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Scientific Myths on the Covers of the Polish Edition of “Scientific American”

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Abstract

The purpose of this article is a semiotic analysis of the covers of the Polish edition of “Scientific American” magazine in the context of scientific myths. It is an attempt to understand how scientific ideas and images are transformed into cultural symbols that carry additional meanings and values. The study is based on a semiotic analysis of 60 covers of the Polish edition of “Scientific American” from the last five years (2019–2024). The commutation test technique and the artificial intelligence application The Semiotic Engine were used to prepare descriptions of each cover. The covers were categorized into larger thematic groups, and the dominant themes were presented in the form of a cross tabulation in relation to the scientific myths analyzed. The analysis showed that the scientific myths present on the covers of Scientific American have a significant impact on society, shaping our understanding of science and technology. These myths can both inspire and mislead, simplifying complex issues and giving them sensational or ideological meanings. Examples of myths include the image of the scientist as hero and technology as salvation. The article offers a new perspective to the study of science popularization and media education, showing how semiotic analysis of journal covers can reveal hidden cultural meanings and values. The work underscores the need for critical analysis of media messages to better understand how culture influences our perception of science and its role in society.

Keywords: mythology, science, science popularization, “Scientific American”, scientific myths, semiotic analysis.

1. Introduction

Scientific myth in the context of semiotics is a concept that refers to the way scientific ideas and images are transformed into cultural symbols that carry additional meanings and values. Roland Barthes, one of the key theorists of semiotics, in his work “Mythologies” analyzes how myths function as the second level of the semiotic system. Semiotics, as the science of signs, studies how signs (that is, anything that can signify something) communicate meanings. Barthes introduces the concept of myth as a second level of semiotic analysis, where signs create new, more complex meanings (Barthes, 1957). For example, the image of a scientist in a laboratory at the denotational level represents a person doing research. However, at the mythological level, it can symbolize progress, innovation and even a kind of heroism.

Scientific myth, then, is not so much false information, but rather the way scientific concepts are presented and interpreted in culture. Barthes argues that myths tend to naturalize history, making it seemingly eternal and immutable. In the context of science, myths can simplify complex issues, giving them sensational or ideological meanings that can affect the way society views science and its achievements. An example of science myths are constructs related to the image of

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the scientist as a hero. Often in the media, scientists are portrayed as solitary, brilliant individuals who make breakthrough discoveries. Such an image can distort the reality that science is usually the result of teamwork and long-term research. Another scientific myth concerns technology as salvation. Many scientific publications present new technologies as solutions to all of humanity's problems, which can lead to excessive optimism and ignoring potential risks.

Scientific myths have a significant impact on society, shaping our understanding of science and technology. According to Bishop Adam Lepa, a Polish media educator, scientific myths “concern the goals and functions of science, as well as scientific research and its interpretation. They are also meant to create an image of science in a country with emphasis on the merits of the ruling party or coalition” (Lepa, 1999: 21). They can both inspire and mislead, so it is important to critically analyze what meanings are conveyed by the media and scientific publications. Thus, scientific myths in the sense of semiotics are how scientific ideas are transformed into cultural symbols that carry additional, often simplified meanings. Analyzing these myths allows us to better understand how culture affects our perception of science and its role in society.

We will take a look at the scientific myths on the covers of the Polish editions of the monthly magazine “Scientific American”, analyzing why these myths are on the covers and what implications they may have for readers and for science itself. We will also examine how these myths fit into a broader cultural and ideological context, in line with Barthes' theory that myths tend to naturalize history, making it seemingly eternal and unchanging.

2. Materials and methods

A semiotic analysis was carried out: denotative and connotative of 60 covers of the Polish edition of the journal *Scientific American* from the last five years (2019–2024). Specifically, from issue 11/2019 (339) to issue 10/2024 (398). This prestigious monthly magazine has been published in the US since 1845, in Poland – as “World of Science (Świat Nauki)” – since 1991. Semiotic analysis of magazine covers is both a media studies methodological proposal (Taylor, Willis, 1999: 19-26) and a method of contemporary media education in identifying social myths and cultural codes (Drzewiecki, 2016).

An answer was sought to the question of contemporary scientific myths present on individual magazine covers. They were categorized into larger thematic groups. The dominant themes present on the covers in the journal were also indicated. They were presented – in the form of a cross table – in relation to the analyzed scientific myths. In the semiotic analysis of the covers, the technique of the commutation test was used, seeking answers to the question of what was omitted in the construction of the image of science on the covers of the Polish edition of *Scientific American*. The artificial intelligence application *The Semiotic Engine* was used in the preparation of descriptions of individual covers.

3. Discussion

The research topic undertaken in the article is part of the contemporary discussion on the social image of science. Science is still a tool for dealing with the difficulties of civilization. However, the scientific community is faced with a new metamodern reflection, seeking answers to the question of how to popularize science on the one hand, make it interesting to the modern media, and make it easy and accessible to the audience. On the other hand, how to maintain its seriousness and strict methodological requirements, the formal language of science, the requirements of the process of scientific proof of truths. Another aspect concerns the policy of open science and its digitization, providing the public with wide access to research achievements (Pipere, Mārtinsone, 2023). The main challenge of modern science is the problem of post-truth, which undermines our basis for knowing knowledge, as well as trust in scientists. The discourse of post-truth renders invalid the rationality of the world, destabilizes epistemology, and leads to competing ways of explaining reality based on pseudoscience. Hence the need for a new social responsibility of science and correction of its public image (Wagner, 2023). It also seems important to study the language of contemporary scientific messages, to inquire how the media image of science is created, not only the rational one, but also the emotional one.

This is not only a question about the function of scientific and popular science publications, but also about the scientific policy of countries and regions (Mamonova, 2023). This image of science is also created by pop culture, including feature films. Popular depictions of science play a key role in constructing society's “scientific imagination”, they are an integral dimension of

society's understanding of science and are just as important to science communication as “real” science. Here we are sometimes confronted with negative stereotypes, of the scientist as an evil demigod, an egotist without morals, a nerd and a capitalist who betrays the ethos of science. However, these are largely positive images: the objective researcher, the practical expert and the dedicated idealist (Domaradzki, 2023). Contemporary questions about the image of science are leading to the need to rethink its paradigms. From the time of Galileo and later through the critical rationalism of Karl Popper, there is a need to rethink the Aristotelian conception of science. It also takes into account the role of religion and theology as a discipline in the system of modern sciences (Baruwaso, 2022).

Contemporary research on scientific myths can provide interesting clues here about the contemporary image of science. Much of this research refers to the colloquial understanding of a scientific myth as something false or untrue. These include myths about historical science figures (Kokorina et al., 2023), as well as contemporary beliefs that are not supported by research findings, for example, about the “creativity crisis” in young people (Barbot, Said-Metwaly, 2021), or quasi-scientific ideas about reality, such as the noosphere theory (Fesenkova, 2019). However, there is also an emerging semiotic understanding of myth as a hidden idea that organizes social life, including science. This is the case with the myth of technological progress, which replaced the medieval belief in a world guided by divine providence (Burdett, 2020). Barthes' model of denotative and connotative analysis makes it possible to establish myths, primarily concerning contemporary politics and social life (Istiyanto et al., 2024). However, it seems that it can be successfully used when studying the dominant current image of science.

4. Results

Denotative and connotative analysis, commutative tests performed on 60 covers of the Polish edition of “Scientific American” pointed to 113 detailed myths about modern science. They were grouped into 8 main categories: the myth of science as a driver of progress, the myth of transcendence and cosmic expansion, the myth of technology as inevitable evolution, the myth of man as the dominator of nature, the myth of global crises and disasters, the myth of exploratory science and exploration, the myth of social harmony and cooperation, and the myth of cyclicity and finality. The results of these analyses are presented below on 8 selected covers relating to 8 major scientific myths. Then a summary of the mythological analysis is presented in the form of a cross table. The didactic possibilities of semiotic analysis in media education classes were also pointed out.

The myth of science as a driver of progress

The myth of science as a driver of progress is based on the belief that science and technology are key factors leading to continuous development and improvement in the quality of life. Within this myth, scientific progress is seen as a continuous process of discovering new truths and pushing the boundaries of human cognition, which is expected to lead to a better understanding of the world and dispel old beliefs. Technology, as the fruit of science, is considered a tool that brings progress and promises a better world through innovation and discovery. Science is also seen as a light in the darkness, a guide that helps humanity control and predict future disasters, and a lifesaver that has the potential to solve global problems. Scientists are often portrayed as heroes who, through their work, contribute to humanitarian progress and the exploration not only of the Earth, but also of space. In this way, the myth of science as a force for progress combines a belief in constant development, innovation and the drive to conquer new territories and search for truth.

On the cover of issue 10/2022 (“Świat Nauki”, 2022c) we see the title of the magazine “Scientific American”, with the supplement “World of Science (Świat Nauki)” on the left. The main element is a large, transparent hourglass that contains galaxies and star clouds, suggesting the cosmos. In its lower part we see a vortex that resembles a black hole. In the foreground is the inscription *The Paradox of Black Holes resolved* in Polish. In the margin to the left are slogans foreshadowing the magazine's content, such as *Spacetime Tunnels*, *Event Horizons* and *Monstrosity at the Center of the Milky Way*. We see the hourglass as a symbol of time, the passage of time and inevitability. In the context of the cosmos, the hourglass may suggest the idea of infinity, the evolution of the universe or its cyclical nature. The black hole symbolizes mystery, the unknown and the forces of nature that transcend understanding. It can also suggest a theme of deep scientific discovery or challenges in cosmic physics. The message *The Paradox of Black Holes resolved* suggests that the magazine article addresses the topic of scientific puzzles and

breakthroughs. This is typical of popular science magazines, which often try to present complex theories in an accessible way. Blue is often the color associated with science, peace and infinity, while the black of the black hole symbolizes mystery, horror and the unknown.

The hourglass combined with galaxies suggests the narrative that science has the ability to penetrate time and space, uncovering the secrets of the universe. The myth of the scientist as hero or science as light in the darkness is strongly present here. In this context, science is presented as a force capable of solving even the most complicated puzzles of the universe. Taking a commutation test, we can imagine that instead of an hourglass we have a mechanical clock on the cover. The mechanical clock would still refer to time, but more in terms of the human understanding of time, structure and control, instead of the idea of a cosmic, infinite passage of time. Such a substitution could suggest a more “earthly” and understandable approach to the subject of black holes, rather than a cosmic mystery. By replacing the black hole with something less abstract, such as a planet, the cover would cease to be so strongly symbolic. It would lose the element of mystery and depth, turning into a more conventional representation of space science.

The analyzed cover of the Polish edition of Scientific American magazine uses strong visual signs and symbolism to communicate the complexity and depth of scientific topics. The hourglass sign, combined with galaxies and a black hole, introduces the viewer to a world of science that is both mysterious and promising to solve great cosmic puzzles. A denotative and connotative analysis, coupled with analysis of myths and a commutative test, reveals that the cover depicts science as a force capable of solving the greatest mysteries of the universe.

The myth of transcendence and cosmic expansion

The myth of transcendence and cosmic expansion is based on the belief that humanity is destined to explore and colonize the infinite cosmos. Within this myth, the cosmos is seen as the final frontier, full of mysteries and unknown civilizations waiting to be discovered. Space pioneers are heroes who cross the boundaries of the known world, striving for cosmic harmony and the search for the ultimate truth about the universe. Science is the tool that enables knowledge and understanding of this great galaxy, as well as the transcendence of human experience. As a place of both fascination and horror, the cosmos symbolizes both potential dangers and infinite possibilities. In this way, the myth of transcendence and cosmic expansion combines dreams of humanity's future as a species exploring the universe and the quest to discover the mysteries of the cosmos.

At the denotative level, the cover of issue 1/2023 (*Świat Nauki*, 2023) shows the title of the journal: “Scientific American”, main headline: *A New Era of Astronomy*, subtitle: *How the James Webb Space Telescope is Changing Our Understanding of the World*. The background is an image of outer space with stars, nebulae and galaxies visible. Dark colors dominate, with bright flares of stars and clouds of cosmic dust. Additional article titles: *Deceiving the Light*, *A New Look at Autism*, *How Teeth Evolved*. The visual and textual elements are directly scientific in nature, aimed at an audience interested in space, astronomy and new discoveries.

On a connotative level, the cover symbolizes a watershed moment in space science, pointing to the James Webb Space Telescope as a technological tool that is revolutionizing our understanding of the universe. The use of the word “new era” refers to the marked change the telescope brings to astronomy. The connotation of the word “era” suggests that this event is not temporary, but permanent and of great historical significance. The illustration of the cosmos on the cover depicts the vast, mysterious expanses of the universe, which connotes the infinite and the unknown that are being explored. Colors such as black, blue and white are often associated with scientific seriousness, outer space and the mysteries of the cosmos, reinforcing the importance of discovering and exploring this area. The phrase “changes our understanding of the world” suggests that discoveries made with the Webb Telescope can affect not only scientific knowledge, but also our world view, which underscores the importance of modern space exploration.

On a mythological level, the cover touches on the myth of science as a means to discover truths about the universe. The modern myth of technological advances that enable us to reach new frontiers of cognition is prominent here. The James Webb Space Telescope is presented as a symbol of the human ability to push the boundaries of knowledge and understanding of the universe. The cover also fits in with the myth of the cosmos as the last frontier that humans are constantly trying to cross. Here, the telescope acts as a tool that allows us to “cheat” limitations that were previously impassable – for example, the limitations of vision that formerly prevented such a deep look into space. Conducting a commutation test allows us to understand the meaning carried by key elements of the cover. Replacing the illustration of an image of outer space with another,

more earthly one (such as a landscape of nature) would completely change the context of the cover, shifting the meaning from space discoveries to nature themes. The cover would cease to be understood as a reference to space science, while losing its mystical and exploratory aura. If a title of a more technical nature had been used instead of *New Era of Astronomy*, such as *Discoveries of the Webb Telescope*, it would have changed the perception of the cover from a new breakthrough in astronomy to a more detailed, technical article, which might have discouraged readers interested in more general scientific aspects. Changing the colors to more warm or bright colors (e.g., green, yellow) could dilute the sense of mystery and seriousness associated with the discovery of the cosmos, causing the cover to be perceived as less serious and less connected to the subject of astronomy. The commutation test shows that both the image of the cosmos and the color scheme and title are key to building an atmosphere of discovery and emphasizing the importance of astronomical breakthroughs.

The myth of technology as inevitable evolution

The myth of technology as inevitable evolution is based on the belief that technological development is an inherent and inevitable direction of human development. Within this myth, the relationship between humans and technology is seen as symbiotic, where artificial intelligence acts as a super-intelligent tool that has the potential to transform society. The human body and brain are often compared to machines, leading to the idea of “mind mapping” and the unlimited potential of artificial intelligence. Technology is seen as a powerful tool that can control the fate of the planet, fight invisible threats and disinformation, and create new things from existing elements. Fire, as a symbol of civilizational progress, reflects the belief in technology as a key element in the evolution of humanity. In this way, the myth of technology as inevitable evolution combines belief in the power of technology and its ability to shape the future.

On a denotative level, the cover of issue 5/2024 (Świat Nauki, 2024b) depicts a large AI (artificial intelligence) sign in the center, in bright pastel colors, surrounded by a mosaic of small cubes and pixels in orange and blue tones. The main text reads *What AI Teaches Us*, and below it is a subtitle: *How Artificial Intelligence Deciphers Damaged Papyri, Proves Theorems and Helps Us Understand Ourselves*. Additional topics appear in the margins: *Mysterious Brown Dwarfs, How to Bring a Piece of the Cosmos to Earth*, and *The Battle Against Ineffective Drugs*.

On a connotative level, the main symbol is AI, which immediately refers to modern technology, especially artificial intelligence, which is at the center of discourse about the future of science, technology and society. The text and image suggest technological sophistication and the potential of AI to analyze data and discover new facts, especially in a scientific context. The pixelated appearance of the letters in the AI caption connotes the digital world and virtual reality, emphasizing that artificial intelligence operates in the realm of information technology. The mosaic of cubes and pixels scattered around the central inscription may symbolize the chaos of data that AI can transform into orderly information. The colors orange and blue can symbolize both energy (orange) and calmness or rationality (blue), reinforcing the narrative of AI as both a dynamic and precise tool.

The cover story is in keeping with contemporary myths about artificial intelligence. The first myth is that of AI as a “super-intelligent tool” that has the ability to solve complex problems, process massive amounts of data and decipher complex puzzles such as ancient papyri. AI is presented here as a “lifesaver” for science and culture, a technology that not only makes our lives easier, but also deepens our knowledge of ourselves and history. The second myth is the narrative of technology as the inevitable direction of humanity’s evolution. Artificial intelligence, symbolized by the inscription AI, in this cover story becomes a metaphor for the future, where technological progress is not only beneficial, but even necessary for the further development of civilization. The third myth is the belief in the “unlimited potential” of artificial intelligence. The cover suggests that AI has the ability not only to analyze current data, but also to tap into knowledge from the past (like deciphering papyri) and enable a better understanding of human nature.

As a commutation test, the central element of AI could be replaced with another technological symbol, such as that of a quantum computer. Such a change would shift the narrative from data analysis and artificial intelligence to quantum physics and more abstract concepts related to the future of technology. Such a change could also introduce connotations of accelerating technological development and more scientific, less popular applications, reducing the universality of the topic and its emotional impact on the viewer. Another change could be to replace the pixelated form of AI letters with more traditional mechanical imagery, such as cogs or tools, which

would introduce connotations of industry and mechanical technology, shifting attention away from the digital world toward more physical forms of technology. Then the topic of AI would lose its reference to the virtual and digital world and relate more to industrial technologies, which would change the perception of AI as not only an informational tool, but also a material one.

The myth of man as the dominator of nature

The myth of man as the dominator of nature is based on the belief that humanity has the ability and right to control and transform the environment. Within this myth, man is seen as a being who, through science and technology, has come to understand nature and can subdue it. The struggle against one's own body and its limitations is part of this process, as is the pursuit of harmony with nature, which is often idealized as wild, innocent and close to the ideas of social relations. The myth of Prometheus symbolizes human ambition and daring to gain knowledge and power, while nature is seen as both a powerful force and a resource to be exploited. Man's evolution and dominance after the extinction of the dinosaurs emphasize his unique position in the world. In pop culture, dinosaurs often symbolize this former power of nature, which man now dominates. In this way, the myth of man as the dominator of nature combines elements of struggle, understanding, harmony and control over the environment.

On a denotative level, the cover of issue 6/2024 depicts a man blowing out fire, which occupies most of the frame (Świat Nauki, 2024c). It is a dynamic image in which the flame fills the upper right part of the composition, moving from yellow to orange tones. The background is dark, which emphasizes the contrast between the flame and the surroundings. The main text on the cover reads: *Life in Pyrocene. How Fire Shapes Human Civilization*. Additional topics listed on the cover include *Talking Robots*, *Nature's Strongest Influence*, and *The Age of Strange Metals*.

On a connotative level, fire symbolizes both a destructive and creative force, which is one of the central ideas of this cover. The flame motif evokes the controlled energy and civilizational progress associated with fire, which since ancient times has enabled mankind to survive, cook, make tools and develop technology. The image of a man blowing out fire can be interpreted as a reference to man's power over nature and his ability to subdue and control the powerful forces of nature. The dark background further emphasizes the contrast between light and darkness, which may suggest the historical significance of fire as an element that literally and metaphorically "illuminates" the darkness and allows people to gain control over their environment. The motif of "pyrocene" is also a neologism, referring to the age of fire, which may indicate an anthropocentric approach to man's relationship with nature.

The cover refers to several myths ingrained in the culture. The first is the myth of fire as a symbol of civilizational progress. Fire is portrayed here as a force that has influenced humanity's development, allowing it to take control of nature and transform the environment to its advantage. Modern narratives often glorify technology and science as means to subdue and control nature, with fire as their primary symbol. The second myth is that of man as the dominator of nature, who controls and shapes the forces of nature according to his own needs. The fire-blowing man symbolizes this dominion and power, emphasizing humanity's superiority over the primordial forces. It is also a myth about man's relationship with technology – fire, as the first technological tool, is part of a long line of inventions that have enabled mankind to advance civilization, from the Stone Age to the Age of Metals to modern technology.

By conducting a commutative test, the image of fire could be changed to include other elements related to civilization and technology, such as replacing the flame with LED light or a laser. Such a change would radically affect the reception of the graphic, shifting the narrative from the archetypal meaning of fire to more contemporary and technical associations. Laser light could symbolize more modern forms of energy and technology, moving away from the primal force of nature, which is fire. Then the "pyrocene" theme would lose its original meaning, and the focus would be on a more modern and futuristic relationship between man and technology. On the other hand, changing the background from dark to light or adding other natural elements, such as water or earth, could introduce new connotations related to harmony or conflict between the elements, rather than just the dominance of one (fire) over darkness.

The myth of global crises and disasters

The myth of global crises and catastrophes is based on the belief that humanity faces numerous, serious threats that could have catastrophic consequences. The nuclear threat, climate change and global warming are seen as major sources of danger, with glaciers acting as guardians of the global climate balance. Pandemic, as an all-encompassing phenomenon, is portrayed as both

a disaster and a catalyst for change, with the virus being the invisible enemy. Science is seen as a tool that can save humanity from these global threats, while the president is seen as responsible for solving problems on both a national and global scale. In this way, the myth of global crises and disasters combines elements of fear, hope and responsibility, emphasizing the need for action and cooperation for the survival and future of humanity.

On a denotative level, the cover of issue 4/2022 depicts an image of the Earth in dark tones, dominated by a reddish glow reflected in the water (Świat Nauki, 2022a). The main title reads *How COVID Changed the World*, and the subtitle explains that the article addresses lessons learned from two years of the pandemic. Additional text on the cover refers to the topics of diagnostics, conspiracy theories and the importance of cooperation in times of crisis.

Connotatively, the cover expresses a sense of global crisis and transformation. The earth illuminated by a reddish light suggests an alarming condition, which may be symbolic of the threat of the COVID-19 pandemic. The red color is strongly associated with danger, warning, as well as blood and suffering, which may refer to the many victims of the pandemic. The reflection in the water distorts the image, symbolizing the chaos and change that COVID-19 brought, and the difficulty of adapting to the new reality. The symbolism of the Earth underscores the global nature of the pandemic – it is not a problem confined to one country or region, but a situation that has affected everyone on the planet. The dark, nocturnal depiction of the planet and the gloomy glow may also suggest that the pandemic has still not been fully resolved, and the world is still struggling with its effects.

The myth associated with the cover story fits into the global narrative of the COVID-19 pandemic as an event that radically changed the world. The pandemic became a symbol of the fragility of systems that were previously considered stable – health, economic, political and social systems. The cover reflects the myth not only of the pandemic as a disaster, but also of it as a catalyst for change. The title *How COVID Changed the World* indicates that the pandemic not only caused a crisis, but also initiated a transformation whose effects will be felt for a long time to come. This myth is part of broader narratives about a “new normal” and the need for global cooperation and resilience against future threats.

In the commutation test, we could replace the image of Earth with another symbol, such as a depiction of the SARS-CoV-2 virus or a human figure wearing a protective mask. This change would transform the meaning of the cover, focusing attention on the more immediate aspects of the pandemic – such as the virus itself or health measures. However, the image of Earth gives the message a more global, abstract dimension that emphasizes the impact of the pandemic on the entire world, not just the individual. Another element that could be substituted is the red reflection in the water – if it were instead, for example, a reflecting rainbow, the message would suggest hope and positive change, rather than danger and crisis.

The cover of “Scientific American” presents the pandemic reality as a global crisis and world-transforming event. On a denotative level, we see the Earth illuminated by a reddish light, which on a connotative level suggests a state of emergency, crisis and change. The myth of the COVID-19 pandemic as a catalyst for global change is part of a broader narrative about the need to cooperate and adapt to a new reality. The commutation test confirms that changing the main visual elements would change the nature of the message from a general global crisis to a more local or specific one, which would weaken the meaning of the cover.

The myth of exploratory science and exploration

The myth of scientific discovery and exploration is based on the belief that science is a key tool for discovering truths about the universe and the human body. Within this myth, scientific discovery and space exploration are seen as means to expand the boundaries of human cognition. Researchers are the heroes who discover the “New World” and the mysteries of nature, both on Earth and in space. Science is a tool for exploring the unknown, from ancient beliefs about sea creatures to prehistoric threats. In this way, the myth of discovery, science and exploration combines elements of adventure, the search for truth and pushing the boundaries of human cognition.

On the cover of issue 9/2022 we see a transparent tentacled sea creature – most likely a jellyfish or a species of deep-sea octopus (Świat Nauki, 2022b). This image dominates the title of the magazine *Scientific American* and the Polish headline *News from the Deep*. In the center is the text that explains the main theme of the issue: *What the Oceans Tell Us About Life – Not Just That On Earth*. Additional text elements refer to “reports” on bioluminescence, sea creature migration and water-related therapies, among others. Visible on the left is the magazine's permanent

identifying feature, a red bar with the “World of Science (Świat Nauki)” logo, indicating the Polish edition of the magazine.

On a connotational level, the image of a deep-sea creature symbolizes more than just an exotic creature – it refers to the mysteries that the oceans hold and the cognitive possibilities that face science. The juxtaposition of a creature from the deep with a text suggesting research into extraterrestrial life opens the field to connotations that go beyond biology. The deep sea becomes a metaphor for uncharted areas of science that may hold the key to understanding life on other planets. The transparency of the creature may also suggest the delicacy and ephemerality of life in the deep, and its unknown appearance brings to mind alien, “cosmic” life forms. The cover's color scheme – a dominance of black and transparency, with contrasting white and blue text – also connotes mystery and scientific discovery in unexplored areas. The cover acts as a symbol of exploration of the unknown and deep in the literal (oceans) and figurative (science, space) sense. The slogan “not only on Earth” implies a combination of terrestrial and extraterrestrial life, and the creature image itself becomes an image not only of marine fauna, but also of hypothetical beings from outer space.

The myth on the cover refers to ancient beliefs about unknown sea creatures that have been present in human cultures since the dawn of time. The creature from the deep, although scientifically described, evokes images of mythical monsters, which in the cultures of many peoples were symbols of unknowable forces of nature and mysteries of the cosmos. The myth of the explorer can be identified here – science appears as a modern form of mythology, where the oceans are the “unknown land” and the creatures of the deep represent modern versions of ancient legends. The myth of science also manifests itself in the way the cover depicts ocean research as the key to understanding life – not only on Earth, but also in space. The ocean becomes a metaphor for the unknowable, and science itself acts as a tool to reveal these mysteries to us. In the context of this cover, a commutation test could be performed, swapping, for example, a deep-sea creature for something more familiar, like a dolphin or whale. Such a change would significantly weaken the original effect of mystery and exoticism, as well as change the cover's connotations. Instead of a symbol of unknown depths and extraterrestrial life, we would have a more down-to-earth image that suggested research on known marine species, diminishing the “cosmic” exploration aspect. Also, changing the title from *News from the Deep* to the more general *Research of the Oceans* would affect perception – the cover would become more neutral and scientific, and less enigmatic and full of associations with mystery.

The cover of the above issue of “Scientific American” operates with multiple layers of meaning. Denotatively it shows a deep-sea creature, connotatively it refers to the exploration of the unknown, and mythologically it corresponds to ancient beliefs about sea monsters and the modern myth of science as a tool for discovering the secrets of life. The commutation test demonstrates how crucial it is to choose an image of a deep-sea creature and an appropriate text to maintain an atmosphere of mystery and depth.

The myth of social harmony and cooperation

The myth of social harmony and cooperation is based on the belief that humanity can achieve understanding and unity through cooperation and interconnection. Social harmonization of thought and understanding is key to building a “global village”, where cooperation and networking lead to social justice and solidarity. History is seen as a narrative to be rediscovered, especially in the context of a patriarchal society and the reconstruction of women's history across cultures. Daydreams are considered a mirror of reality, and holistic health and food as medicine symbolize the pursuit of harmony and balance. In this way, the myth of social harmony and cooperation combines elements of unity, justice and a common quest for a better world.

On a denotative level, the cover of issue 12/2020 shows an illustration of a face that is deformed, as if “stretched” in different directions, with the dominant color blue (Świat Nauki, 2020). In the background we see blank comic balloons, suggesting unspoken thoughts, statements or dialogues. The main title is *Combating Disinformation*, and the subtitle informs: *How to Protect the Public from Lies and Manipulation*. At the bottom of the cover are additional topics: *Space – Aggression in Orbit*, *History – Epidemics of the Past*, and *Medicine – Body or Mind?*

The illustration of a deformed face connotes information chaos and the effects of misinformation on the individual. The face, deformed and distorted, may suggest that lies, manipulation and disinformation distort perception and common sense. Its blue color can indicate feelings of anxiety, dehumanization or cool analysis – suggesting that disinformation affects

rational thinking. Empty balloons indicate a lack of real communication or dialogue, and may also suggest that much of what is “said” in the public sphere has no real substance or is a lie. The title *Combating Disinformation* connotes fighting something negative and destructive – disinformation becomes something to be actively fought, like a social threat. The subtitle emphasizes the need to protect society from manipulation, indicating that the phenomenon of disinformation has far-reaching consequences not only for individuals, but also for social and political structures.

The cover refers to the myth of fighting disinformation as an indispensable part of modern information society. At a time when social media and other information sources are saturated with false information, the fight against disinformation becomes a matter of survival of rational public debate. Here we have the myth of “truth” as a value that must be protected from manipulation and falsehood. The face on the cover is a symbol of an individual distorted by disinformation – the myth of “deformed reality” refers to how lies affect our perception of the world. The deformed face suggests that false information can change the way we see each other and the reality we live in. Empty balloons, suggesting a lack of content in the messages conveyed, can be read as the myth of the “empty narrative” – the idea that much of the information we receive is devoid of value and truth. These are “empty” messages that may look like real dialogues, but carry no meaningful content.

If the illustration of the face was replaced with another, more realistic face or photo of a person, the cover's message could be less abstract and more literal. The current form – a deformed face – suggests some abstract but profound reflection on the nature of misinformation and its impact on the human mind. Changing the balloons to, for example, fill-in-the-blanks words could reduce the symbolic significance of the emptiness that disinformation brings. If the title were changed to *Fighting Misinformation*, it could be more technical and less dramatic. The current title *Combating Disinformation* suggests not only the fight against falsehood, but also the need to be proactive in defending the truth, which emphasizes the importance of the problem.

The cover of the above issue of “Scientific American” presents a visual metaphor for the effects of disinformation – a deformed face symbolizing the distortion of perception and the void of communication. Together, the title and illustration create a narrative about the need to combat disinformation, which is presented as a threat to both the individual and society. A commutation test showed that changing the image or title would affect the reception of the cover, weakening the message about the profound, distorting impact of disinformation on our perception of reality.

The myth of cyclicity and finality

The myth of cyclicity and finality is based on the belief that life on Earth is inextricably linked to the cycles of nature and the cosmos. The sun, as the central source of life, symbolizes the constant cycle of birth and death, while water is a symbol of life, rebirth and purity. The tree, as a symbol of life and nature, reflects longevity and tradition, as well as transformation and regeneration. The cycle of life, old age and the inevitable passage of time emphasize the finality of human existence. The myth of “stellar birth and death” and the cosmic illusion point to the great mystery of the universe, where the lost past and the dark side of reality remain invisible but inseparable from our experience. In this way, the myth of cyclicity and finality combines elements of nature, the cosmos and human life, emphasizing their interconnectedness and the inevitability of change.

On a denotative level, the cover of issue 2/2024 depicts a visualization of the cosmic wilderness, with a dark, almost black space in the center, surrounded by a network of colorful structures (Świat Nauki, 2024a). These networks resemble fibers or waves of energy, shown in shades of blue, orange and gold. The main title is *Cosmic Nothing*, and the subtitle adds: *Will the Exploration of the Empty Areas of the Universe Reveal its Deepest Secrets?* In the margins are additional topics: *Dark Energy – 25 Years of Exploration*, *Life Without Sex*, and *Dethroned Vitamin D*.

On a connotative level, the cover refers to the idea of “nothing”, which in a cosmological context is as intriguing as it is paradoxical. The dark space in the center may symbolize the cosmic vacuum, the unexplored mystery of the Universe, which, despite its apparent emptiness, may conceal a profound understanding of the nature of reality. The surrounding structures, which resemble fibers, may connote gravitational forces, dark matter or energy, which connect space in the cosmos. The color scheme – gold and blue – can be read as a contrast between the warmth of energy and the coolness of emptiness, further enhancing the impression of duality between fullness and lack. The title *Cosmic Nothing* introduces the theme of emptiness, which is seen not as lack, but as a potential source of discovery. What looks empty may in fact hide secrets of fundamental

importance to science, suggesting that the “nothing” in cosmology may be more full and complex than one might think.

The cover story operates on several levels of modern scientific myths. The first is the myth of the “void of space” – a space that appears to be empty, but hides vast mysteries. Modern science often changes the perspective on what seems simple and obvious – “nothing” here becomes a symbol of what is unknowable, but critical to understanding the nature of the Universe. The second myth is that of the “power of exploration”. Humanity, through its ability to explore even the most remote and seemingly insignificant areas of the cosmos, gains the ability to discover key truths about the nature of the Universe. The depiction of the void as a potentially valuable space underscores the notion that any space – even one that appears empty – has meaning and can lead to breakthrough discoveries. The third myth is that of the “invisible”. On a scientific level, what we can't see (like dark matter, energy, or just cosmic emptiness) can be crucial to understanding the entire structure of reality. In this way, the cover refers to the myth that science reveals the hidden, transforming “nothing” into something of fundamental importance.

The application of the commutative test could involve replacing the visualization of emptiness with another image, such as a densely star-filled expanse of space. Such a change would shift the connotation from a mysterious and incomprehensible “nothing” to a more traditional image of the cosmos as a space full of life and energy. Instead of exploring the void, the emphasis would be on exploring the complexity and richness of the Universe's structures, which could reduce the element of mystery and paradox. Replacing the dark void with an image of, for example, known planets or other celestial bodies would introduce more concrete references to known and already explored cosmic objects, which would weaken the narrative of undiscovered areas of the Universe.

Mythological analysis in the form of a cross table

These analyses are summarized in the form of a cross-tabulation of the main scientific myths and themes represented on each cover of the Polish edition of Scientific American (Table 1).

As mentioned earlier, 113 scientific myths were extracted and combined into 8 main problem categories. They were assigned to the 7 subject areas 118 times. Hence $N = 118$, rather than 60, which is the number of covers, or 113, which is the number of scientific myths described in detail. N here is the number of assignments.

Table 1. Mainly scientific myths and topics presented on individual covers of the Polish edition of “Scientific American”

	Cosmos	Nature	Health	Technology and civilization	Mind	History	Society		
The myth of science as a driver of progress	7 22,58%	5 22,73%	3 15,00%	3 15,00%	0 0,00%	2 22,22%	0 0,00%	20	16,95%
The myth of transcendence and cosmic expansion	18 58,06%	1 4,55%	0 0,00%	0 0,00%	1 11,11%	0 0,00%	0 0,00%	20	16,95%
The myth of technology as inevitable evolution	0 0,00%	0 0,00%	2 10,00%	5 25,00%	5 55,56%	0 0,00%	4 57,14%	16	13,56%
The myth of man as the dominator of nature	0 0,00%	7 31,82%	3 15,00%	5 25,00%	0 0,00%	0 0,00%	0 0,00%	15	12,71%
The myth of global crises and disasters	0 0,00%	2 9,09%	6 30,00%	2 10,00%	0 0,00%	0 0,00%	0 0,00%	10	8,47%
The myth of exploratory science and exploration	2 6,45%	2 9,09%	1 5,00%	1 5,00%	1 11,11%	3 33,33%	0 0,00%	10	8,47%
The myth of social harmony and cooperation	0 0,00%	2 9,09%	3 15,00%	1 5,00%	2 22,22%	3 33,33%	3 42,86%	14	11,86%
The myth of cyclicalality and finality	4 12,90%	3 13,64%	2 10,00%	3 15,00%	0 0,00%	1 11,11%	0 0,00%	13	11,02%
	31 26%	22 19%	20 17%	20 17%	9 8%	9 8%	7 6%	118	100,00%

The above cross-tabulated analysis includes the frequency of a given major scientific myth in relation to the dominant theme. Seven recurring themes are indicated here: space, nature, health, technology and civilization, mind, history, and society. The percentage calculations show a certain dominance of cosmos-related issues, as well as the myth of transcendence and cosmic expansion (58.06 %). With regard to the subject of the human mind, the myth of technology as an inevitable evolution was prominent (55.56 %). With regard to social issues, we mainly have the myth of social harmony and cooperation (42.86 %). Also prominent were the myth of man as the dominator of

nature in relation to the subject of nature (31.82 %), the myth of global crises and disasters in relation to health (30 %), as well as, in relation to history, the myth of discovery science and exploration and the myth of social harmony and cooperation (33.33 % each). The most common topics were those related to cosmos (26 %) and nature (19 %), while the least frequently presented were social topics (6 %).

The myth of science as a driver of progress and the myth of transcendence and cosmic expansion are the most strongly represented (20 assignments, 16.95 % each). The myth of global crises and disasters and the myth of exploratory science and exploration are the weakest (10 assignments, 8.47 % each). The calculations presented were checked using Cramér's V test. The chi-square statistic was 135.25, Cramér's V coefficient was 0.44. This indicates a moderately strong relationship between the variables.

Didactic possibilities of semiotic analysis in media education classes

The results of semiotic analysis of the covers of the Polish edition of "Scientific American" magazine can be a valuable tool in media education, especially in the context of critical thinking training in students. Semiotics, as a research tool, provides a deeper understanding of how the media transform scientific ideas into cultural symbols. Using this analysis in didactics can help students identify hidden messages and myths that shape their perceptions of science and technology.

For example, during the course, students may be asked to conduct their own denotative and connotative analyses of selected covers. Based on the article's results, they can create their own interpretations of the themes presented, such as the myth of the scientist as hero or technology as salvation. Such an activity develops critical analysis skills, allowing students to identify myths and stereotypes in media messages, as well as to understand how these messages affect public perceptions of science.

In addition, this analysis could serve as a starting point for a discussion on the ethical responsibility of the scientific media. Students could consider how the media can both inform and mislead audiences by simplifying complex scientific issues. By analyzing the differences between media coverage and scientific reality, students will learn to recognize semiotic manipulation and the impact of commercialization on the representation of science.

This class could also include discussions of current examples from the covers of popular scientific magazines, which would allow students to practically apply semiotic theory and media analysis skills to the current cultural context. In this way, semiotic analysis of "Scientific American" covers could become not only an academic exercise, but also a tool that helps students understand communication mechanisms and their impact on society.

In the 2023/2024 academic year, I taught popular science journalism as part of the education and media specialization, in the course of study journalism and social communication, at Cardinal Stefan Wyszyński University in Warsaw. These classes were aimed at developing students' skills of critical analysis of popular science content and semiotic approach to media messages. Students, analyzing selected covers and articles from the Polish edition of "Scientific American", had the opportunity to see how science is presented in the media, often in the context of scientific myths. A variety of suggestions were made during the discussion. Some students suggested that the covers may build unwarranted optimism around new technologies, while others noted that the media too often create an image of the scientist as a heroic individual, instead of portraying science as a team effort. One pointed out that some covers oversimplify complex scientific issues, which can lead to misunderstandings and a false sense of easy problem-solving. Another student noted that in depicting global crises, such as climate change, the media often operate with images of catastrophes, which instills fear, rather than promoting a balanced approach to the problem and encouraging rational debate. I plan to implement this class again in the 2024/2025 academic year, expanding the topics with new examples and deepening the critical analysis of popular science messages.

5. Conclusion

Based on the semiotic analysis of the covers of the Polish edition of "Scientific American" and the scientific myths presented in the article, it can be concluded that the process of creating and receiving these covers has a profound impact on the public perception of science. These covers not only depict the latest scientific achievements, but also fit into a broader cultural context in which science is interpreted through the prism of mythological structures. These mythological interpretations, based on Roland Barthes' concept of science, portray science as a source of progress and often as an undeniable force of an almost divine nature.

The images depicted on covers reinforce beliefs about technology as the salvation of humanity, which can lead to oversimplification of complex scientific issues. This analysis shows that covers not only inform, but also modify public understanding of science, often giving it a sensationalist or ideological character. Such myths can inspire, but also mislead, creating a simplistic picture of science that overlooks its interdisciplinary and often collective nature.

A critical approach to such media messages is essential to understanding how culture influences our perceptions of science and its role in the modern world. Future research can help better understand the dynamics between the popularization of science and its media portrayal, pointing to the need for more balanced representation that not only informs, but also teaches critical thinking.

The cross-tabulation-based analysis reveals an interesting relationship between the various categories of scientific myths and the topics depicted on the covers. Eight main myths were identified, which include the myth of science as a driver of progress, the myth of global crises and disasters, and the myth of technology as inevitable evolution, among others. A cross-tabulation table juxtaposes these myths with the themes of the covers, making it possible to see which myths dominate each period. For example, the myth of technology as humanity's salvation is often linked to covers depicting modern technological advances such as artificial intelligence or space exploration, while the myth of global crises is particularly prominent during periods of heightened interest in climate change or public health threats. Such juxtapositions show that these myths not only respond to contemporary public fears and hopes, but also direct readers' attention toward specific narratives that can have far-reaching consequences for how science is perceived.

The analysis also reveals a certain undervaluing of social issues compared to the topics of space and nature, which is in line with the philosophy of scientism. Scientism, which puts the natural and technical sciences on a pedestal, promotes the belief that these fields offer the only true solutions to the problems of the modern world. As a result, covers often focus on space exploration, technological innovation and natural phenomena, leaving social issues in the background. Complex social problems, such as inequality, health policy or issues related to the ethics of science, are less frequently exposed. This emphasis on space and nature reinforces the myth of technology as salvation, and the natural sciences appear as an area of ultimate answers, which can lead to the marginalization of social discourse in the scientific media narrative.

Popular science media has a huge impact on the way the public views science and its role in solving global problems. By analyzing examples of science myths, students saw both positive and negative aspects of science popularization. A critical approach to cover stories and media narratives allowed them to understand the importance of conscious and responsible creation of scientific messages. The class showed that media education can effectively prepare future journalists to analyze and create content that not only informs, but also engages audiences in a more complex reflection on contemporary scientific and technological challenges.

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