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The Use of English Vocabulary in Physics Terminology

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Abstract

This article discusses borrowings in the physics terminology of the English language. The paper provides a brief history of foreign borrowings' entry into the English language, examines the morphological features of their assimilation by the English language, and organizes them into groups based on lexical and semantic characteristics. Borrowing, as the term implies, is a word that enters the language from another language and is used as a synonym to define a specific concept. This is one method of developing a nation's language because the language responds quickly to societal needs. Borrowing is also one of the most productive methods of term formation, particularly for physics terms, which are mostly made up of words of foreign origin. This is primarily due to the fact that physics as a science is inherently international, and as a result, the majority of words in English physics terminology are borrowed from foreign languages. The majority of the words are borrowed from Latin, Greek, French, and German. Thus, the entry of foreign borrowings is the primary factor in the replenishment and further development of the English language's physics terminology.

Keywords: English Language; Physics Terminology; Foreign Languages.

1. Introduction

As is well known, "language is constantly evolving as a means of social communication" (Sadykova & Gilmutdinova). Furthermore, "...being able to understand and use scientific terms is an inseparable part of scientific literacy..." (2018) (Poupová). That is why it is critical to study and analyze them—the English language's physics terminology is being enriched with new terms as a result of borrowings from foreign languages. Lotte (1982) and others made significant contributions to the study of foreign borrowings. Lotte (1982), a well-known scientist and linguist, paid special attention to borrowings. In his works, which were collected in a one-volume book titled "Fundamentals of the Construction of Scientific and Technical Terminology," he addressed in depth the issues of technical terminology composition and order. Along with questions about term standardization, he focused on the difficulties of translating scientific and technical terms (Egorov, 2014). Lotte (1982) considered borrowings as a potential source of replenishment of the original terminological vocabulary in his paper "Issues of Borrowing and Ordering of Foreign Language Terms and Term Elements." He also discussed borrowing methods, categorizing borrowed terms into three types: original borrowings, terms made up of borrowed or previously borrowed elements, and translated borrowings (Kuzmin et al., 1992).

The introduction of foreign borrowings into the English language has a long history that can be divided into several stages (Biktemirova et al., 2018). English ambassadors at the courts of English kings Elizabeth I and Jacob, as well as the first English specialists in medicine, mining, shipbuilding, and military affairs, actively embedded special English terminology and introduced the first English words into the English language. The unconditional necessity that the first English diplomats faced when compiling reports for the Moscow government was the reason for the early borrowing of English words. During Peter I's reign, more English words were introduced into the language (1682-1725). Great advances were made in many areas of life during Peter's reign, which had a significant impact on the English language. Due to Peter I's revolutionary shipbuilding transformations, Dutch and English loanwords from this area entered the English lexicon. The next stage of English word penetration into the English language is associated with the 1920s and the 19th century. The English scientific contingent, as well as the contingent of translators and lexicographers, began to form among the English sent to study at English universities at the time.

The late nineteenth and early twentieth centuries were active pre-revolutionary periods that favored borrowing. Until the end of the 1920s, most borrowings into English came from French and German. The amount of vocabulary borrowed from the English language was minimal. A political revolution occurred in 1917 against the backdrop of the scientific and technological revolution. New phenomena such as the telephone, photography, cinematography, aviation, and the automobile emerged. The competition between German, French, and English has increased as a result of scientific and technological progress.

2. Literature Review

Language is a reproductive system, and all human languages, including English, can generate new words to aid their speakers in the naming of new scientific and industrial products and tools. This article examines various aspects of loanwords in the English language to help you better understand them. Loanwords are words in one language that have been borrowed from another (Durkin, 2009). The debate over the types of lexical borrowings is heated, as scholars classify loanwords in various ways. Furthermore, recent studies, according to China National Knowledge Infrastructure, have primarily focused on vocabulary teaching, with little attention paid to the teaching of English loanwords. Modern English words are composed of 29% French, 29% Latin, 26% German, 6% Greek, and 6% others (Zhou, 2016), with nearly 80% of English words being loanwords (Kavtaria, 2011); therefore, knowing English loanwords is essential for English learners. Although loanwords increase the difficulty of learning English vocabulary, they enrich it (Wang, 2015). Because of the abundance of loanwords in English, beginning students may be perplexed by the irregularity of English pronunciation and spelling. Unlike other Germanic languages, which can be read by mastering their alphabets, English learners must first learn phonetic symbols before learning English vocabulary. This is due to the lack of a one-to-one mapping between a sound and a letter, which is exacerbated by loanwords (Zhan, 2013). As a result, studying loanwords is beneficial to vocabulary development (Zipei Guo, 2020).

The Romans were the first invaders with a higher civilization than the Celts. From the Romans, Celtic absorbed many words that denoted concrete things of daily life. Cherry (Latin. cerasum), pear (Latin. pirum), plum (Latin. prunus), pepper (Latin. piper), and wine (Latin. vinum) are examples (Kavtaria, 2011). Several Germanic tribes known as Angles, Saxons, Frisians, and Jutes arrived in the British Isles to assist the Celts in defending their lands. Despite this, friends became conquerors. Celtic was dominated by the Anglo-Saxon language (Zhang, 2015). Because of the Christianization of England during this time period, Latin words were borrowed into English. As the first schools were held by churches, English borrowed education terms from Latin as well (Kavtaria, 2011). The Norman Conquest was a significant event that resulted in people speaking both English and French of various identities. People who spoke English were regarded as inferior, whereas powerful and well-educated individuals spoke French (Zhang, 2015).

Reading ancient Greek and Latin literature became popular in Europe at the start of the Renaissance. Scholars and writers created literary works in Greek or Latin. Instead of words, Greek and Latin make significant contributions through roots and affixes (Zhang, 2015). Following the restoration of the Stuart Dynasty, French regained popularity as a fashionable language (Wang, 2015). A large proportion of French words retained their previous pronunciation and spelling in Modern English vocabulary (Xuan, 2006). Historical events and political circumstances hasten the borrowing process, and different nations establish social and linguistic ties. Loanwords entered the English language through wars, invasions, and conquests (Kavtaria, 2011). Because of the Norman Conquest in 1066, for example, a large number of French words entered English vocabulary, the majority of which denoted religion, military, government, administration, legal, culture, and the royal court. At least 75% of these French words are still in use today (Zhang, 2015).

3. Methodology

During World War I, the popularity of the German language declined, and as a result, English equivalents replaced some German words. In the first two decades of the 20th century, such English words as *bum (boom), boykot (boycott), film, djaz (jazz), servis (service), sviter (sweater)*, and others entered the vocabulary of the English language (Gilmutdinova & Sadykova, 2015). The inflow of foreign words into the English language increased after the 1920s, and English became the primary language from which words were borrowed. During these years, the English language was enriched with a plethora of technical terms. The vocabulary of the English language includes such international words as *kombayn (combine-harvester), konteyner (container), tanker, trauler (trawler), trolleybus, konveyer (conveyor), mashinizatsiya (mechanization), mehanika (mechanics), elektr (electric), radio, energiya (energy)*, etc. (Flood, 1960).

The twentieth century had a significant impact on the number of foreign borrowings in the English scientific language. The fall of the Iron Curtain and increased contact with other countries resulted in an expansion of state-to-state relations. During this period the English language was replenished with such terms from the field of physics as *faks (fax), internet, kompjuter (computer), printer, disk, disketa (floppy disk), fayl (file), fonogramma (phonogram), radiotelefon (radiotelephone), video, mobilniy telefon (mobile phone), videomagnitofon (video recorder), videokamera (video camera)*, and others.

At present, the English scientific language continues to borrow new physics concepts. This is primarily due to the advancement of science and technology, close relationships with other countries, and the adoption of their experience in physics and technology. The following words are borrowed in the twenty-first century: gadget, *smartfon (smartphone)*, *ayfon (iPhone)*, *aypad (iPad)*, *adaptor (adapter)*, *netbuk (netbook)*, *modem*, *vebsayt (website)*, *fleshka (flash drive)*, *soft (software)*, *skaner (scanner)*, *imeyl (email)*, and others. As we can see, "all peoples' culture is a dynamic phenomenon that continues to develop." "This is due to people's expanding perspectives of conscious creativity, as well as increased opportunities for vigorous activity" (Novikov, 2000).

The following are the primary methods for researching borrowings in English physics terminology: 1. Historical examination. We looked at the stages and reasons for borrowings entering the English language. 2- A comparative examination. We compared physics terms in English to see how English assimilates foreign borrowings and how they differ from the original language. 3- A typological examination. We classified physics-borrowed terms into groups based on their lexical and semantic characteristics.

4. Results

Foreign borrowings that have entered the English scientific language can be used both unchanged and in accordance with English grammatical rules. The following are the morphological characteristics of the English language's assimilation of foreign borrowings: 1- The English language borrows foreign nouns denoting an object without any changes. For example, *element, mehanika (mechanics), radio, elektr (electric), radiator, termometr (thermometer)*, etc. 2- Foreign nouns denoting processes take the English suffix: *electrification (elektrifikatsiya), signaling (signalizatsiya), identification (identifikatsiya), graphitization (grafitizatsiya)*, and others. 3- Foreign adjective terms and verb terms, when borrowed, also take the English suffix: *mechanical (mehanicheskiy), physical (fizicheskiy), cosmic (kosmicheskiy), vacuum (vakuumniy), electronic (elektronniy), identify (identifitsirovat)*, and others.

As evident from the examples, the following factors contribute to the development of foreign borrowings in the English language: If the word is a derivative, English replaces the suffix. To designate the process, such suffixes as *-atsiya, -izatsiya, -anie* are used: *metallizatsiya (metallization), reaktsiya (reaction), formirovaniye (formation), modelirovaniye (modeling)*, etc. The suffixes *-skiy, -niy* are used to denote properties: *mehanicheskiy (mechanical), fizicheskiy (physical), universalniy (universal), spektralniy (spectral)*, etc.

Physics terms are borrowed mainly from Latin and Greek. "If we know Latin and Greek a little, scientific terms seem self-explanatory to us. Due to this fact, terms are perceived as international". For example, the terms *vakuum (vacuum), gradus (degree), fokus (focus), element*, and others are borrowed from the Latin language. The words *kosmos (cosmos), termos (thermos), fizika (physics), akustika (acoustics), tehnologiya (technology)*, etc. are borrowed from the Greek language. Also, in the physics terminology of the English language, there are many borrowings from French, German and English, for example *rezonans (resonance), fjuzelyazh (fuselage), shtepsel (plug), shtativ (tripod), detal (detail), kamera (camera), kompyuter (computer)*, etc.

According to their lexical and semantic characteristics, borrowed physics terms can be divided into the following groups: 1- Physical processes: *reaktsiya (reaction), relaksatsiya (relaxation), refraktsiya (refraction), diffraktsiya (diffraction), elektroliz (electrolysis), ekspositsiya (exposure), sintez (synthesis), tsirkulyatsiya (circulation), fotosintez (photosynthesis), vibratsiya (vibration), dispersiya (dispersion), dissotsiatsiya (dissociation), diffuziya (diffusion), effuziya (effusion), emissiya (emission), translyatsiya (translation), radiotranslyatsiya (radio transmission), kavitatsiya (cavitation), desorbtsiya (desorption), konvektsiya (convection), detektirovaniye (detection), modulirovaniye (modulation)*, etc.

2- Devices and their parts: *lazer (laser), detal (detail), kamera (camera), anker (anchor), kabel (cable), teleskop (telescope), kondensator (condenser), inductor (inductor), introskop (introscope), izolyator (isolator), barometr*

(barometer), djoystik (joystick), injector (injector), manometer (manometer), spidometr (speedometer), projector (projector), konveyer (conveyor), elektroskop (electroscope), reduktor (reducer), fototranzistor (phototransistor), radiotelesko (radio telescope), radiolampa (radiovalve), etc.

3- Physical properties: *normalniy (normal), molyarniy (molar), mehanicheskiy (mechanical), magnitniy (magnetic), lineyniy (linear), kriticheskiy (critical), kristallicheskiy (crystalline), kosmicheskiy (cosmic), kontaktniy (contact), kvantoviy (quantum), kvartseviy (quartz), potentsialniy (potential)*, etc.

4- Elementary particles: *element, molekula (molecule), nuklon (nucleon), nuklid (nuclide), foton (photon), proton, fonon (phonon), bozon (boson), kvant (quantum), electron (electron), ion, spin, kollayder (collider), neytron (neutron), atom, fermion, ferromagnit (ferromagnet), gram-atom, gram-molekula (gram-molecule)*, etc.

5- Units of measurement: *volt, amper (ampere), vat (watt), metr (meter), om (ohm), gertz (hertz), litr (liter), djoul (joule), kelvin, tonna (ton), voltmetr (voltmeter), kilovatt (kilowatt), voltamper (voltammeter), ampermetr (ammeter), kilovolt, kilogram, kilometr (kilometer), kilodjoul (kilojoule), kilokaloriya (kilocalorie)*, etc.

6- Chemical elements: *kaltsiy (calcium), kadmiy (cadmium), radiy (radium), litiy (lithium), indiy (indium), iridiy (iridium), hlor (chlorine), azot (azote), hrom (chromium), bor (boron), fosfor (phosphorus), magniy (magnesium), platina (platinum), titan (titanium), lyutetsiy (lutetium), neon, tsink (zinc), kobalt (cobalt), alyuminiy (aluminum), selen (selenium), spirt (spirit), ammiak (ammonia), kvarts (quartz)*, etc.

7- Natural sciences and their fields: *fizika (physics), tehnologiya (technology), mehanika (mechanics), himiya (chemistry), optika (optics), statika (statics), biofizika (biophysics), geofizika (geophysics), gidromehanika (hydromechanics), radiofizika (radiophysics), geometricheskaya optika (geometric optics), tehnicheskaya mehanika (technical mechanics), molekulyarnaya fizika (molecular physics)*, etc.

5. Discussion

Some terms have both a foreign and an English component. Such words are known as semi-loan translations. The following foreign blocks are borrowed elements of such words: *avto- (auto-), alfa- (alpha-), amper- (ampere-), anti- , beta-, gamma-, giper- (hyper-), makro- (macro-), mikro- (micro-), radio-, ultra-, termo- (thermo-), foto- (photo-), elektr- (electr-)* etc. For example: *avtoprovodimost (autoconduction), avtouskoreniye (autoacceleration), alfa luchi (alpha-rays), alfa-raspad (alpha decay), amper-chas (ampere hour), amper-vitok (ampere turn), antiveshestvo (antimatter), antichastitsi (antiparticles), beta-luchi (beta rays), beta-raspad (beta decay), gamma-izlucheniye (gamma radiation), gamma-luchi (gamma rays), giperaromat (hyperaroma), makrotreshina (macrocrack), mikrodobavka (microadditive), mikrovzriv (microexplosion), ultrazvuk (ultrasound), termoyaderniy (thermonuclear), fotoplenka (photographic film), elektroprovodimost (electrical conductivity)*, etc. [ibid].

In studying borrowings in the English language, we used methods such as historical, comparative, and typological analysis. The following are the morphological characteristics of English assimilation of foreign borrowings: 1) The English language borrows foreign nouns denoting an object without modification; 2) foreign nouns denoting processes receive the English suffix; and 3) foreign adjective and verb terms receive the English suffix when borrowed. Borrowed physics terms can be classified into physical processes, devices and their parts, physical properties, elementary particles, units of measurement, chemical elements, natural sciences and their fields based on their lexical and semantic properties.

6. Conclusions

In this article, we investigated borrowings in the English language's physics terminology. Borrowing, as demonstrated by the examples, is the most effective way to replenish the English language's terminology. This is due to the international nature of physics, and the English language borrows the majority of foreign words. Most of the words are borrowed from Latin, Greek, French, German, and English. In English orthography, borrowed terms are most frequently used. However, there are a number of terms that are slightly modified when they enter the English language, i.e., English replaces the foreign suffix in the English version. In some cases, one of the word's components is borrowed, and the English equivalent replaces the other. It should be noted that the introduction of a large number of foreign borrowings into the English language has become the most important factor in the replenishment and advancement of English physics terminology.

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