography, as an unintentional message not fully controlled by consciousness, and thus susceptible to deformation and manipulation, will also return in the age when man will really walk on the Moon. I mean, of course, the 'conspiracy theories' (created by what can be called a 'populist reasoning', which is the opposite of common sense), which exploded with incredible force with the appearance of the first images and sounds sent from the surface of the Earth's satellite. <sup>43</sup>

40 J. Jeans, *Eos or the Wider Aspects of Cosmogony*, p. 77.

41 See, for example, term: 'gwiazd ewolucja' in the encyclopaedic guide, *Kopernik – astronomia – astronautyka* [Copernicus – astronomy – astronautics], ed. W. Zonn (Warsaw: 1973), p. 101.

42 The thing is, in the light of Hubble's originally formulated theory of evolution of galaxies, large nebulous objects photographed or seen by astronomers beyond our Galaxy, are composed of cosmic gasses (mainly hydrogen and helium), from which stars are yet to originate. The introduction of higher-resolution telescopes (as well as the possibility to place them on top of even higher mountains than before, or even in Space itself) allowed for an assertion that the vast majority of nebulae, previously identified as gaseous objects, consists, in fact, of millions of faint (due to their remoteness) 'ready' stars.

43 As Jerzy Prokopiuk writes in the introduction to the book by Carl Gustav Jung, *Norwczesny mit. O rzeczach widywanych na niebie* [*Flying saucers: A modern myth of things in the sky*] (transl. and foreword by J. Prokopiuk (Cracow: 1982)), in the circle of American radio hams the following dialogue was allegedly received, between the crew of the 'Eagle' lunar module and mission control in Houston: 'Mówi Armstrong: – Co to jest? O co, u diabła, tu chodzi? Chciałbym naprawdę wiedzieć, co to jest?! Następuje pewne zamieszanie, a po chwili daje się słyszeć głos kontrolera z NASA: – Co się dzieje? Czy coś nie w porządku? – Kontrola lotu wzywa Apollo 11! Odpowiada Armstrong: – Są tu olbrzymie obiekty, sir! Olbrzymie! O Boże! Ustawione są po drugiej stronie krateru! Są na Księżycu' ['Armstrong says: "What is it? What the hell is this about? I would really like to know what this is!'" There is some commotion, and then a NASA controller's voice can be heard: "What is it? Is something wrong? Mission control to Apollo 11!" Armstrong replies: "There are huge objects, sir! Huge! Oh God! They are placed on the other side of the crater! They are on the moon"] (ibidem, p. 25). [Quotation in English translated from Polish edition.]



Fig. 5. A conspiracy of NASA and the White House, or optical illusion? According to conspiracy theory enthusiasts, the shadows of both astronauts should be even or very close in terms of size, if they really were lit by the Sun, and not with a spotlight in a film studio nearby (<http://www.ufos-aliens.co.uk/cosmica-pollo.html>, accessed 1 November 2023).

The root causes of the media uproar surrounding photographs from the Moon can be diagnosed in various ways: their obvious aspects can certainly be explained through social anthropology, while a psychoanalytic diagnosis proposed by Carl Gustav Jung<sup>44</sup> should also not be ignored. I believe one can, however, lean towards the aforementioned philosophers of science (panpsychists or neutral monists), whose findings enable us to see an enormous gap in post-Galilean concept of objective knowledge: the lack of consideration for the intuition of the possible 'answer' of the object of cognition to the impulse from the human consciousness, different from their passive presence, vulnerable to manipulation.<sup>45</sup>

Just like various other topics related to epistemology of sciences and man's place in the Cosmos, this issue was explored by Stanisław Lem in his excellent allegorical short story *Inwazja* [Invasion], written in the late 1950s. The work is not only a sign of scepticism towards the possibility of reaching an understanding of the cosmic 'Other' thinking (or consciousness), but also a symptom of a change in approach (the emergence of fear and scepticism after the shock of the 'time of

44 I refer to Jung's book *Nowoczesny mit...*

45 In the spirit of 'studies of objects' (or 'non-anthropocentric' Humanities) one can interpret this as follows: in a situation where a 'thing' or an 'object' gains a certain autonomy in communication with the human (stemming from the special situation, atmosphere of mystery and uniqueness accompanying this contact, such as in the case of the first landing on the Moon), a previously blocked 'residuum' of the subject-object relationship is revealed, located this time on the side of the object, and expressing itself in uncontrolled images and sounds (or voices), which we can experience in this strange and new environment.



Fig. 6. Photography in the service of science and heroic idea of conquest. A photograph of the surface of the planet Venus taken by a Soviet probe, Venera 14, before it was destroyed by the temperature and pressure (the probe landed on the planet's surface on 5 March 1982 and managed to survive and work for 57 minutes; the pressure on Venus is approx. at 92 atmospheres, the temperature can reach 420 degrees Celsius; [https://ya.ru/images/search?img\\_url=simage&source=serp&text=фотографии%20поверхности%20венеры](https://ya.ru/images/search?img_url=simage&source=serp&text=фотографии%20поверхности%20венеры), accessed 8 November 2023).

contempt'), which is apparent especially in contrast with the narratives of Camille Flammarion. He also raises, in a certain way, the issue of photography, optical modelling of objects and events, because it relates to mysterious, transparent objects (in the shape of spheres or 'pears'), which land in various areas of our globe, killing random people and animals with temperature and shock waves released on collision with the surface of the Earth. The essence of the problem (posed by the writer for the characters of his work and, directly, for the readers) is that these spheres, not just devoid of any living crew, but also apparently not being technological devices, in some way photograph the surrounding area of their landing before destroying it, retaining its image for some time within themselves.

The story distils the issues of the reliability of photography, its moral implications, and the boundaries of scientific cognition. The 'photographs' made by the white spheres are somewhat linked with territorial interference or aggression (this moving message was enhanced by Lem through the fact that the first victims of one of the 'white spheres' is a couple of young people in love, having sex 'out in nature'), and the three-dimensional images seem to distort reality. However, they

can be turned into film, which only reveals a part of the truth,<sup>46</sup> while the ultimate purpose of their actions remains inscrutable, exposing the limitations of science and human cognition.<sup>47</sup>

It is, however, not so much a helplessness, but an inability of the public opinion to accept the truth in all its directness. Interpretators of this short story (and there have not been many of those, as Lem, unjustly, excluded *Inwazja* from later collections of his texts) omit the fact that the ultimate explanation (appropriate for the human mind) of this 'murderous' phenomenon does finally get formulated, and by a scientist, no less, at a public press conference. As Doctor Haines states there, the spheres are most likely peculiar forms of life, which were shaped on planets of variable stars (Cepheids) – hence their unusual physical resistance, including to penetrating and lethal radiation – and, if the appearance of their new generation requires a 'mixing' of genetic material within their translucent casing, the spheres, attempting reproduction, rely on chance and give their insides the shape of surrounding objects and creatures. Therefore, the 'killings' executed by the spheres, as well as their 'photographic' quality result only from the laws of evolution and genetics, and simple accident.

The journalists, however, are not satisfied with this answer; they are tenaciously asking the question: 'Why?' The author then reveals an allegorical dimension of his story. Doctor Haines likens the actions of the spheres to the journalists' wearing of 'floral shirts', stating:

Należy [...] sądzić, że noszenie takich koszul sprawia tym panom przyjemność. Jest to bardzo dobre wyjaśnienie, bo nie wszystko, co robią ludzie, a także inne istoty żywe, podyktowane jest celowością

One should (...) assume that wearing such shirts brings these gentlemen pleasure. This is an excellent explanation because not everything that people and other living creatures do is dictated by biological

46 Photographs taken by the spheres move, though imperceptibly, at a speed unnoticeable to the human eye. Later, a rational explanation is found for this, albeit a wholly unsatisfactory one for the audience.

47 This short story is often cited by critics and interpreters as a sign of Lem's famous agnosticism, relating especially to the contacts between various species of intelligent beings in the Universe. Any truth that we reach is, according to the writer, a typically 'human' truth, shaped not only by the limitations of our senses, but also by the specific orientation of our mentality and biological conditioning. Hence the most quoted passage from *Inwazja* is the following fragment of Doctor Haines's, one of the character's, speech directed at journalists: 'Panowie chcecie ode mnie usłyszeć prawdę – ale prawdy są dwie. Pierwsza – dla tygodników zamieszczających dłuższe artykuły z graficznymi winiętami. Szkliste grusze – to okazy z ogrodów botanicznych wysoko rozwiniętych istot gwiazdowych. [...] Grusze są ich rzeźbiarzami i portrecistami. Druga prawda, tak samo dobra, obowiązuje prasę codzienną, zwłaszcza popołudniową. Grusze – to potwory kosmiczne, którym uciechę sprawia sam akt niszczenia [...] ['Gentlemen, you want to hear the truth from me – but there are two truths. The first – for weeklies publishing longer articles with photographic vignettes. Glassy pears – they are specimens from the botanical gardens of highly advanced stellar beings (...) The pears are their sculptors and portraitists. The second truth, equally as good, is for the daily papers, especially evening press. The pears – are cosmic monsters, taking pleasure in the sole act of destruction (...)]' (S. Lem, "Inwazja" [Invasion], in: idem, *Inwazja z Aldebarana* [Invasion from Aldebaran] (Cracow: 1959), p. 49). [Quotations in English translated from Polish edition.]

biologiczną. Jeśli to komuś odpowiada, może sobie rzec, że wytwarzanie podobizny istot, w pobliżu których spędzają swą wczesną młodość, sprawia gruszkom przyjemność.

purpose. If one pleases to say so, one can claim that creating a likeness of creatures, next to which they spend their early youth, brings pleasure to the pears.<sup>48</sup>

A 'multivocal roar' of outrage, which rises in reaction to these words, cannot perhaps be justified in terms of the plot and the setting of the story, but it suggests to the reader an iconoclastic character of the allegory. This is because, if we take into consideration the symbolic meaning of the first 'victims' of the invaders from Space (for example via an association with Romeo and Juliet), we can realise how distorted is the image of the human civilisation, culture, ethics, all our endeavours that we see as lofty and unselfish, that the story portrays. They are all merely there to serve a mixing of genetic material, survival within the environment, and a minuscule pleasure which may accompany it.<sup>49</sup>

And what does the short story say in terms of photography in the context of the previously invoked texts of culture? We can assume (with the cognitive humility of Lem's Doctor Haines) that, regardless of what we associate the remote, peculiar objects with, objects that we get to know thanks to the benevolence of light and laws of physics (whether they be 'gods',<sup>50</sup> 'God', 'other forms of consciousness', or 'qualities not experienced by anyone').<sup>51</sup> They do exist and, in a sense, photograph us, too.

*Translated by Maria Helena Bryś*

*verified by Jerzy Giebułtowski*

48 Ibidem, p. 48.

49 The character of Lem's story confirms this, saying (in private) to a very inquisitive young journalist: 'To pytanie [o s e n s niedających się wyjaśnić zachowań, jak w przypadku «kul-gruszek» – M. P.] odnosi się tak samo do roślin, do zwierząt, do ludzi – do wszystkich istot. Na co dzień nie dostrzegamy go, bośmy przywykli do życia, do naszego życia, takiego, jakim ono jest. Trzeba było dopiero obcych, innych organizmów o odmiennych kształtach, funkcjach, żebyśmy je odkryli na nowo – jeszcze raz' ['This question [on the purpose of inexplicable behaviours, such as those by the 'sphere-pears' – M.P.] relates in the same way to plants, animals, humans – to all creatures. We do not see it in the every-day, because we got used to life, our life, the way it is. It took alien, other organisms of strange shapes and functions, for us to discover it afresh – once more.'] (ibidem, p. 50).

50 Sir Jeans stated, for example: 'The future; may not be as unalterably determined by the past as we used to think; in part at least it may rest on the knees of whatever gods there be' (J. Jeans, *The Mysterious Universe*, p. 25).

51 According to Philip Goff this way of determining the 'essence' of objects experienced (existing independently of the experiencing subject, apart from their characteristics which are mathematically calculable and geometrically measurable) is proposed by Sam Coleman, philosopher from the University of Hertfordshire. (See: P. Goff, *Galileo's error...*, p. 183, footnote 52).

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## ABSTRACT

The article aims at tracing the role of photography in the popular scientific narrative on the Cosmos in selected examples from the second half of the nineteenth century and the first half of the twentieth century. The following authors have been selected to represent this kind of literature: Camille Flammarion and Sir James Jeans. Particular consideration is given (from the perspective of photography as scientific proof) to the question of the ontological status of the objects of astronomy and physics research (stars, galaxies, planets, elementary particles, etc.). This status has, with the emergence of the theory of relativity and quantum mechanics in the first quarter of the twentieth century, undergone a significant change due to the need to include the awareness of the researcher into physical processes. The article recalls the outlooks of prominent physicists and science theoreticians (such as Sir Arthur Eddington, Bertrand Russell, Wolfgang Pauli and other representatives of the so-called panpsychism), who argued for the granting of a distinctively understood awareness not only to the subject (the researcher), but also to the object of study. Against this backdrop, the author endeavours to portray the ambivalent role of the photography of space objects, which, on the one hand, strengthens their autonomy in the process of the humans' experience of them, but which, on the other hand, would be written into the expansionist narrative, suggesting the possibility of a neo-colonial exploitation of the riches of Space. The conclusion presents an allegorical interpretation of a short story *Inwazja* [Invasion] by Stanisław Lem, which, according to the author, is excellent at summarising the issue of the boundaries of human knowledge, experienced when confronting unknowable phenomena, in a narrow 'Galileo-Cartesian' epistemology.

**KEY WORDS:** Photographs of the Cosmos, popularisation of astronomy, quantum mechanics, panpsychism, Galileo Galilei (1564–1642), Stanisław Lem (1921–2006)