Buletinul Ştiinţific al Universităţii Politehnica Timişoara
Seria Limbi moderne

Scientific Bulletin of the Politehnica University of Timişoara
Transactions on Modern Languages

Vol. 24, Issue 1 / 2025

Science Fiction for Teaching English to Military Students

Iren BOYARKINA*

Abstract: This research focuses on teaching English using science fiction. It is one of the first papers in this field. The paper analyses important characteristic features of the genre that make it a suitable tool for teaching English to science students and military cadets. The paper studies interactions between science fiction and military field that make it a fit-for-purpose didactic instrument for ESP and CLIL in military schools and academies. The author explores the didactic potential of the military science fiction for teaching English using the example of *Ender's Game* by Orson Card and the movie based on the novel, offering some practical advice for constructing teaching units.

Keywords: Ender's Game, Orson Card, ESP, CLIL,

1. Introduction

Given the importance of the science fiction genre for military activities emphasized by several researchers (Sloccombe 2021, Oltermann 2021, Boyarkina 2025), it seems useful to employ science fiction for language training (English) of the military students. Students are interested in reading science fiction and it is possible to employ this fact for teaching. The present paper explores some aspects of teaching English to military students using the genre of science fiction as an effective tool of English for Specific Purposes (ESP) and Content and Language Integrated Learning (CLIL).

First of all, it is necessary to introduce some definitions that are going to be employed in this paper. The present paper is going to use the definition of science fiction by Darko Suvin, which postulates that science fiction is the literature of estrangement and cognition, namely, "science fiction is a literary genre whose necessary and sufficient conditions are the presence and interaction of estrangement

* Adj. Professor, Department of Aerospace and Mechanical Engineering, University of Rome La Sapienza, Italy, iren.boyarkina@uniroma1.it

BUPT

and cognition, and whose main formal device is an imaginative framework alternative to the author's empirical environment" (Suvin 1979, 8).

Science fiction is impossible without *novum*, which has also been defined by Suvin (1979, 64) as a "totalizing phenomenon or relationship deviating from the author's and implied reader's norm of reality." Also, it is very important to indicate the difference between good and bad science fiction. According to Suvin, good science fiction not only introduces *novum* but also creates a complete world in which this *novum* is embedded. Frederic Pohl (1968, 6) argued along the same lines, saying, "Somebody once said that a good science-fiction story should be able to predict not the automobile but the traffic jam." For the purposes of this paper, it is also necessary to draw boundaries between the genres of science fiction, fantasy, and literary fairy tales. For Darko Suvin, this demarcation line can be the use of physics. True science fiction employs real physics, while other genres do not do it (Suvin 1979, 18). We need this separation line in order to select for teaching only good science fiction, which is based on the accurate use of scientific facts and concepts.

The first part of the paper will explore the main characteristics of science fiction which make it an ideal means of *ESP* for a wide range of university students. The second part offers some practical examples of using science fiction in ESP for military cadets.

2. Science Fiction and Teaching

We should remember that, already at the beginning of the 20th century, science fiction stories were intended for didactic purposes. Hugo Gernsback, the editor of *Modern Electrics*, offered a platform in the journal for publishing science based stories. Later, *Amazing Stories* sought science fiction to help its readers love and understand science. After all, "Ray Bradbury has stated that 'Gernsback made us fall in love with the future'" (Smith, 2017). Other scholars and researchers argue along the same lines, advocating the use of science fiction for teaching students of engineering, design, and the natural sciences (Rosen, 2013). Students may be inspired by reading science fiction and can realise some ideas they find in this genre. After all, "it is a natural course of events, from theoretical speculations to the factual realization of scientific projects. Suffice it to mention that travel in space or under water, first appeared as bold fantasies in scientific romances, then as projects, calculations of engineers and then, finally, became reality" (Boyarkina, 2022).

As said, science fiction seems to be rather important for the military sector. According to Will Sloccombe from the University of Liverpool, "[o]ne of the most interesting tools for thinking about future defence technology isn't big data forecasting and the use of synthetic training environments, but narrative and imagination. And we get this from science fiction" (Sloccombe, 2021).

Indeed, military professionals have been widely employing science fiction for various purposes. Sloccombe points out that "many militaries are already engaging with the genre. The US military and the French army use science fiction writers to generate future threat scenarios. The Australian Defence College advocates

BUPT

for the reading of science fiction and, in Germany, Project Cassandra uses novels to predict the world's next conflict" (Sloccombe, 2021).

In fact, science fiction can provide military professionals with various future scenarios. For this reason, some governmental security councils have been already using the services of famous science fiction writers to study defence strategies for one or another possible future scenario. This information is, of course, highly confidential, but you may consult for example, the platform *Sigma* where established science fiction specialists offer their services to predict future scenarious.

For the purposes of teaching English to military cadets, it should be pointed out that not only purely military science fiction deals with conflicts that can be studied by military planners, but also science fiction about extraterrestrial encounters can describe a rich variety of conflicts where the army is involved. Hence, science fiction about extraterrestrial encounters can be also useful for teaching military students. As Boyarkina (2025) observed,

> The works of science fiction which deal with extraterrestrial life forms may be subdivided into those where the contact takes place on the Earth and those where it happens somewhere else in the space or on some other planet. In both cases, these encounters may be peaceful or aggressive. If the works of science fiction focus on the contacts that take place on the Earth they often feature also the army interventions aimed at performing several functions in the narrations, which the present paper is going to analyze in details.

Boyarkina (2022, 15) analysed a strong interaction between science and science fiction; the researcher points out that

> Science and good science fiction have the same targets to find the truth about the world around us. Though science fiction cannot provide mathematical calculations, it can produce powerful metaphors that very often lie at the basis of solid scientific theories (suffice it to mention a metaphor of elastic rubber balls for the ideal gas model.

The characteristic feature of science fiction that employs real physics and is based on it, makes it it highly useful for teaching not only students in the humanities, but also students of engineering, the natural sciences and military cadets. Moreover, hard science fiction together with specialised texts in English can bring elements of CLIL to teaching English to military cadets and students of natural sciences and medicine.

As it was observed, "the interaction between science fiction and science is very strong. Very often, works of science fiction introduce some *novum*, which later gets constructed by scientists and engineers" (Boyarkina 2022, 15). There are many examples of this phenomenon in science fiction:

> Karel Čapek first envisaged an intelligent machine and coined the term "robot" in science fiction; nowadays we observe these machines in reality. Travel to the Moon was first mentioned in science fiction […] and then became a real fact, the same goes for travel to Mars, the submarine, etc. In *The War of the Worlds* Wells introduced a

BUPT

> device similar to a laser, constructed by engineers a few decades later; in *Aelita* Alexey Tolstoy depicts an apparatus similar to a television/computer and some decades later it appears in reality. In the 1930s Wells and Stapledon describe atomic weapons and predict their potential danger for the total destruction of the human species, long before first atomic bombs exploded. Actually, the list can be really very long (Boyarkina 2022, 17).

The same course of events is also true in the case of the black hole, which has been a popular protagonist in science fiction for many decades.

> Laplace and Michell hypothesized the existence of highly massive bodies which gravity prevented even light from escaping their boundaries. At the beginning of the 20th century the existence of these heavenly bodies became more real, when a singularity (a black hole) turned out to be a solution to Einstein's field equations, yet they still seemed to be a rather hypothetical phenomenon, nothing more than a mathematical construct. However, the situation changed drastically after only a hundred years, when not only the existence of black holes become a reality but even a first image of a black hole (or rather, its halo) was obtained. (Boyarkina 2022, 17)

In her paper, Boyarkina explored "the scientific phenomena and discoveries employed in post-apocalyptic novels by *The Wind from Nowhere* (1961) by J. G. Ballard and *Last and First Men b*y Olaf W. Stapledon (1930), in which *novum* is used as the springboard for the observations about human nature and human futurity" (Boyarkina 2019, 223). The researcher observed that

> The 20th century had been extremely rich in important scientific discoveries, starting from the discovery of radiation by Rutherford, relativity theory by Einstein, quantum theory, the Big Bang theory, the evolution of the stars, and many others. These important discoveries in astrophysics and elementary particle physics inspired not only scientists but also science fiction writers, who immediately started employing this scientific knowledge in their fiction. (Boyarkina 2019, 224)

Boyarkina (2022) analysed how physics is employed in the novel *Contact* by Carl Sagan. The researcher observed how a Nobel Prize winner in Physics Kip Thorn helped Sagan to calibrate the plot through the prism of quantum physics, especially when it dealt with travelling through wormholes. Hence, the novel is based on accurate scientific concepts, which makes it useful not only for teaching science fiction but also for teaching science students of various departments and for teaching ESP.

Hence, there are many works of science fiction that use reasonably accurate science fact and concepts and can be used for teaching science students, for example, to reinforce concepts of physics, astrophysics, astronomy, chemistry, and other sciences. For example, Andrew Fraknoi (n.d), astronomer and the author of astronomy textbooks and science fiction stories compiled a list of speculative fiction that can be used for teaching science students. It must be emphasised that these texts with solid science can be extremely useful for teaching ESP at various levels

BUPT

(B.A/B.S, M.A/M.S, PhD) and in various departments, including physics, engineering, medicine, and military students.

Another reason why many works of science fiction are based on accurate science facts and concepts is that they are written by professional scientists. For example, Isaac Asimov was a professional biologist, Ivan Yefremov was a palaeontologist, Andrew Fraknoi is an astronomer and the author of science fiction. Stephen Baxter, an aerospace engineer with a PhD is a prolific science fiction writer and the author of innumerable science fiction novels. Carl Sagan, astronomer and director of several US space missions wrote a science fiction novel *Contact.* The list is very long.

Another characteristic feature of the science fiction genre that can make it an effective tool in ESP is that, as the film "James Cameron's Story of Science Fiction" claims, "science fiction is always about the mistakes of technologies" (2018, series 5). That is why it can be so important for teaching military students, especially military engineers and science students, since it can motivate them to use English to speak about the moral, ethical, and philosophical implications of scientific discoveries that they study in specialist articles and hard science fiction.

3. Science Fiction for Teaching English to Military Students

At present, there are several possibilities to study English in military schools in Italy. English courses are widely available to cadets pursuing a university degree (for example, undergraduate degrees in political sciences and international relations). Depending on the curriculum, usually such courses last about 48-60 academic hours and the language target level is B1. Another possibility, offered to cadets, is an intensive English course finalised to pass Joint Forces Language Test (JFLT), indispensable for any military mission abroad.

Taking into consideration that in military schools and academies, it is necessary to effectively combine very intensive military professional training with no less intensive academic one, the limited number of academic hours dedicated to language training becomes inevitable. Nevertheless, as the practice clearly demonstrates, it is possible to obtain good results by means of employing in military English courses the latest achievements of cognitive linguistics, Second Language Acquisition (SLA) studies, CLIL studies. The course structure and syllabus are organised according to the course target and objectives, taking into consideration also the specific military context. Given the fact that some cadets have no prior exposure to English training and that they will not be interacting "on the job" with native speakers very soon, the first priority of the course is to develop receptive competences – especially reading abilities – in their field, that is, the military context. For those cadets, who intend to use spoken English in the missions abroad very soon, a JFLT course by mother tongue trained teachers is offered.

Another important skill trained during this course from the very beginning is listening comprehension, which can be improved best by listening to recordings, videos, discussions, instructions, etc.; all these activities are extremely useful to

BUPT

develop mastery of understanding. For this purpose, teaching materials created on the basis of science fiction stories, novels and films can be very useful. Various extracts from the films containing specialised military vocabulary and context can be offered to military students.

During the course, production practice begins with written activities (such as description of the military base, daily routine, military training) and oral practice is based on the writing. Once there is a solid foundation of reading and understanding, oral production will come more rapidly, first for communication in the specialised technical military field, and later for social purposes.

Works of science fiction can be used successfully to teach English to military students. For better results, it seems useful to combine science fiction novels with films. In 1985, Orson Card published his first novel *Ender's Game,* which later was followed by several sequels. In 1991, the writer updated the novel following the breakdown of the Soviet Union and the end of the Cold War. The genre of the novel can be defined as military science fiction; it won a Nebula award and a Hugo Award for best science fiction. In the novel, Earth was attacked twice by aliens (buggers) and its population united in anticipating a third strike. By choosing alien insects as invaders, Card demonstrates some indebtedness to those science fiction writers like H.G. Wells, Olaf Stapledon, and others who imagined alien races as insects. The novel seems to owe some indebtedness also to the military science fiction novel *Starship Troopers* (1959) by Robert Heinlein. By supposing that aliens use telepathy – "The buggers don't talk. They think to each other, and it's instantaneous" (Card 1985, 195) – the author also reveals his indebtedness to the science fiction works by Olaf Stapledon, namely, his *Last and First Men* (1930) and *Star Maker* (1937). In *Ender's Game*, aliens also represent a hive mind, the same idea that was earlier developed by Wells, Stapledon, Clarke, and other science fiction writers. "When they [buggers] evolved this ability to think together, wouldn't they still keep the queen? Wouldn't the queen still be the center of the group?" (Card 1985, 206).

The possibility to directly monitor human brain activity via an implant demonstrates similarities of the novel *Ender's Game* to the works of cyberpunk, for example, the works of Richard Morgan (see Boyarkina 2020).

The united population of Earth founded the international armed forces and the Battle school to train elite military offices able to fight alien invaders. This school "is for training future starship captains and commodores of flotillas and admirals of the fleet" (Card, 1985). Since the training is very long and hard, the school enrols children as their brain responds better to intensive training. The hard training lasts until the age of 16 and includes "[h]ard work. Studies, just like school here, except we put you into mathematics and computers much more heavily. Military history. Strategy and tactics. And above all, the Battle Room" (Card 1985, 19). The Battle room was constructed for military drills and war games, for which

> All the boys are organized into armies. Day after day, in zero gravity, there are mock battles. Nobody gets hurt, but winning and losing matter. Everybody starts as a

BUPT

> common soldier, taking orders. Older boys are your officers, and it's their duty to train you and command you in battle. More than that I can't tell you. It's like playing buggers and astronauts-- except that you have weapons that work, and fellow soldiers fighting beside you, and your whole future and the future of the human race depends on how well you learn, how well you fight. It's a hard life, and you won't have a normal childhood. (Card 1985, 19)

The military drills and training mainly consist of daily hours of classes:

> Reading. Numbers. History. Videos of the bloody battles in space, the Marines spraying their guts all over the walls of the bugger ships. Holos of clean wars of the fleet, ships turning into puffs of light as the spacecraft killed each other deftly in the deep night. Many things to learn. […] But the games-- that was what they lived for. That was what filled the hours between waking and sleeping. (Card, 1985, 35)

The school also has the holographic games with objects hovering in the air. This method of teaching is very similar to flight simulators that pilots and astronauts use for their professional training. In addition, the same principle lies at the basis of the platform for practical training of surgeons and assists them during operations. The protagonist of the story Andrew Wiggin Ender is particularly good at holographic games, as well as in other aspects of training. The military bosses noticed Andrew's numerous talents and he becomes their hope for the decisive victory in the future battle against buggers.

As we observed above, the novel contains a lot of specialised military terminology. The use of terminology and description attentive to tactics and strategy make this work of science fiction suitable for teaching English to military students, since it contains both specialised language and knowledge of military subjects.

The theme of leadership is very important in training future military officers and commanders. In the novel, this theme is also explored in depth, the commanders of the military school speak at length about the necessary qualities of the future commander of the international army and his leadership abilities. That is why this novel can be useful for teaching military cadets and for training the future military elite.

In the novel, a lot of attention is dedicated not only to the military and strategic talents of the protagonist but to his personal characteristics as well. Andrew is the third child in the family and this fact is emphasised many times in the novel. His siblings were both enrolled in the same military school but failed. His sister Valentine was a good commander but too soft. Andrew's brother Peter was also a promising military cadet but too cruel to be a commander of the international fleet. Hence, as Andrew's commander says, he has to be something in between, he has to combine the qualities of both Valentine and Peter.

In *Ender's Game*, an emphasis is placed on the importance of studying the enemy, their way of thinking, psychology, and tactics in order to win. The protagonist spends many hours watching videos of the battles between humans and aliens until he realises that they fought hand to hand only in the first invasion of the Earth. Wiggin

BUPT

holds that he won since he could understand the way of thinking of the aliens “From what they did. I could tell what they thought. I'm very good at that. Understanding how other people think” (Card 1985, 183). Innumerable times, Andrew compares videos from the first invasion and the second one and realises that there is a huge difference between them. During the second invasion, “[a]ll the scenes from the Second Invasion, when our soldiers are in IF uniforms, in those scenes the buggers are always already dead. Lying there, slumped over their controls. Not a sign of struggle or anything. And Mazer Rackham's battle – they never show us any footage from that battle” (Card 1985, 183). Confronting these videos, Andrew realises that the buggers may be a hive and when their queen’s ship is shot and explodes, all the buggers die. This important discovery by Andrew Ender is made the basis of a new strategy elaborated for the final battle with the buggers and turns out to be very successful. After winning the final battle, Andrew had many regrets for destroying a whole species of intelligent beings. He writes a book from the point of view of the hive-queen. It is a book with an anti-militaristic message, which is “written as if the hive-queen spoke, telling all that they had meant to do, and all that they had done. Here are our failures, and here is our greatness; we did not mean to hurt you, and we forgive you for our death” (Card 1985, 248). Wiggin tells a long story of the hive queen that tried to educate her kids in peace to make them understand “her quest for harmony. This was a new thing in the world, two queens that loved and helped each other instead of battling, and together they were stronger than any other hive. They prospered; they had more daughters who joined them in peace; it was the beginning of wisdom” (Card 1985, 248). Andrew also speaks about queen’s regret that they do not speak the same language with the human species and that they were shaped differently by fate or evolution:

> If only we could have talked to you, the hive-queen said in Ender's words. But since it could not be, we ask only this: that you remember us, not as enemies, but as tragic sisters changed into a foul shape by Fate or God or Evolution. If we had kissed, it would have been the miracle to make us human in each other's eyes. Instead we killed each other. (Card 1985, 248)

Despite being destroyed by the human species, by the international army under the command of Andrew Wiggin, the hive queen forgives the humans and welcomes them to the new lands:

> But still we welcome you now as guestfriends. Come into our home, daughters of Earth; dwell in our tunnels, harvest our fields; what we cannot do, you are now our hands to do for us. Blossom, trees; ripen, fields; be warm for them, suns; be fertile for them, planets: they are our adopted daughters, and they have come home. (Card 1985, 248)

Wiggin does not sign the book in his own name but as a “speaker for the dead”. The book is published and spread among the inhabitants of Earth, so everybody can read it. Most of those who read it find it interesting. It becomes a kind of religion, one among many religions on Earth. This episode may be seen as a parable of a new

BUPT

peaceful religion. Such parables are not rare in the works of science fiction. For example, Olaf Stapledon demonstrates the origins of a new musical religion, which metaphorically refers to Christianity (Boyarkina, 2014) in *Last and First Men.*

As has been noticed, Andrew Ender is an example of a good leader; he is also a very good strategist and this is obvious during innumerable battle simulations that were extensively used at school for military training.

> The simulator would display the situation on the screen. In that moment Ender learned for the first time what his own fleet would consist of and how the enemy fleet was deployed. It took him only a few minutes now to call for the squadron leaders that he needed, assign them to certain ships or groups of ships, and give them their assignments. Then, as the battle progressed, he would skip from one leader's point of view to another's, making suggestions and, occasionally, giving orders as the need arose. (Card 1985, 212)

Card also points out the importance of trust between a commander and his soldiers for the success of the military unit operation:

> Since the others could only see their own battle perspective, he would sometimes give them orders that made no sense to them; but they, too, learned to trust Ender. If he told them to withdraw, they withdrew, knowing that either they were in an exposed position, or their withdrawal might entice the enemy into a weakened posture. They also knew that Ender trusted them to do as they judged best when he gave them no orders. (Card 1985, 212)

It should be pointed out that the book describes military realities and training so accurately and realistically that it is recommended for military organizations such as the United States Marine Corps and included in "Commandant's Professional Reading List per ALMAR 009-16." (n.d.) For this reason it can be also used as an effective means of ESP for military cadets in combination with the movie *Ender's Game* (2013), co-produced with Orson Card, the author of the original novel.

After a careful analysis of the linguistic means employed to narrate the story of a young soldier Andrew Ender in *Ender's Game* based on the 1985 novel by Orson Card, it is possible to construct several teaching units based on various episodes of the movie and novel. Using episodes from the film, it is possible to introduce the topic "Military daily routine" with the related vocabulary. The vocabulary items can be as follows: to wake up, to get up, to do physical exercises, military training. On the basis of the abovementioned topics and the related movie episodes, it is possible to create grammar practice units, introducing the present tenses (present simple, present continuous, present perfect) and a unit confronting present simple and present continuous tenses, illustrating them by the related movie episodes picturing a soldier's daily life in the military academy. This grammar material may be accompanied by the grammar exercises on the introduced topics.

To develop the listening skills of the students, it may be useful to employ some selected dialogues between the soldier Ender and his military commanders during his daily activities in the military school and academy. These dialogues can be also used

BUPT

to introduce such grammar material as the present perfect, past simple, as well as a comparison between these two tenses. It is also possible to introduce imperatives on the basis of various communications between the soldier, his colleagues, his military commanders, and in the Battle room.

4. Conclusion

This paper is one of the first works to analyse the didactic potential of using science fiction for teaching English to military students and it explored some possible avenues for future research. It focused on the role of science fiction in teaching English to military cadets, though science fiction can be used as an effective ESP and CLIL tool for many other university departments, including PhD courses. It was pointed out that not only military science fiction can be used for teaching English to military cadets but also science fiction dealing with extraterrestrial encounters and military interventions. The paper focused on the analysis of the military science fiction novel *Ender's Game* by Orson Card and pointed out its indebtedness to some science fiction writers. The novel and the movie based on *Ender's Game* were analysed from the point of view of teaching English to military cadets, with some suggestions made for teaching English to military students.

Referenes

1. Boyarkina, Iren, 2014. "Musical Mataphors and Parables in the Narratives by Olaf Stapledon", PhD thesis, University of Rome Tor Vergata.
2. Boyarkina, Iren, 2019. "Nature against the human species: Science in the apocalyptic novels by James Ballard and Olaf Stapledon." *Zbornik radova Filozofskogo fakulteta u Prištini*. vol. 49, issue 4, pp. 223-236.
3. Boyarkina, Iren, 2020. "Artificial Intelligence, Cyborgs and Immortality: Bioethics in Science Fiction Novels". *Sakharov Readings 2020: Environmental Problems of the XXI Century*, Minsk: Byelorussian State University Press.
4. Boyarkina, Iren, 2022. "Passages through Spacetime: Science and Fiction." *Passages Through Enclosures and the Spacetime Continuum in English and American Science Fiction*. Boyarkina Iren (ed.) Cambridge: Cambridge Scholars Publishers.
5. Boyarkina, Iren, 2022. "Passages through the Spacetime Continuum in *Contact* by Carl Sagan" in *Passages Through Enclosures and the Spacetime Continuum in English and American Science Fiction*. Boyarkina Iren (ed.) Cambridge: Cambridge Scholars Publishers.
6. Boyarkina, Iren, 2025. "Extraterrestrial Contacts and Military Interventions in English and American Science Fiction." *The Woes of War in Text and Context*. Adela Catana, Alina Bottez (editors). Cambridge: Cambridge Scholars Publishers, in press.
7. Card, Orson, 1985. *Ender's Game.* Salt Lake: Century.
8. Fraknoi, Andrew. "Science Fiction Stories with Good Astronomy and Physics. A topical index," n.p., n.d. https://astrosociety.org last consulted on 24.02.2025.
9. Hood, Gavin, 2013. *Ender's Game,* film.

BUPT

10. Oltermann, Philip. 2021. “At first I thought this is crazy: the real life plan to use novels to predict the next war." *The Guardian*, 25 January 2021.
11. Pohl, Frederic. 1968. “The Great Inventions”, *Galaxy*, v 27, n 5, 1968.
12. Rosen, Rebecca. 2013. “Why Today’s Inventors Need to Read More Science Fiction.” *The Atlantic*, 20 September 2013.
13. Sloccombe, Will. 2021. “Militaries plunder science fiction for technology ideas, but turn a blind eye to the genre’s social commentary.” *The Conversation,* 26 July 2021.
14. Smith, Ryan. 2017. “Fifty Years Later, Remembering Sci-Fi Pioneer Hugo Gernsback,” Smithsonian Magazine. August 18, 2017.
15. Suvin, Darko. 1979. *Metamorphoses of Science Fiction: on the Poetics and History of a Literary Genre*. New Haven and London: Yale University Press.
16. Vargas, Kevin, (produced by), 2018. “James Cameron’s Story of Science Fiction.” US.
17. *** “Commandant’s Professional Reading List per ALMAR 009-16.” *Library of the Marine Corps Research Portal* https://web.archive.org/web/20170110015130/http://guides.grc.usmcu.edu/content.php?pid=408059&sid=5775651 last consulted on 22.02.2025

BUPT