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**POPULAR SCIENTIFIC DISCOURSE  
IN ENGLISH AND LITHUANIAN:  
A MULTIMODAL PERSPECTIVE**

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**MOKSLO POPULIARINIMO DISKURSAS  
ANGLŲ IR LIETUVIŲ KALBOMIS:  
MULTIMODALIOJI ANALIZĖ**

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# 1 Introduction

## Relevance of the topic

For a long time, discourse analysis was concerned only with language studies, disregarding the visuals incorporated in various genres. Visuals have been the object of art studies or photography, while various signs and symbols have been analysed by semiotics. However, the omnipresence of various modes is typical of various genres in written and oral communication, including the internet which provides numerous affordances, modifying genres. Even though all texts are multimodal in nature, the approach and theoretical framework to analyse texts by integrating both the analysis of the textual and the visual mode has appeared only recently (Kress 1996, 2006). The theory of multimodality, which emerged in the 1990s, may be defined as “the idea that communication and representation always draw on a multiplicity of semiotic modes of which language may be one” (Kress 2001: 67-68). The popularity of this theoretical framework and methodology is increasing, especially in the Scandinavian countries, while in Lithuania this approach is almost unknown, and only a few studies have appeared recently (Ruzaitė 2008, 2012).

Academic discourse has been widely analysed from various perspectives: genres (Swales 1990, Bhatia 1995, and Biber 2008), lexical and grammatical features (Ventola 1996, 1997, Hyland 2005, 2010, 2011, and Biber 1995, to mention only a few), discourse community, and intercultural point of view (Beedles and Petracca 2001, Mauranen 1993, and Fløttum et al. 2007). Popular scientific articles may be viewed as a sub-genre of academic discourse, as the same scientific knowledge is provided in a modified way, i.e., taking into consideration the fact that the expected reader is a non-specialist<sup>1</sup> in the field. Despite a wide interest in some popular scientific magazines, which are translated into many languages and read all over the world (e.g., *National Geographic*), the genre itself has a marginal status from the scholarly point of view. If compared to academic discourse, only a few articles or theses can be mentioned which discuss linguistic or genre features of popular scientific discourse (cf. Scherer 2010, Schmalzer 2012, or Petrėnienė 2003, 2010, 2013). In addition, some scholars (e.g., McGowan 2009) express criticism towards the genre, claiming that the information is not reliable enough, and based only on a small-scale research, while wide implications or generalizations are provided. Furthermore, the authorship is sometimes questionable or the authors unprofessional or ‘invisible.’

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<sup>1</sup> A non-specialist and a lay person are used as synonyms in the present thesis

The choice of the **research object**, i.e., online popular scientific articles in English and Lithuanian, has been influenced by several factors. First, popular scientific discourse has not been analysed in greater detail either in English or in Lithuanian. Second, many popular scientific magazines are accessible on the internet, which provides different affordances than the printed versions of the magazines and, accordingly, a wider use of modes. Thus, this sub-genre is especially interesting from the multimodal perspective.

Due to a wide variety of possible aspects usually involved in a multimodal analysis, certain limitations have to be imposed. First, the analysis is limited to popular scientific articles in the humanities in English and Lithuanian. Second, the research of the visuals focuses only on non-moving images as the analysis of videos or audios would require different methods. Third, the linguistic analysis in this thesis is limited to the most important and distinctive features, i.e., the author's stance, intertextuality, and interdiscursivity.

#### Novelty of the dissertation research

The present research is the first attempt to apply the theory of multimodality in larger-scale research in the Lithuanian context and to show the interrelationship between textual and non-textual elements. The thesis also demonstrates that the combination of different modes rather than language alone shapes the genre and reaches various purposes beyond the informative nature of popular scientific articles.

The present thesis also takes a new approach at popular scientific discourse as its research has been only fragmented; thus, there is a lack of systematic research and comparison of popular scientific and academic discourse. In the present thesis, both non-verbal and verbal elements of popular scientific articles are explored with a special focus on such distinctive features as the use and functions of illustrations, the author's stance, intertextuality, and interdiscursivity.

The thesis is also new from a methodological perspective. Usually multimodal analysis is limited in scope, while multimodal corpora are only being created. The present investigation combines a multimodal analysis carried out manually with corpus linguistics, as the main principles and tools of this method were used in analysing the verbal mode.

In addition, the present contrastive analysis of popular scientific articles in English and Lithuanian contributes to cross-cultural genre studies. The genre differences between popular scientific articles in English and Lithuanian highlighted in this thesis demonstrate a different attitude towards creation of the genre and the use of non-verbal modes to complement the verbal text.

## Aim and objectives

**The aim** of the research is twofold. First, the present thesis aims to identify and describe the main features of popular scientific articles from a multimodal perspective. Second, a comparative analysis of popular scientific articles in English and Lithuanian seeks to indicate the main cross-cultural differences of the genre.

In order to reach the aim, the following **objectives** have been set:

1. To compile a comparative corpus of popular scientific articles in English and Lithuanian;
2. To analyse the main non-linguistic modes of popular scientific articles in English and Lithuanian both quantitatively and qualitatively;
3. To analyse the distinctive linguistic features of popular scientific articles in English and Lithuanian using corpus linguistics tools;
4. To reveal the interrelationship between different modes and the functions performed by each of them;
5. To identify the cross-cultural differences and similarities between popular scientific articles in English and Lithuanian.

## Research questions:

In order to analyse popular scientific articles from a multimodal perspective, the following research questions have been formulated:

1. What are the most typical modes in popular scientific articles and how frequently are they used in English and Lithuanian?
2. What is typical of the visual representation of social participants?
3. What are the functions of images in popular scientific articles?
4. What is the relationship between text and images in popular scientific articles?
5. What is the author's stance in popular scientific articles and how is it different from traditional academic discourse?
6. How dominant are intertextuality and interdiscursivity in popular scientific articles and how are they used?

## Dissertation structure

The dissertation is composed of the introduction, two chapters of theoretical overview, a chapter on data and methods, two analytical chapters, and the concluding chapter which is followed by a List of References and Appendices.

The introductory section presents the object of the research, its aims, and objectives. Chapters 2 and 3 discuss the theoretical foundations of the theory of multimodality, academic discourse, and the main features of popular scientific discourse. The chapter 'Data and Methods' introduces COPSA, The Corpus of Popular Scientific Articles, and methods applied in the present investigation. Chapter 5 discusses the features and functions of non-verbal elements used in popular scientific articles in English and Lithuanian and highlights the main similarities and differences between the two languages and cultures. Additionally, parallels between verbal and non-verbal elements are drawn and their interrelationship is discussed. Chapter 6 focuses on the analysis of the verbal mode of popular scientific articles in the two languages; in particular, the author's stance, intertextuality, and interdiscursivity are explored as the main features that shape the genre. The conclusions generalize the research and provide implications for further study.

## **2 Overview of the Theory of Multimodality**

Multimodal analysis stems from the idea that various modes are involved in communication (both written and oral) in addition to language. Contemporary media combines not only texts but also moving and non-moving images; new literary genres such as graphic novels appear, and the internet is multimodal in nature. This chapter discusses the background to the theory of multimodality, the main principles of multimodal analysis, and the extensions of the theory.

### **2.1 The Concept of Multimodality**

Our communication is multimodal in nature, and as correctly noted by Nikolajeva and Scott (2006: 1), both conventional and iconic signs have existed in human culture from its beginning. Art forms and contemporary media use various combinations of verbal and non-verbal elements; cinema, theater, comics, or advertisements are only a few examples where different modes are combined in order to produce meaning.

Despite the omnipresence of various modes in daily communication and the surrounding world, multimodality as a concept emerged only recently in the second half of the 1990s (Kress 1994, 1997); therefore, it does not have a firmly established status. It is referred to as a theory, as a methodology, or as a branch of discourse analysis. From a theoretical point of view, multimodality is based on semiotics and social semiotics discussed in greater detail in Section 2.2. The theory of multimodality combines the main concepts used in various disciplines (i.e., semiotics, art, photography, cinema, or computer design) in a unified, well-grounded, and multidisciplinary framework.

Multimodality is also referred to as a methodology. Numerous publications by Kress and van Leeuwen not only provide the main theoretical foundations on the potential of different semiotic resources, but also the tools for carrying out a multimodal analysis (Kress et al. 2001, Kress et al. 2005, Kress and van Leeuwen 2006). These scholars describe the main aspects which should be taken into consideration while carrying out a multimodal analysis, and exemplify them with case studies. Multimodal analysis establishes its status as a branch of discourse analysis as it provides a broader perspective towards language by focusing not only on verbal but also on non-verbal elements. Thus, chapters on multimodality are included in the most recent books on discourse analysis which analyse discourse in contemporary media and focus on the combination of modes in various discourses (cf. Jones 2012; Gee and Handford 2012; Dybkjær and Minker 2008; Maybin and Swann 2010). Multimodality as a research method will be applied in analysing popular scientific articles in the present thesis.

In general, the popularity of multimodal studies is increasing. Nowadays, the major English academic publishing houses (Longman or Routledge) print several books on multimodality each year, while the universities establish centres of multimodal analysis (e.g. Multimodal Analysis Lab at the National University of Singapore headed by Kay O'Halloran; Multimodal Research Centre at the Auckland University of Technology headed by Sigrid Norris; Centre for Multimodal Research at the University of London), or refer to it as one of their priority areas (e.g. the University of Agder, Norway; the University of Aalborg, Denmark).

Many other recent publications do not refer to the theory of multimodality directly; however, they explore the topic of the relationship between the textual and the visual. For instance, Heywood and Sandywell (1999) and Thibault (2004) discuss contemporary visuals in relation to culture studies and sociology; Hunt (2003) focuses on the transformation towards an image-dominated world and discusses the differences between Judeo-Christian and the Protestant tradition; Johnson and Milani (2010), Honeywill (1999), and Kompatsiaris and Hobson (2008) analyse 'visual language' in the world wide web and the affordances provided by contemporary technological possibilities.

As defined by Kress, the leading researcher in the field of multimodal studies, multimodality refers to 'the idea that communication and representation always draw on a multiplicity of semiotic modes of which language may be one' (Kress 2001: 67-68). The definition contains two main ideas: first, that several modes are involved in communication, and second, that language is only one mode among others, i.e., it does not always take the central role, even though traditional discourse analysis mainly focuses on texts and disregards the visuals.

The definition of multimodality is inextricably linked to the definition of a *mode*. It can be defined as 'a socially shaped and culturally given semiotic resource for making meaning' (e.g., image, writing, layout, gesture, or soundtrack) (Kress 2010: 79). In another definition, Kress informally refers to a mode as to the concept which "indicates that we make signs from lots of different "stuff," from quite different materials" (Kress 1997: 7). Different modes offer different potential for meaning making dependent on social and cultural context (Kress 2011: 54). Kress also distinguishes two approaches to this definition, a social and a formal one. Socially, a mode depends on the community and its social-representational needs. Thus, the community by itself decides on the features of the mode. Formally, it is a matter of social-semiotic theory, i.e., what it requires the mode to be and to do. The formal approach is related to Hallidayan functions, i.e., the ideational, the interpersonal, and the textual which are discussed in greater detail in Section 5.3.

For a long time, only language was a dominant mode in discourse analysis. It was common to analyse various linguistic or genre features disregarding the visuals, even though both written and spoken communication is multimodal in nature. Texts are written or printed on a certain paper; types and fonts are chosen, and certain formatting conventions are followed. The analysis of spoken discourse is also usually limited to linguistic analysis; however, oral communication employs not only words which are pronounced, but also gestures, tone, a speaker's facial expressions, or the speaking environment, to name a few. As indicated by Kress and van Leeuwen, human societies use a variety of modes of representation: each mode has a different representational potential and a social valuation in particular social contexts (Kress and van Leeuwen 2006: 123; O'Halloran 2004: 1). Accordingly, different modes should be analysed in order to obtain the whole intended message.

The functions of each mode are different. For instance, language may communicate information concerning events and the image concerning content, as the written word is founded on the logic of succession in time and the visual on the logic of display in space (Kress 2001: 69-71; Elleström 2010: 23). In addition, the reliance on a certain mode is dependent on the situation and context: a picture may be the best mode to illustrate some procedure, while, for instance, in a legal document, language is the most significant mode (Kress 1997: 38). Lindstrom (2008) provides many interesting examples and illustrates that branding and advertising is based not only on the visual and the textual mode but also on touch or smell.

However, there is no exhaustive classification of modes. For instance, Forceville and Urios-Aparisi (2009: 5) refer to written language, spoken language, visuals, sound, and gesture as distinct modes; Norris (2004) also emphasizes the existence of several modes, such as distance, posture, gestures, or gazes in interaction, and distinguishes between embodied modes and disembodied modes. The examples of embodied modes are language, gesture, and gaze, while disembodied modes are exemplified by music or layout (Norris 2004: x-xi). Even though these authors do not discuss the influence of a genre, presumably, modes are genre-dependent: certain modes are typical of some genres, but not others.

The multimodal approach does not suggest that the importance of language is being downplayed. It is still an important mode, but its role in analysing discourse is changing: it is only one of many other modes, the combination of which produces meaning. As Kress et al. put it, "meaning is made in all modes separately, and at the same time, that meaning is an effect of all modes acting jointly" (Kress et al. 2001: 1). Thus, a new look at language is taken: it is viewed as one of a multiplicity of modes and does not take the central role in contemporary discourse analysis.

## 2.2 Background to the Theory of Multimodality

Even though multimodality is a contemporary theory and approach to discourse analysis, it did not evolve in a vacuum. Basically, the theory of multimodality is grounded on semiotics and social semiotics; in addition, as has been mentioned, terminology is borrowed from other disciplines. Thus, multimodality unites these theoretical foundations and interdisciplinary terminologies and provides a unified system for how to analyse multimodal discourse. This section focuses on the background to the theory of multimodality, namely, the main principles of semiotics and social semiotics.

The role of semiotics is not homogeneous. It is viewed as an important theoretical approach to discourse, especially among French scholars. One of the most prominent semioticians, Greimas, not only wrote influential books on structural semantics but also laid the foundations for the Paris School of Semiotics (Landowski 2005). In addition, Barthes took a more popularizing approach in his *Mythologies* (1957) by discussing modern cultural phenomena and the myths associated with them, as well as analysing the socio-cultural significance of selected images (Barthes 1991).

The role of semiotics is comparatively downplayed in English linguistics: it is not one of the most common research areas. Semiotics is the study of signs; it involves many different theoretical stances and methodological tools; it is an interdisciplinary field, involving linguistics, philosophy, psychology, sociology, anthropology, psychoanalysis, or education (Chandler 2006: 2, Chandler 2013). Chandler quotes Eco, who claims that “semiotics is concerned with everything that can be taken as a sign” (Eco 1976: 7 quoted in Chandler 2006: 2), i.e., that a sign may be a word, an image, a sound, a gesture, or any other verbal or non-verbal expression.

There are two traditions of semiotics: the first stemming from Ferdinand de Saussure, and the second one from the American philosopher Charles Sanders Peirce. Saussure claimed that the relationship between a signifier and the signified is arbitrary, and his concept of the sign/signifier/signified/referent forms the core of the field (Manghani et al. 2006:1). Hodge and Kress (1991: 21-22) criticise Saussure’s model and instead take Peirce’s ideas as key in social semiotics. Peirce proposed a classification of signs, namely:

- a) symbol: a mode in which the signifier does not resemble the signified but which is fundamentally arbitrary or purely conventional (e.g., a language, alphabetical letters, numbers, or Morse code);
- b) icon: a mode in which the signifier is perceived as resembling or imitating the signified (e.g., a portrait, cartoon, metaphors, or realistic sounds);

- c) index: the signifier is not arbitrary but is directly connected in some way to the signified, and this link can be observed or inferred (e.g., natural signs: smoke, thunder, footprints; medical symptoms: pain, pulse rate). (based on Chandler 2006: 36-37; Hodge and Kress 1991: 21-22)

Thus, in contrast to Saussure's emphasis on structure, Peirce's model describes a semiotic process. These concepts of semiotics are used and expanded by social semioticians<sup>2</sup>, who emphasize the social nature of signs and view meaning-making as a social practice.

In a social semiotic view on meaning, all signs in all modes are meaningful and function as social constructs. Furthermore, the social semiotic theory attends to general principles of representation: to modes, means, and arrangements. Thus, spatial arrangements, facial expressions, different colours, or other modes contribute to the meaning of the message (Kress 2010: 58-59).

Kress has formulated the main principles of social semiotics. The fundamental assumptions can be summarised as follows:

- (a) signs are newly made in a social interaction;
- (b) signs are motivated, not arbitrary;
- (c) the motivated relationship of a form and a meaning is based on and arises out of the interest of the makers of signs;
- (d) the forms/signifiers are made in social interaction and become part of the semiotic resources of a culture (Kress 2010: 54-55).

Kress (2010: 58) illustrates these main theoretical assumptions by providing an example of a written sentence. Taken in isolation, it has no full meaning as we do not know the context of the statement, the intonation, or the gestures that accompanied it. Thus, such variables as gaze, facial expression, gesture, or spatial positioning have to be taken into account to obtain a full message.

In a social semiotic theory, a sign acquires new qualities: signs are not only used but also made by the sign maker. In the process of representation, sign makers remake concepts and knowledge in a new shaping of the cultural resources for dealing with the social world. Thus, the speaker makes the signs himself/herself from the available resources if he/she has to express some unknown idea (e.g., drawing or using non-verbal communication if the person does not know the necessary word in the communicative situation) (Kress 2010: 65). Furthermore, social semiotics does not use Peirce's tripartite classification of signs into the iconic, indexical, and symbolic and proposes the idea that the sign reveals the interest of the sign

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<sup>2</sup> Social semiotics is a branch of the field of semiotics which studies social dimensions of meaning (Hodge and Kress 1991)

maker (ibid.). Thus, signs are viewed as social and cultural resources in order to encode meaning, while sign-making is a dynamic process, pertaining to everyday communication.

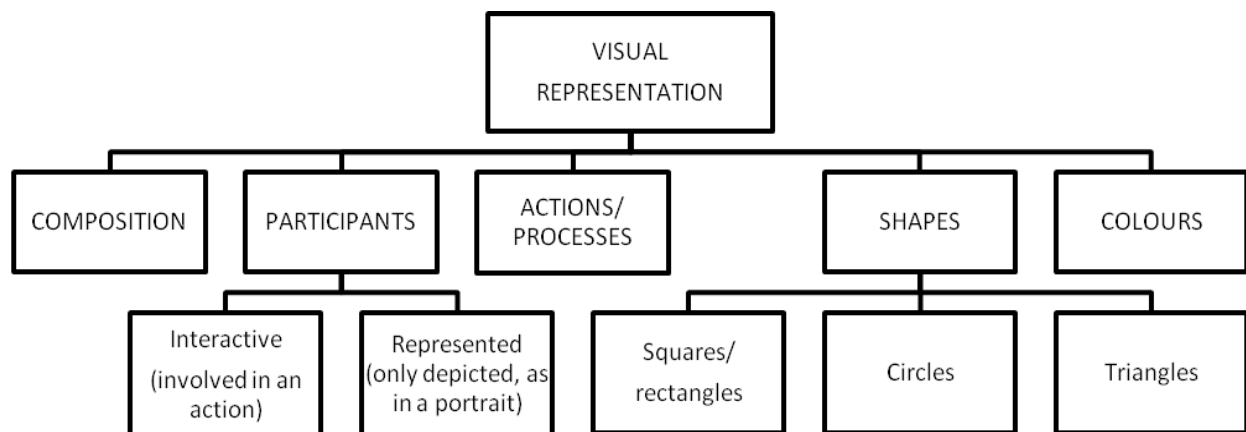
In addition, Kress (2010: 62-64) maintains that Saussure's assumption about arbitrariness between the signifier and the signified was wrong. He claims that arbitrariness goes against the notion of a sign-maker's interest and is, therefore, replaced by motivation in the social semiotic theory, i.e., a sign is chosen for a certain purpose. The form of the sign strongly suggests the meaning that the sign maker wants to communicate.

Social semiotics also distinguishes between representation and communication. This distinction is only theoretical, as in reality these two concepts are inseparable (Kress et al. 2001: 4). Representation focuses on the speaker's (or sign maker's) interest and what s/he wants to represent about the represented thing in a particular situation, while communication focuses on the assumed interest of the recipient of the sign and how the representation is done in a specific environment and for a specific audience (Kress 2010: 71, Kress et al. 2010: 3). Representation is always partial, as the sign maker chooses how much he/she wants to reveal about the object, and the partiality of interest shapes the signified at the moment of making the sign. The evolution from a sign as a more stable unity to a changing and context-dependent phenomenon can be observed. Sign-making in social semiotics is viewed as a conscious choice of representation and a dynamic activity which takes place in communication.

On the whole, according to social semiotic theory, all signs and messages are always multimodal: no sign or message ever exists in a single mode (Kress 1997: 10). The dominance of the modes is determined by the context of the genre and its conventions which have to be obeyed by the discourse community, while signs are dynamic resources used for creating meaning in particular social situations.

### **2.3 Main Aspects of the Multimodal Analysis**

As has been discussed in Section 2.2, semiotics and social semiotics form the theoretical foundations for the multimodal analysis. The aim of this section is to discuss the main aspects of multimodal analysis. In numerous publications, Kress and other scholars distinguish some main aspects of multimodal analysis, which can be summarized in the following figure:



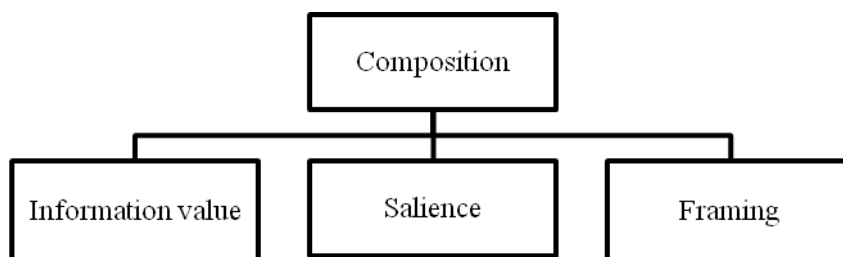
**Figure 1.** Elements of visual representation (based on Kress and van Leeuwen 2006: 45-73)

As can be seen in Figure 1, the main aspects which are discussed while analysing multimodal texts are composition, participants, actions or processes, which are realized as vectors, shapes (especially common in graphical representation), position of the viewer, and colours. Each of these aspects will be discussed in the following Sub-sections.

### 2.3.1 Composition/Layout

As proposed by structuralists, elements in a text are arranged into a certain structure or relationship. According to Kress and van Leeuwen (1996: 73-75), it is not only texts and genres, but also images that can have a textual metafunction and, accordingly, a certain structure. Visual messages can be decomposed into elements, a procedure which is similar to decomposing linguistic clauses into processes, participants, and circumstances. In addition, Baldry (2004: 84) claims that according to the systemic-functional tradition of multimodality, “meaning is built up as a series of functional units, typically, subphrases, phrases.” Thus, the units in a multimodal document or an image itself are decomposable, and the meaning and function of each may be described.

The combination of elements may suggest additional meanings and contribute to the process of meaning-making. Bateman (2008: 21) highlights the need to devote attention to all elements on the page and view them as a unity; otherwise, the message can be misinterpreted. Kress and van Leeuwen distinguish three systems related to composition, represented in Figure 2:



**Figure 2.** Principles of composition (according to Kress and van Leeuwen 2006:177)

The first compositional element is **information value**, which relates to the placement of elements on the left/right, top/bottom, and centre/margin. The compositional organization adds specific information and values to the image; furthermore, orientational metaphors may be formed (Lakoff and Johnson 1980: 14-22). Chandler (2006: 87) also discusses special syntagmatic relations, such as above/below, in front/behind, close/distant, left/right, north/south/east/west, and inside/outside, which create a certain meaning.

In analysing images, Kress and van Leeuwen (2006: 179-196) relate left elements to given and right elements to new information, while the vertical compositional axis is also connotative: up is associated with goodness, virtue, happiness, health, life, high status, and having control or power; down is associated with badness, depravity, sickness, death, low status, and being subjected to control or power (Lakoff and Johnson 1980: 14-22). In most cases, the information is polarized as given/new and ideal/real; in addition, centre and margin are two more possibilities. The centre means the nucleus of information to which all elements are subservient, even though the linear or non-linear combination of these elements is also common (Kress and van Leeuwen 2006: 179-196).

Despite the fact that these information values (i.e., given and new or ideal and real) might be true in many cases, absolute generalizations cannot be made. First, Kress and van Leeuwen analyse a limited number of examples, which might be selective and not sufficiently representative. In addition, genre differences are not taken into consideration. For instance, in certain genres, these values might work; however, it is not always possible to distinguish left and right or above and below areas, as exemplified by Maagerø (2005), who analysed children's drawings, or Horsbøl (2005), who focused on product labels.

In general, a variety of compositional possibilities may be observed in contemporary genres. Even though the reading path from left to right is typical of Western societies, reading an electronic document might require moving from top to bottom of the page. Thus information value is dependent on the medium (e.g., a printed text or an online document) and genre conventions.

The second feature, **salience**, refers to the attraction of the viewer's attention to different degrees; this includes positioning people or objects in the foreground or background, relative size, tonal value, sharpness, and other variables. While analysing salience, the meaning and intensity of colours are important, as they are the markers of modality. The term *modality* comes from linguistics and in this case refers to the truth value or credibility of statements. Modality markers in linguistics are auxiliary or modal verbs, such as *may*, *will*, or *must*. According to Kress and van Leeuwen, the dominant criterion of what is real and what is not is based on the appearance of things, on how much correspondence there is between what we can "normally" see of an object ... and what we can see of it in a visual representation' (Kress, van Leeuwen 2006:158). Thus colours play an important role: if the colour is more saturated, it is judged as exaggerated, and when it is less saturated, it is judged as 'less real' or 'ghostly,' and, accordingly, the modality is lower. In other words, the more reduced the colour is, the lower the modality, and if a picture can create the illusion of the real, the modality is higher.

In addition, it is also noted that salience of visuals is context- or discipline-dependent. As Kress and van Leeuwen put it, "modality is a system of social deixis which "addresses" a particular kind of viewer, or a particular social/cultural group, and provides through its system of modality markers an image of the cultural, conceptual and cognitive position of the addressee" (Kress 1997: 94, Kress, van Leeuwen 2006:172). This way, images should conform to the expectations of the viewers and the existing genre conventions.

The third element, **framing devices**, is especially important in the composition of newspapers or websites as it connects or disconnects elements on the page and signifies that they belong or do not belong together (Kress and van Leeuwen 2006: 179-196). The existence of several planes may signal social relationship, ideological content, or create parallels, oppositions, or other meanings related to structure (Hodge and Kress 1991: 60). In addition to framing, the use of similar colours has the same effect of connecting the signs (Rose 2001: 84). A typical example where framing devices are important could be textbooks, where frames and colours signify different activities.

As has been observed by Bateman (2008: 22), the main procedure in the analysis is the decomposition of a page into units, and this process must be made as reliably as possible and be reproducible. Page elements or their organization strongly influence how the readers interpret and understand the document; for example, in the case of an instruction manual, it is essential how easily the reader understands the depicted information and can perform the actions (ibid.). In this case, a very important issue is the unit of decomposition, which may be questionable during the analysis: is it a physical page, a two-page spread, or a single article? It is even more complicated with electronic media, as it is very difficult to define the boundaries of a website

(Bateman 2008: 22-23). It seems likely that the unit of decomposition may be dependent on the aim of the research. In addition, not all composition elements may be used in one unit, i.e., they may be chosen according to the genre, the situation, or the expected effect.

### 2.3.2 Participants

While analysing images, considerable attention should be paid to the participant or Carrier, as Kress and van Leeuwen put it (2006: 114). The main distinction is between **interactive** and **represented** participants. In the first case, they are in the act of communication (e.g., speaking or working), while in the second case they are the subject matter as, for instance, in a portrait. Furthermore, the participants usually engage in one or another action or process, which is visually realized as a vector, standing for an action verb (discussed in greater detail in Sub-section 2.3.3) (Kress, van Leeuwen 2006: 42; Scollon and Scollon 2003: 83).

An aspect of participants' representation is called a *variable*, which can be related to his/her appearance (e.g., skin colour or clothes), actions (e.g., physical work), contact with others (e.g., close or far in distance), or environment (e.g., home environment or open spaces) (Kress and van Leeuwen 2006: 48-49; Scollon and Scollon 2003: 84). Dyer (1982: 96-104 quoted in Rose 2001: 75-77) attempts to provide a list of variables that should be considered while analysing participants: representation of bodies (age, gender, race, hair, body, size, and looks); representations of manner (expression, eye contact, and pose); representation of activity (touch, body movement, and positional communication); and props and settings. Naturally, this list is not finite, and more variables may be included in the analysis.

The repetition of certain variables has a social effect and leads to identity creation (Floch<sup>3</sup> 2000: 27; Martin 2010: 24) or stereotyping and even racism (Kress, van Leeuwen 2006; van Leeuwen 2008: 137). This is especially typical of the media, where certain social groups or nationalities are represented repetitively in the same manner or context. This leads to stereotypes about, for instance, African-Americans, non-Western cultures (cf. Machin and van Leeuwen 2007), or gender stereotypes. As correctly observed by Floch (2000), feminine or masculine features are usually exaggerated in advertisements.

In addition to the image of the participant and variables, the position of the viewer is important, i.e., the distance or representation angle between the participant and the image viewer. Here the terminology used is based on cinematographic terms, such as a close-up or panorama (cf. Dick 2006, Company 2007). First, the manner of seeing differs, depending on where the image is viewed, for example, at home, in the living room, or the art gallery (Rose

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<sup>3</sup> Floch mainly discusses identity creation in advertisements.

2001: 15). Kress and van Leeuwen especially emphasize the importance of the eye-contact of the person (sometimes animal or even an object) depicted in the picture and the viewer. A direct gaze creates an immediate contact; however, the meanings of eye-contacts are unlimited as in face-to face communication.

Distance creates interpersonal relationships between the person or object depicted and the viewer of the image: a close-up indicates a close social distance, while, for instance, in diagrams, the human figure is almost always shown in a medium long or long shot, emphasizing the impersonal distance (van Leeuwen 2008: 138). In addition, size can also suggest social relationships between the viewer and objects, buildings, and landscapes: a close distance indicates engagement, while a far distance suggests detachment; various combinations of distance are also possible (Kress and van Leeuwen 2006: 117-121; van Leeuwen 2008: 139; Bell 2002: 15-16).

The relationship between the viewer and the participant may also be expressed by representing the object from a specific angle. As exemplified by Kress and van Leeuwen (2006: 136-140), the horizontal angle expresses involvement, while the oblique angle expresses detachment. Double messages may be achieved when the body is angled away from the viewer and his/her head and/or gaze is turned towards the viewer or vice versa. In addition, a high angle makes the subject look small and insignificant, while a low angle looks imposing. A representation from a specific angle is especially used to express power relations (cf. Chaplin 1994 or Westwood 2002).

The features of the participant and the viewer's position towards him/her are not neutral, as the scholars attempt to show. As Lister and Wells claim, "the viewing position constructed via the camera cannot be seen as ideologically neutral," as visually a social role is created for the participant (Lister and Wells 2002: 83). Thus, from the multimodal perspective, an illustration is not a mere illustration as it has certain features or values encoded, which may be important from the social perspective or may reveal features or attitudes inherent in a particular society.

### **2.3.3 Actions**

Actions and processes are closely related to the representation of participants in images. As discussed in Section 2.3.2, participants may be active, i.e., involved in a particular action or represented as in a portrait. When discussing the actions of participants, Kress uses the term *vector* for an action verb. It is usually expressed by a real line, such as a pointing finger, or a

direct gaze at an object or a person. For instance, in Picture 1, St Jerome's gaze at the book forms a vector:



**Picture 1.** St Jerome in his Study (Jan van Eyck, 1434) (from Kress and van Leeuwen 2006: 106)

Visuals where an action(s) is expressed by the use of a vector(s) may be referred to as narratives. Being a typically literary category, narrativity is now also used in the analysis of visual narratives, the main difference being the fact that a textual narrative is explored linearly, while the information is grasped more immediately from a visual narrative (Doloughan 2011: 24). Visual narrativity in contemporary genres is a topic which is sufficiently widely explored, focusing on graphic novels, opera, websites, or cyber-texts (cf. Page 2010; Doloughan 2011; Hayles 2005; Morris and Swiss 2006).

Different degrees of narrativity may be distinguished. As Bal (2008: 629) maintains, even a portrait tells a certain narrative, as certain things may be deduced from a person's face. However, the images depicting particular actions are more typical examples of visual narratives, which are pervasive in contemporary genres, such as comics or graphic novels.

Images which depict a certain process are referred to as conceptual visuals. In contrast to narrative visuals, conceptual visuals depict a classification or analysis (Kress and van Leeuwen 2006: 87; Scollon and Scollon 2003: 88). Kress and van Leeuwen (2006: 87) distinguish the following subtypes of conceptual visuals:

- (a) unstructured analytical processes;
- (b) temporal analytical processes;
- (c) exhaustive and inclusive analytical processes;
- (d) conjoined and compounded exhaustive structures;
- (e) topographical and topological processes;
- (f) dimensional and quantitative topography;
- (g) spatio-temporal analytical structures.

First, unstructured analytical processes show the attributes or parts of the Carrier. An example here could be a metonymical representation of a part instead of the whole object. Second, temporal analytical processes involve the temporal dimension, and this representation also

suggests a narrative: for example, the visually presented evolution process shows a timeline and indicates the changes that occurred. Third, exhaustive and inclusive analytical processes exhaustively represent the attributes of the Carrier, i.e., all the components are shown. An example of inclusive analytical processes is maps: they show a state or a nation but not all cities or towns are necessarily marked. Fourth, in conjoined and compounded exhaustive structures, Possessive Attributes are either connected or disengaged, as is, for example, with pie charts, which show the division of a certain entity into constituting parts. Fifth, topographical processes represent physical spatial relations, while topological ones represent the ‘logical’ relations between participants and the way they are connected to each other. Sixth, dimensional and quantitative topography is usually represented in charts, which divide a Carrier into components and quantity is translated into relative size. Seventh, an example of spatio-temporal analytical structures is temperature, profit, or company growth charts that combine a narrative structure and vectorial movement (Kress and van Leeuwen 2006: 87-104).

In addition to analytical processes, symbolic processes are also distinguished, which refer to what a participant means or is, i.e., they have or imply some symbolic meaning. Thus, Kress and van Leeuwen (2006) provide an elaborate and detailed classification of processes which may be depicted in the images. On the one hand, their analysis is exhaustive and may serve as guidelines or the theoretical foundation concerning the types of conceptual visuals; on the other hand, the classification seems to be perhaps too detailed and may be used only in analysing those images where processes dominate. In popular scientific articles, which are explored in the present thesis, narrativity dominates over conceptual processes.

#### **2.3.4 Shapes**

Shapes, such as circles, triangles, or rectangles are usually associated with the graphical representation of data, which is especially common in academic writing. Graphical representation is convenient in visualizing processes or reporting qualitative results, as graphs or charts can be perceived more quickly than textual description.

The first chart was produced in the 18<sup>th</sup> century, which depicted the births and deaths of “statesmen of learning” (Suda 2010: 4) Contemporary charts have undergone a considerable change, and are now extensively used in various genres and discourses. As noted by Suda, “the amount of information rendered in a single financial graph is easily equivalent to thousands of words. A graph illustrates so many characteristics of data in a much smaller place than any other means. Charts also allow us to tell a story in a quick and easy way that words cannot” (Suda 2010: 9). Thus, graphical information serves the purpose of presenting statistical

data in a compact way, which is a space-saving strategy. In addition, graphs and charts not only visualize information but also increase the reliability of academic discourse.

There are several main types of presenting graphical information: line graphs, bar charts, histograms, star ratings, area graphs and charts, pie charts, and matrix (Suda 2010: 111-170). Each type has its advantages, or their use is dependent on the situation needed to describe. For instance, line graphs work best when data are continuous (e.g., rising and falling temperatures); bar charts are a very common way of presenting statistical information; area graphs, which are a series of stacked line graphs, are used when multiple data sources are broken down by each item and the sum of all items is also necessary. A pie chart can be used especially to misrepresent data: the amount of the represented data is very limited and only relative amounts can be represented (ibid.). The above-mentioned ones are the main types of graphical representation; more types are constantly developing.

It is believed that quantitative or statistical information is always viewed as objective, logical, and scholarly. However, there are numerous ways of data distortion which may serve the user's purposes or have hidden intentions (Huff 1991: 21-23; Jamieson 2007: 11, Tufte 1997: 25). First, as noted by Huff, there is some bias involved in producing statistics, which also affects the results, as people may not be fair and sincere in answering the questions of polls for some reason (for example, they pretend to be better than they are or they do not want to reveal the truth about themselves). Besides, the data may not be adequately representative (e.g., asking elderly people about using the internet) or some data are intentionally or unintentionally omitted (Huff 1991: 21-23, Suda 2010: 89). Second, taking the average may also distort the numbers because of the very loose meaning of the word, as the average may refer to a mean, median, or mode (Huff 1991: 30). Third, the analysed group may be very small so that the results may not be reliable (Huff 1991: 39). The 'statistic lie,' which is the most closely related to the theory of multimodality, is manipulation with graphs and charts, which will be discussed in greater detail.

On the one hand, no falsification may be used while presenting information in graphs and charts; on the other hand, the created impression may be very different. If, for instance, the graph covers the entire page and the change that it exhibits is very small, it becomes visually even smaller. If, however, the proportion between the ordinate and the abscissa is smaller, even a small increase may create an impression of a considerable change (Huff 1991: 59-61, Suda 2010:81). Furthermore, the size in one-dimensional pictures matters because it may create a false impression of an object being bigger or smaller than it really is. Both Huff and Suda draw attention to the fact that graphics, especially three-dimensional ones, may create the impression that the amount is much bigger than it actually is. On the contrary, the

same number presented in a chart does not create this impression (Suda 2010: 78). According to Huff (1991: 100), percentages “offer a fertile field for confusion. And like the ever-impressive decimal they can lend an aura of precision to the inexact.” Thus, the use of statistics may be more an art than a science, which allows many manipulations and distortions. Quite possibly, manipulation is employed with some purpose in mind (e.g., to sell more products); however, a more detailed study would be necessary.

From a multimodal perspective, Kress and van Leeuwen draw attention to one more aspect of graphical shapes, i.e., the particular meanings which may be attached to them. For instance, as the scholars claim, squares and rectangles are the dominant shapes in the contemporary world; they may be associated with the mechanical and technological order and the world of human construction. Circles may denote endlessness, warmth, and protection; they are the traditional symbols of eternity and the heavens and are associated with organic nature, while squareness does not exist in nature. Finally, the triangle is also an element of the mechanical and technological order, but it can also convey directionality and point at things. In diagrams, triangles may introduce a sense of process, while all these shapes and the combination thereof may be used in diagrams to represent classifications and taxonomies (Kress and van Leeuwen 2006: 45-73). Thus, geometrical shapes may be used in presenting the information graphically, which may be a source for manipulation, and may acquire different and more symbolic meanings in other contexts.

### **2.3.5 Colours**

Colours are one more aspect important in multimodal analysis. They are related to salience, which has already been discussed in Section 2.3.1. Salience may change the perception of an object as real or unreal; in addition, certain colours may be used intentionally for manipulation.

The selection of a particular colour in a text carries an additional piece of information. An example could be a hypertext, which combines text, which is underlined, and bold type; this represents a possible rhetorical link with something related in the text (Bateman 2008: 105). Colours are also used to highlight information. The first method is to use a single colour within a black-and-white or a single-hue graph. Even though one colour is used, its intensity, transparency, or lightness amplify or mute information. Another way is to increase its pixel width. If one line in a graph is thicker, it stands out from other lines (Suda 2010: 45-47).

In addition, colours are used for ideological purposes, i.e., certain groups of people, such as political parties, may be associated with certain colours, which are also used in

printed material related to their activity. For instance, environmentalists are usually associated with the colour green.

The use of colours is analysed in children's magazines by Zammit, who claims that colours perform a variety of functions:

Highly saturated colours are often used for the backgrounds, creating sometimes a psychedelic 1960s style, flower power of the 1970s, or even a surreal mood. These colours are used to contrast with the colour of the writing, drawing the reader's attention, attracting them to read or at least to have a look. The colour for sub-headings or questions usually contrasts with the background or links with another element on the page, for example the colour of the heading. In this way colour is used to create unity and coherence in the text. (Zammit 2009: 65-66)

Thus, colours are used in order to create a certain mood or style; they function as a reader-involvement technique and contribute to the creation of a coherent discourse. In addition, colours are used in the representation of characters and their identity creation (for instance, villains are usually represented in dark colours) (ibid.).

The use of colours may also cause some problems. First, the usage of many colours in graphs may be expensive when the document is printed (e.g. advertisements). Second, too many colours may create a distasteful design. Suda also raises the question of colour blindness: if too many colours or shades are used, this may lead to the misinterpretation of data or hinder reading if the background is too intense (Suda 2010: 57-61; Zammit 2009: 67). Thus, if used properly, colours are a powerful tool to highlight more important or hide less significant aspects.

## **2.4 Multimodality and Figurativeness**

Traditionally it is understood that tropes are formed verbally; however, as contemporary research has revealed, multimodal metaphors and metonymies are highly recurrent in contemporary discourse and media and function as persuasive devices.

As Hill (2008: 25) claims, representational visuals are persuasive because they invoke certain emotions in addition to representing people, objects, or places (cf. Barthes 1981; Blair 2008). Images, in Hill's opinion, have more epistemic force than verbal descriptions, since for the reader/viewer they seem to be 'more real' and, consequently, more convincing. Good examples of long-term persuasion are political and advertising campaigns, which not only evoke a temporary effect but also build positive values which cause the viewer to think positively about the product; therefore, images may be viewed as 'visual arguments,' to use Blair's term (Hill 2008: 36; Blair 2008: 44). Thus, even though figurative language usually performs the

function of arousing the emotional response or persuading the reader, images *per se* may function as rhetorical devices.

So far, most studies have addressed metaphors from the monomodal perspective, as both source and target domains are textual; however, rhetorical figures may involve more than one mode. Probably one of the most frequently discussed figurative devices used in multimodal texts is metaphors, which are especially common in advertising. Forceville correctly emphasizes that the conceptual metaphor defined by Lakoff and Johnson may also be rendered not only verbally but also by the use of other modes (Forceville 2009: 25). He distinguishes between monomodal and multimodal metaphors: in the case of monomodal metaphors, the source and the target are rendered exclusively by one mode, while in the case of multimodal metaphors, the target and the source are represented by different modes (for instance, moving images or metaphors involving language and gesture) (Forceville 2009: 25; Kövecses 2005).

In the case of multimodal metaphors, the source and the target domain usually relate to one of the senses, i.e., seeing, hearing, touch, taste, or smell; the source and the target should be represented in different modes (Forceville 2006: 384; Urios-Aparisi 2009: 96). Otherwise, a monomodal metaphor is produced.

Forceville (2009: 23) also provides a categorization of the aspects that could be investigated while analysing these metaphors: pictorial signs (e.g. logos), written signs, spoken signs, gestures (e.g., in three-dimensional space), sounds, music, smell, which is related to taste, and touch. A typical example of multimodal metaphors could be TV commercials, which relate the visual elements with sounds and verbal expression; furthermore, the verbal mode could even be eliminated in some printed advertisements or films.

Several scholars have carried out research applying Forceville's ideas and analysed companies' logos, brand images, or advertisements, which combine textual and visual information from the perspective of a multimodal metaphor (Koller 2009: 49; Maes and Schilperoord 2009: 70-73). Multimodal metaphor is viewed not as a decorative element but as a tool to meet the persuasive means and as an attractive communicative strategy for multinational companies, as multimodal representation reinforces the conceptualization of a company in the recipient's mind. Koller (2009: 64) also argues that "outside the context of the specific instance of brand communication, there would be little to suggest that illustrations, logos or layouts should be taken metaphorically; it is only in the given genre that they suggest metaphoric construal, at least to some viewers."

Another genre where multimodal metaphors are pervasive is cartoons which combine verbal and visual elements. El Refaie (2009: 176), who focuses on political cartoons, claims that their purpose is to represent an aspect of political, social, or cultural life in a way that

condenses reality and transforms it in a striking, original, and/or humorous way. According to El Refaie, orientational metaphors, which link spatial orientation with more abstract meanings, are especially common in political cartoons, such as HAVING CONTROL OR FORCE IS UP/BEING SUBJECT TO CONTROL IS DOWN (El Refaie 2009: 176; Lakoff and Johnson 1980: 14). Another feature of multimodal metaphors is precision as images are more precise than words and capture nuances in meaning which are difficult to convey in language (El Refaie 2009: 177). Furthermore, such metaphors in political cartoons are socio- and culture-dependent, as the conceptualization of one or another phenomenon may differ (El Refaie 2009: 182; Kristiansen 2006). However, the conclusions of the research are only tentative, as the scope is not very large. In addition, most cartoons have very little textual information; thus the source for metaphorical understanding is mainly the visual mode.

Multimodal metonymy, its interaction with multimodal metaphor, and use in advertisements are discussed by Urios-Aparisi (2009). As indicated by the scholar, “in metonymy a mapping is connected to the mental highlighting or activation of one (sub)domain over another” (Urios-Aparisi 2009: 98). He interestingly exemplifies that metonymies are common multimodal tropes in advertising; for instance, such multimodal metonymies as EMBLEM FOR PRODUCT (Tea Tag for Tea Bag), EFFECT FOR CAUSE (Relaxation for Drinking Tea) or CAR FRONT FOR CAR are analysed and discussed. The limitation of Urios-Aparisi’s and Forceville’s works is that they mainly focus on multimodal tropes in advertising, where figurativeness is very common in order to attract the viewer’s attention and to create a memorable advertisement; however, other genres are not discussed.

## **2.5 Application of the Theory of Multimodality**

Multimodality is not limited to discourse studies. Rather, it is applied and analysed in other areas, such as interaction (Norris 2004) or the teaching/learning environment (Kress 1997, 2003, 2009), which are discussed in this section.

Norris (2004: 79) analyses **multimodal interaction**, i.e., oral communication, and focuses on the interplay of various modes in spoken communication. The author conforms to Kress’s idea that meaning is created by a combination of various modes, which are all of the same value, i.e., gaze, proxemics, gesture, posture, or tone. As Norris (2004: 79) notes, “the intensity, weight, or importance of specific modes in interaction are determined by the situation, the social actors, and other social and environmental factors involved.” For example, speaking on the phone, language and voice qualities are the most important, while in face-to-face interaction such embodied modes as gesture or gaze play the most important role.

Scollon contributes to the analysis of multimodal interaction by referring to it as ‘mediated discourse analysis’ (Scollon 2001). He investigates actions from the perspective of socially inherent practices, i.e., communication in the context of social practices. Similar to multimodal analysis of written texts, such aspects as participants, their actions, environment, or the medium are explored with a focus on meaning, practices, identities, and social structures (Jewitt 2011: 33).

Another area where multimodal studies are developing is the relationship between **multimodality and genre (GeM model)**. Bateman, who carries out this research, argues that “the “written document” (is) a form of communication now so frequent that it is fast coming to rival the spoken word” (Bateman 2008: 1). He follows Kress’ idea that nowadays the text is only one of the representational forms in addition to diverse visual aspects, which are becoming more and more complex (ibid.). Thus, the decoding of these messages is also more complex than it was several decades ago, which leads to the need for the acquisition of visual literacy not only implicitly, but also explicitly, and the need to include it into the teaching curriculum (Bateman 2008: 6-7, Bateman 2009: 59).

The GeM model is a corpus-based approach, according to which a multimodal corpus is compiled using the standards and principles of corpora design (Bateman 2008: 15). Bateman distinguishes the following layers of documents:

- (a) the GeM base (the basic elements physically present on a page);
- (b) layout base (the layout properties and structure);
- (c) rhetorical base (a detailed account of the rhetorical relationship between the content expressed by elements on a page and their communicative purpose);
- (d) navigation base (the elements that contribute to navigation and access in the page, supporting ‘movement’ around the document in various ways);
- (e) genre base (a representation of the grouping of elements from other layers into generically recognizable configurations distinctive for particular genres or document types).

For the description of visual representation in multimodal documents, Bateman suggests creating multimodal document corpora, which would help to analyse more data and provide more reliable conclusions. This would allow performing not only qualitative analysis, as is the usual case while analysing documents from the multimodal perspective, but also quantitative and more systematic analysis. A corpus-based approach is also proposed by Baldry (2004: 84) who discusses an annotation system of multimodal documents and provides a very detailed analysis of advertisements based on a concordance.

Despite the advantages of applying a corpus-based approach to the analysis of images, it might pose several problems. First, human and financial resources are necessary in order to apply this approach, as the software for carrying out a multimodal research is only developing and used only in some multimodal research centres. The examples of such a software could be MMAX developed at the European Media Laboratory in Heidelberg or ANVIL developed at the University of the Saarland for multilevel video annotation (Bateman 2008: 265). Second, from a technical perspective, the annotation of a large corpus is a time-consuming process, especially because of a variety of moving and non-moving images and variables attached to them (for instance, for participants, bodily position, facial expression, eye-contact, skin colour, environment, and many other aspects have to be indicated to create a reliable corpus). Still, several multimodal document collections can be mentioned. For instance, Eckkrammer and colleagues have compiled a corpus on layperson-oriented medical texts (DIALAYMED corpus); Walker and colleagues have compiled a corpus on the educational materials produced for children (Bateman 2008: 266); and Baldry and Thibault use an annotated multimodal corpus of video advertisements (Baldry 2004: 83-108). Third, because of many variables, the analysis might be complicated, especially taking into consideration different genres.

In his earlier research, Kress focused on the emergence of literacy and claimed that images are an inextricable part of **literacy development** and educational settings in general in the world, which is shifting from the verbal to the visual mode (Kress 1997: 23, Kress 2003: 35, Kress et al. 2005: 21, Kress 2009: 16): before starting to write, children are interested in the world around them, conceptualize it, and try to recreate it (Bearne, Wolstencroft 2007: 4). Zammit (2009: 60) adds that children should be taught multimodal literacy rather than only writing skills because contemporary books, magazines, newspapers, and other sources are multimodal; thus pupils have to learn to interpret and create multimodal documents.<sup>4</sup>

Kress et al. (2001: 58-59) maintain that the combination of several modes is employed in teaching/learning situations, particularly in science classes, as demonstration, experiments, or visualizations are especially typical. Furthermore, the acquisition of information is manifested not only in the ability to verbally describe certain objects or phenomena, but also to represent them visually (e.g., the textbooks on biology or geography employ the visual mode to a large extent, and the use of the visual mode is also sometimes required from the pupils) (Kress 2009: 37). Kress et al. (2001: 128) approach learning as a transformative action of sign

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<sup>4</sup> A project to teach multiliteracies was carried out in Sidney (2003), the aim of which was “to explore, evaluate and describe in detail the kinds of classroom pedagogies that bring enhanced outcomes for educationally disadvantaged students” (Zammit 2009: 62)

making: students remake the signs which have been available to them as resources motivated by the lesson or their own interests. Learning is viewed as a process of sign making: students acquire certain knowledge exhibited in their own texts which function as responses to the communicative actions of the classroom (Kress et al 2001: 128; Kress et al. 2005: 21). Thus teachers provide some knowledge input, while students select and interpret this knowledge in their own way, creating new signs or changing those given.

Kress exemplifies the re-making of signs with a situation from a biology class (cf. Kress et al. 2001: 140; Kress 2003: 106). The pupils looked at onion cells and had to describe what they did and what they saw, and to draw a picture illustrating what they saw through the microscope. The examples of pupils' papers demonstrate that each is very individual and different from the original view, the differences appearing both in the language used to describe the experiment and the visual representation. As Kress et al. note, the pupils imported different elements from the teacher's instructions, talks, worksheets, and their experiences of the experiment (ibid.). This way the signs are decoded in pupils' minds and recoded in their assignments, showing understanding and recreating the knowledge that they gained, which seems to be dependent on the individual student.

O'Halloran (2006) and Rivera (2011) focus on another subject, mathematics. The scholars emphasize that mathematics involves a substantial use of visuals; thus, particular attention should be paid to visuals while teaching this subject. The same could be true about other subjects as well: for instance, physics or chemistry. However, the use of visuals in the textbooks of hard sciences has not been analysed.

Another issue in pedagogical settings is the analysis of the multimodal learning/teaching environment, which involves such modes as table arrangement, teacher's actions and movements, visual display, language used, gaze, gesture, and voice quality (Kress et al. 2005: 25- 32). For instance, features of a classroom such as the arrangement of tables are meaningful by creating a more student-centered and interactive arrangement when a small group sits at a table, or a more traditional teacher-oriented layout with the teacher's desk at the front and students' tables arranged in rows. In addition, the teacher's movements may suggest involvement if s/he constantly approaches the pupils or, on the contrary, detachment if s/he sits at a table all the time (ibid.). Research on pedagogic settings, modes, and their effect on the pupils/students offers many prospects and practical applicability; however, very little research has been done in this area, and Kress's ideas are limited to the discussion of only a few examples.

The theory of multimodality is applied not only in the analysis of texts, but also places such as museums, or spaces such as towns. For instance, Ventola (2009: 149) analyses

how various multisemiotic ways are used in the creation of the relationship between Mozart and Salzburg. In her analysis Ventola considers places, official buildings, squares, or the range of products related to Mozart and how these different modes market the famous composer. Furthermore, Stenglin (2009: 245) discusses the semiotic resources and ideologies which pervade museums; Ventola considers home design a target for the semiotization process (Ventola 2011: 220); Lim focuses on the application of multimodality in analysing the design of a supermarket (Lim 2005: 109); Koeck and Roberts (2010) explore the topic of urban landscapes, architecture, and the moving image. Thus, the theory of multimodality is applied not only in the analysis of printed multimodal texts but also in the analysis of communication and spaces, which might become a more widely explored direction in multimodal analysis.

## **2.6 Summary**

This chapter presented the main concepts and principles of the theory of multimodality. Grounded on social semiotics and Halliday's functional-systemic grammar, multimodality is a useful tool in analysing contemporary genres or cultural phenomena.

Multimodal analysis focuses on social participants, the variables associated with them, actions or processes, and their representation in discussing not only genre features of the contemporary media, but also the practices and features of contemporary society, identities, and stereotypes. In addition, Kress and van Leeuwen broaden the concept of composition; in multimodal analysis it refers not only to page layout, but the images themselves might be decomposable and carry additional meanings. Multimodal metaphors and metonymies are pervasive in contemporary media and function as important rhetorical devices.

The theory of multimodality is applied in various contexts: in conversation analysis, in literacy emergence, and pedagogical settings, as well as the analysis of spaces from the semiotic/multimodal perspective. Thus, the theory of multimodality is not homogeneous and has many perspectives and applications in contemporary society. It should be stated that in multimodal analysis a certain degree of subjectivity cannot be avoided while interpreting data; however, multimodality is an especially useful approach in discussing genre conventions or cross-cultural differences. In addition, multimodal corpora being created provide a possibility for analysing more texts and obtaining more reliable and objective results.

### **3 Academic Discourse as a Genre**

Academic discourse is often contrasted with other discourse types as having distinct conventions and features which have to be mastered by novice members of the academic discourse community. While reading numerous publications on academic discourse, a clear mismatch between methodological books for teaching academic writing and the actual research on academic discourse can be observed. For instance, Murray (2005: 11) enumerates the following words associated with academic discourse: objective, hierarchical, focused, conservative, and neutral; according to Montgomery (1996: 2), academic discourse is also jargon-laden, precise, claiming authority, and exclusive, while Nash (1990: 22-23) points out that the main features of an academic text are exactitude, objectivity, and modality (cf. Dodd 2005). The above mentioned generalizations about academic discourse support the myth of objectivism outlined by Lakoff and Johnson<sup>5</sup> (1980), which is dominant and pervasive in the Western world. The myth highlights the importance of scientific truth, rationality, accuracy, fairness, and impartiality (Lakoff and Johnson 1980: 188-189).

Contemporary research on academic discourse emphasizes different aspects of academic discourse which contradict the myth of objectivism or view academic writing as a more complex and heterogenous phenomenon. For instance, academic discourse is understood as a dynamic construct dependent on many factors rather than a set of established conventions (Duff 2007: 3); there are certain genre conventions which have to be obeyed (Rienecker and Jorgensen 2003: 37; Biber 1995; Swales 1990); and academic discourse exhibits numerous cross-cultural (Duszak 1997) and interdisciplinary differences (Russell 1995; Berkenkotter and Huckin 1993; Hyland 2005, 2009). The research by these and other authors shows that academic discourse is varied and influenced by culture and discipline, and may deviate from objectivism and precision (cf. Hyland 2009, 2010, 2011). Thus the aim of this chapter is to discuss the main features of academic discourse and contrast it with popular scientific discourse, which may be described as a variety of academic discourse addressed at lay people rather than professionals.

#### **3.1 Main Features of Academic Discourse**

Academic discourse as a genre has attracted the attention of many scholars both in foreign countries and Lithuania. The analysis of the features of academic writing is carried out along several directions: vagueness (Myers 1996), precision and graphical representation (Channell 1990, Davis 2005, Casey and Selfe 2008), persuasion (Beedles and Petracca 2001), modality

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<sup>5</sup> Kress (1989) refers to these features as ‘the ideology of science.’

(Nash 1990; Simpson 1990; Ventola 1997), hedging (Crismore and Farnsworth 1990; Kreuz and Harres 1997; Ventola 1997), metadiscourse (Crismore and Farnsworth 1990), differences between the features of professional and novice writers, and genre differences. This list of the features of academic discourse is not exhaustive, and each requires a separate study, especially in Lithuanian. The present thesis does not aim to discuss each of these features in great detail; in order to reach the aim of the present investigation, a general framework is necessary in order to draw the main distinction between academic discourse and popular scientific discourse. Thus such distinctive features as author's stance (i.e., hedges, boosters, attitude markers, and self-mention), (im)precision, metadiscourse, intertextuality and interdiscursivity, and other prominent features of academic discourse are discussed in Sub-sections 3.1.1-3.1.5.

### **3.1.1 Author's Stance**

Even though the notion of a faceless and objective academic discourse can still be found in methodological books on academic writing, the idea that academic writing is persuasive and to some extent personalized is now widely accepted. One of the ways to persuade and engage the reader is to use devices which express the author's stance. Hyland (2011: 197) defines stance "as the writer's textual voice or community recognized personality, an attitudinal writer-oriented function which concerns the ways writers present themselves and convey their judgements, opinions, and commitments." The definition implies that the writer does not remain aside; rather, s/he is an active participant who not only describes his/her research, but also highlights his/her own personal attitude, thereby creating identity and establishing a relationship with the readers.

Hyland, one of the leading scholars in the analysis of academic discourse, has formulated several strategies on how the reader's stance may be expressed, which are the following:

- (a) hedges;
- (b) boosters;
- (c) attitude markers;
- (d) self-mention.

These ways of expressing the author's stance are discussed in this Sub-section.

The concept of hedging is very closely related to a broader issue in academic discourse, i.e., modality (Nash 1990, Ventola 1997). The concept of modality comes from logic, from which it spread to other disciplines, including linguistics. Nowadays, modality is understood as having a variety of degrees of necessity and possibility. As defined by Downing

and Locke, “modality is to be understood as a semantic category which covers such notions as possibility, necessity, volition, obligation and permission” (2002: 382).

Different authors distinguish various subtypes of modality, such as alethic modalities, temporal modalities, boulomaic modalities, etc. (Perkins 1983: 9 quoted in Šolienė 2013). The main distinction, however, is between epistemic modality and deontic modality. Epistemic modality refers to the speaker’s assumptions or assessment of possibilities, as well as the speaker’s confidence or lack of confidence (e.g., *You could be right; You should be right*), while deontic modality is concerned with a speaker’s attitude toward the (non)desirability of a certain action or event (e.g. *You may leave at 10 o’clock; You must leave at 10 o’clock*) (Simpson 1990: 67-69). Ventola refers to these terms as modulation and modalization, and explains that the first term refers to the speaker’s obligation or readiness towards the action, while the second denotes probability or frequency of the statement (Ventola 1997: 159). Modalized utterances express the author’s tentativeness, tact, and distance, i.e., considerations of politeness; in particular, they are one of the negative politeness strategies (Brown and Levinson, 1978: 75).

Modality may be expressed in several ways: modal verbs (e.g., *may, must, shall, can*), evaluative lexical verbs (e.g., *seem, think, wonder*), hedges (e.g., *kind of, sort of*), verbally derived adjectives (e.g., *It is conceivable/debatable*), phrases with past participles (e.g., *it was implied/claimed*), or nominal expressions (e.g., *You have an obligation/probability/possibility*) (Simpson 1990: 67-69, Ventola 1997: 159-161).

In scientific texts, modal verbs (e.g., *may, would*) are used in rather complex ways. As noted by Butler, modal verbs are used in making claims from evidence and in making generalizations about what is possible (Butler 1990: 139). He also adds that the use of modals is not homogeneous: in some cases they can change the meaning completely, and in other cases, they would not affect the meaning if omitted (*ibid.*). According to Butler, the most frequent modals in English are *may, can, and will*, which perform a variety of functions. Most often, *may* expresses possibility, uncertainty and ‘existential meanings,’ while the most frequent function of *can* is ability and legitimacy (Butler 1990: 167-168).

Modality is one of the areas which is more widely analysed in Lithuanian; recent investigations have been focused on literary texts (Šolienė 2013, Usonienė 2007, 2006a, 2006b), while academic texts have not received sufficient attention. Only a few studies which analyse modality in academic discourse might be mentioned: for instance, Ryvitytė (2005, 2008) discusses evaluation including modality markers in book reviews; Šinkūnienė (2011) explores hedging as one of modality aspects in written academic discourse in articles on linguistics and medicine and has observed that it is dependent on the language and on the discipline.

One category of modality markers are hedges, which downgrade or qualify precise propositions and refer to the ‘fuzziness’ of language (e.g., *kind of, sort of, I mean*) (Kreuz and Harres 1997: 182). As explained by Crismore and Farnsworth, “hedging is the mark of a professional scientist, one who acknowledges the caution with which he or she does the science and writes on science” (Crismore and Farnsworth 1990: 135). Hedges are extensively analysed by Hyland, who defines them as “devices which withhold complete commitment to a proposition, allowing information to be presented as an opinion rather than fact” (Hyland 1998). This is especially important in academic discourse where subjective assessments are unavoidable (Hyland 1995: 33).

As indicated in the definitions, hedging devices soften and mitigate the proposition; in addition, they also function as a way to express the author’s stance, i.e., the degree of confidence with which the proposition is expressed (cf. Hyland 1995, 2005, 2011). Authors usually avoid propositions that are too strict in order to leave a possibility for another interpretation of the data or future research. Furthermore, rapid scientific changes and advances condition a more tentative description of results or their mitigation; in this way, information manipulation may be achieved.

Hedges also serve the interpersonal function. According to Ventola (1997: 163), hedging, in addition to face saving and positive/negative politeness strategies are manifestations of the interpersonal function of language, especially affinity and solidarity; because of the use of hedging, statements seem more accurate and less dogmatic (Kreuz and Harres 1997: 182; Thonney 2011: 352). From a pragmatic point of view, hedges express an illocutionary force by affecting the propositional content of an utterance (Kreuz and Harres 1997: 182). Thus, hedges might function as face-saving strategies (positive and negative politeness theory, Brown and Levinson 1987) which also increase the interactivity of discourse or, in Halliday’s terms, fulfill the interpersonal role (Halliday 1994).

Hedging devices are widely discussed by Hyland, who refers to hedging as one of the strategies to highlight the author’s stance (Hyland 1995, 2005, 2009). In his numerous publications, Hyland discusses that hedging, as well as other devices expressing the author’s stance, are subject-dependent. According to his research, the humanities exhibit a much higher frequency of hedging devices than hard sciences. For instance, as Hyland indicates, there are 18.5 hedging devices per 1000 words in philosophy and 18 in applied linguistics, while the frequency of hedging devices is twice as low in physics and electronic engineering (only 9.6 hedging devices per 1000 words) (Hyland 2005: 204). This is due to interdisciplinary differences, as the research in hard sciences is based on testing and obvious quantitative results, while the humanities require more interpretation and a more personal attitude.

The use of hedges is also genre-dependent. Hyland has demonstrated how different audiences and different purposes influence linguistic choices; he analysed university textbooks and research articles and noted that the use of hedges in research articles reaches 15.1 per 1000 words in research articles and drops to 8.1 per 1000 words in university textbooks (Hyland 2009: 7). Thus, there are many factors, such as interdisciplinary, genre, or personal choices, which influence the used of hedging in discourse.

There are some studies which discuss the use of hedging in various languages (e.g., studies by Dontcheva, 2009, Ruswan and Dallyono 2008, among others). However, there is a lack of comparative studies of hedging devices, especially in Lithuanian; additionally, the differences between academic discourse and popular scientific discourse in various disciplines has not been analysed.

In Lithuanian, the interest in hedging devices is increasing. However, possibly due to a lack of research, a variety of terms is used to refer to hedges, such as *sušvelninimas* or *apsidraudimas* (Ryvitytė 2001, 2005), *modalinimas* (Usonienė), *sqšvelnis* (Šeškauskienė 2005, 2008), *išlyga* (Marcinkevičienė 2007), or *hedžingas* (Alosevičienė 2007). Hedging devices have been discussed in a few discourse types (e.g., political (Alosevičienė 2007) and newspaper discourse (Buitkienė 2008)), including academic discourse. For instance, Ryvitytė (2005, 2008) has analysed hedging devices in the context of evaluation in academic writing; Šeškauskienė (2008) has focused on ESL learners and different uses of hedges in English and Lithuanian academic discourse. Besides, in her comparative study of English and Lithuanian academic articles in the humanities and medicine, Šinkūnienė (2011) supports Hyland's ideas that native speakers use more hedging devices; in addition, they are more typical of the humanities because of the specificity of the subject field. Thus, in general, modality and hedges are the features of the author's stance which are more widely researched in Lithuanian academic and non-academic discourse.

Another feature expressing the author's stance is **boosters**, which can be defined as resources "which emphasize force or writer's certainty in proposition" (Hyland 2004:139). Boosters may be contrasted with hedges, which soften or mitigate the proposition; boosters, on the other hand, reinforce the proposition or express the author's certainty in what s/he says (e.g., *definitely, sure, prove*, etc.) (Hyland 2011: 199).

In discourse, boosters have several functions. First, they express certainty and restrict opportunities for alternative voices by emphasizing the author's opinion. Boosters also usually stress the shared information and thus mark solidarity between the author and the reader, i.e., boosters not only express the author's stance, but also demonstrate engagement with the readers. The combination of hedges and boosters functions as a powerful stylistic tool: the

former express caution and self-effacement, while the latter express assertion and involvement. Both represent the author's response to the potential points of view of the readers (Hyland 2005: 179-180; Hyland 2004: 139; Hyland 2011: 199).

As with all stance markers, disciplinary similarity cannot be expected; furthermore, as indicated by Fløttum et al. (2008: 15), disciplinary conventions are more important than language in the identification of cultural identities. Hyland's research reveals that boosters are most typical of philosophy with a frequency of 9.7 per 1000 words, while they are used minimally in electric engineering (3.2 per 1000 words). Applied linguistics may be positioned in the middle of the continuum between the highest and the lowest frequency: 6.2 boosters are used per 1000 words (Hyland 2011: 204). Thus the humanities exhibit a tendency to use not only hedges but also boosters most frequently.

The tendency towards the higher frequency of hedges and boosters in the humanities is also emphasized by other scholars. For instance, Dontcheva-Navratilova analysed hedges and boosters in diploma papers by non-native writers in three different disciplines and observed that the authors use most hedges and boosters in linguistics (2008: 38). However, the comparison of her and Biber's (1999) results demonstrate that non-native speakers are more direct and use hedges and boosters significantly less than native speakers (*ibid.*). Thus, the analysis of these stance devices reveals not only interlinguistic but also existing cross-cultural differences and genre features.

**Attitude markers** may be defined as resources "which indicate the writer's affective, rather than epistemic, attitude to propositions, conveying surprise, agreement, importance, frustration, and so on, rather than commitment" (Hyland 2005: 180). For instance, attitude verbs (e.g., *agree* or *prefer*), adverbs (e.g., *unfortunately* or *hopefully*), and adjectives (e.g., *logical* or *remarkable*) may be considered attitude markers (Hyland 2005: 180; Hyland 2004: 139).

With attitude markers, writers take a stand and align themselves with certain value positions (Hyland 2011: 199). The main difference between boosters and attitude markers is that boosters express the author's certainty about the proposition, while attitude markers highlight his/her affective attitude and serve as an evaluative tool, thereby denying the conception that academic writing avoids personalization and is objective.

Another attitude towards evaluation is provided by Martin and Rose (2007), who refer to it as *appraisal* and define it as "the kinds of attitudes that are negotiated in a text, the strength of the feelings involved and the ways in which values are sourced and readers aligned" (Martin and Rose 2007: 25). Their definition is very similar to the one proposed by Hyland, with the main focus on the affective judgement or attitude. Martin and Rose classify appraisal into

affect, judgement, and appreciation and emphasize its social nature as it has a clear interpersonal meaning: the author tells his/her readers how s/he feels (Martin and Rose 2007: 25-26). Martin and Rose continue their discussion by providing very detailed classifications of affect, judgement, and appreciation; for instance, affect is subclassified into positive and negative, personal and moral, direct and implicit, etc.

Concerning interdisciplinary observations, attitude markers are the most frequently used in the humanities (8.9 per 1000 words in history and 8.6 per 1000 words in applied linguistics), while the smallest number of attitude markers is in biology: 2.9 per 1000 words (Hyland 2011: 204). Presumably, the humanities are more interpretive and require a personal stance or interpersonal conviction more than hard sciences; consequently, more attitude markers are used in this field.

Traditionally, academic discourse is described as objective and ‘faceless’ in contrast to more expressive and personalized text types such as literary texts; i.e., the **self-mention** of the author mainly expressed by the personal pronouns *I* and *we*, as well as the possessive pronouns should be avoided in academic writing. However, there is a discrepancy between writing manuals and actual usage. Recent studies, especially carried out by Hyland, highlight the social nature of academic discourse: it is understood as a social relationship between the author and the expected reader. Thus, contrary to traditional expectations, the use of personal pronouns is one of the tools to create the author’s stance in academic discourse.

As indicated by Hyland, self-mention in academic texts fulfills several functions. First, it gives credit to the author and to the research carried out by him/her. This is also field-dependent, as Hyland’s research shows that hard sciences use personal pronouns less than soft sciences, such as literature, history, or applied linguistics. Thus, personal contribution and personal credit is expressed more in the humanities. Second, by self-mention (especially the pronoun *we*) the author identifies himself/herself with the academic community. This leads to another point, that by using personal pronouns the scholar creates the authorial self, i.e., this is a tool of creating one’s identity. Finally, the pronoun *we* establishes a relationship of solidarity between the author and the reader and serves as an involvement marker in discourse. Its usage suggests sharing common grounds between the author and the reader, thereby increasing the interactivity of discourse.

The research carried out by Hyland and other scholars (e.g., Dontcheva-Navratilova 2009, Khoutyz 2013) suggests the existing interdisciplinary differences in self-mention in academic texts. A clear distinction may be drawn between soft and hard sciences concerning the use of personal pronouns in discourse. As indicated by Hyland (2009: 15), in the humanities, authors take more personal positions (pronouns repeat 4.5 times per 1000 words in

articles on linguistics), while in hard sciences personalization is avoided more (e.g., pronouns repeat only once per 1000 words in mechanical engineering).

As far as research on the author's stance in Lithuanian, only modality and hedges have received adequate attention in both academic and non-academic genres (several articles and theses have appeared). However, other features, such as the use of boosters, attitude markers, or self-mention have not been focused on. There is no clear and definite explanation concerning the reasons. Possibly, this depends on the attitudes of the discourse community: other aspects of academic discourse are explored as being more typical, while such features as boosters or attitude markers are associated with other genres or discourses rather than academic discourse. This would suggest a more conservative attitude towards academic discourse as objective and accurate writing devoid of emotionality and personalization.

### **3.1.2 Precision vs Imprecision**

Precision and imprecision are, first, philosophical categories, which can be related to the myth of objectivism. According to this myth, imprecision and vagueness should be avoided, while objective truth, 'proper' meanings, and a correct and precise description of reality are valued as the cornerstones of successful communication. Consequently, imprecise language, including tropes, should be avoided (Lakoff and Johnson 1980, Palmer 1998). Objectivity is associated with precision, i.e., being objective implies being precise; this idea still permeates society and the academic domain.

As has been mentioned, some authors associate academic writing with precision, detail, and accuracy (cf. Murray 2005 or Montgomery 2006). Channell relates logic, clarity, and precision to the presentation of quantities; furthermore, experimental methods, materials, and subjects also require a precise expression of ideas (Channell 1990: 96). On the other hand, as has been observed by a number of scholars (cf. Channell 1990, Hidayati 2008, Cutting 2007, Myers 1996), academic writing is replete with vague expressions, such as approximators and quantifiers, which diminish accuracy in academic discourse. This section discusses these two seemingly contrasting concepts, which are both used in academic writing.

Precision is very closely related to graphic representation. Despite possible manipulation with the graphical representation of data, the use of charts and graphs creates the impression of reliability, accuracy, and precision and are typical of various subject fields (Myers 2003: 10-11). Even though accuracy and graphical representation are often referred to as features common to academic discourse, in most cases graphical representation is discussed

separately from linguistic features, despite the fact that the two modes occur together (Suda 2011; Heller 2004, Davis 2005) .

Davis (2005: 115) suggests considering the purpose and audience in presenting the data, as well as selecting representative data. She also discusses each possibility in data presentation: tables, bar charts, pie charts, and line graphs. It is noted that tables are excellent for presenting specific data and making exact comparisons; bar charts make comparisons in sizes, magnitudes, amounts and other distinctions, and should emphasize differences rather than trends; pie charts are a simple way of showing parts of a whole or percentages; and line graphs are designed to demonstrate movement, change, and trends (Davis 2005: 116). Davis also stresses the importance of simplicity, clarity, precision, accuracy, and honesty in devising graphs or charts and warns about misconceptions resulting from visual or psychological illusions, which may result because of colour, intensity, size, and spacing usage:

Any amount of explanation will not completely overcome the psychological impact of a wide line compared with a narrow one or a large letter compared with a small one. Size suggests importance. The same would be true of a column of information in a table if it were set apart in some way with color or spacing. (Davis 2005: 117)

Even though the theory of multimodality is not referred to directly, its usage and the possibility to manipulate information by using formatting is discussed.

Davis (2005: 151-154) also discusses the relationship between the graphical material and its description to some extent, even though the essence is presented in the form of pieces of advice. The scholar emphasizes that the table should communicate the main points without any description; in illustrations, formatting can add an understanding that is difficult to convey in words or it may be as important as words in written and visual communication. For example, if the items are numbered, the reader may assume that the first one is more important than the second, while an inserted bullet does not infer the importance to any provided statements. So far as colours are concerned, a dark type or pale background may evoke little response from the reader; on the contrary, a bright word or phrase may elicit a complex and even an emotional response.

In addition to specific data, authors of academic texts also employ vague language (e.g., *about/approximately 30%*, *a number of models*, etc.), which is often associated with miscommunication (Channell 1990: 98; Ruzaitė 2005: 42). According to Channell, vague language is necessary in academic discourse, and serves several purposes:

- (a) to give the right amount of information;
- (b) to withhold information;

- (c) to compensate a deficit of vocabulary;
- (d) to cover a deficit of knowledge;
- (e) to express politeness;
- (f) to downgrade or to highlight information;
- (g) to protect oneself against making mistakes. (Channell 1990: 98)

An important aspect here is the interpersonal function, as the author takes into consideration the readers, i.e., his/her knowledge and expectations. In addition, the author, by using approximators or quantifiers and avoiding precise numbers, may tone down his/her lack of knowledge or unwillingness to reveal the whole truth (Channell 1990: 108-111). The last function, to protect oneself against making mistakes, is especially important in academic writing, as different research may provide different results; therefore, vagueness serves the purpose of ethics and honesty. The other functions express either the Maxim of Quality or the Maxim of Quantity, as vague expressions are used to persuade the reader or are related to providing specific or the right amount of information.

In addition, Myers (1996: 3) focuses on vagueness of academic language, which may be viewed as a strategic feature because it allows for the inclusion of apparently conflicting authors, or helps to cross boundaries between institutions, disciplines, academic and applied goals, and academic and popular audiences. He enumerates the following features that produce vagueness: polysemic terms, coordinate expressions, comparatives, elliptical expressions, unusual modifiers, and the relationship of text to visual image, which allows for a different reading of the text for different people.

### **3.1.3 Metadiscourse**

As recent studies on academic discourse show, many devices are employed in academic discourse to represent the author's identity and stance, which modifies academic discourse into a more personalized and subjective one. One of these devices is metalanguage, which, according to the simplest definition, is 'writing about writing' (Williams 1985, quoted in Crismore and Farnsworth 1990: 118). It may also be defined as "the complex of devices used by authors to comment on the texts they write and keep readers currently informed of the *rationale* of composition" (Nash 1990: 24). In defining metalanguage, Hyland emphasizes the negotiation of social relationship more than its structural function and claims that metadiscourse refers to "interpersonal resources used to organize a discourse or the writer's stance towards either its content or the reader" (Hyland 2004: 134). Furthermore, Hyland (1998: 440) views metadiscourses as having a rhetorical purpose, expressing collegiality, and avoiding disputation.

Different authors view metadiscourse slightly differently. For instance, as indicated by Crismore and Farnsworth, metalanguage involves the following devices:

- (a) connecting devices (e.g., *therefore, however*);
- (b) the author's attitude (e.g., *I believe, in my opinion*);
- (c) comments about the writer's confidence (e.g., *most people believe, it is widely assumed*);
- (d) references to the audience (e.g., *as you can see, you will find that*) (Crismore, Farnsworth 1990: 119).

In academic texts, metadiscourse may serve many purposes, such as explanation, summary of thought, orienting information, guidance of readers' expectations, or reader involvement with text (ibid.). Metadiscourse may be expressed subjectively (e.g., *I think, it seems to me*), interpersonally (e.g., *let us remember, we can assume*), or objectively (e.g., *it is true, possibly*) (Crismore, Farnsworth 1990: 222-223).

A somewhat different categorization of metadiscourse is proposed by Hyland (2004), who distinguishes between interactive and interactional resources. He identifies the following interactive resources:

- (a) transitions (e.g., *in addition, thus, but*);
- (b) frame markers (e.g., *finally, to conclude*);
- (c) endophoric markers (e.g., *noted above, see Fig.*);
- (d) evidentials (e.g., *according to X, as Z states*);
- (e) code glosses (e.g., *namely, e.g., such as*) (Hyland 2004: 138-139).

Thus, interactive resources are concerned with text organization to anticipate readers' knowledge and reflect the author's assessment. Interactional resources, on the other hand, are related to the author's stance (i.e. hedges, boosters, and attitude markers), and have already been discussed in Sub-section 3.1.1 (Hyland 2004: 138).

Hyland also emphasizes the differences in using metadiscourse according to the academic level of the author. For instance, MA students use fewer features of metadiscourse than, for instance, PhD students (Hyland 2004: 141). In addition, interdisciplinary differences can be observed: more interactive resources are used in the humanities than in the hard sciences (e.g., electronic engineering or computer science) (ibid.).

Thus, the use of metadiscourse is an important feature of academic writing and academic discourse community. The use of metadiscourse depends on the discipline and the conventions of a particular discourse community, and the study cycle: more advanced students

use these devices with more confidence, as they attempt to guide their readers more and also express their personal attitude.

### **3.1.4 Intertextuality and Interdiscursivity**

Intertextuality as a concept goes back to Bakhtin's ideas about the dialogic and heteroglossic nature of texts (in his case, literary texts) and can be defined as "the property texts have of being full of snatches of other texts, which may be explicitly demarcated or merged in, and which the text may assimilate, contradict, ironically echo, and so forth" (Fairclough 1992: 84). These 'snatches' of texts can be mere allusions, jokes, or criticism without referring to a particular source (implicit intertextuality) or explicit textual features, such as citations or references in the text and a list of references (Koch 2009: 146 quoted in Scherer 2010: 29). At first only a literary term, intertextuality is now discussed and analysed in various genres, not only as a rhetorical device, but also as a social phenomenon performing an interpersonal function.

As noted by Jones, there are several ways of representing other people's voices and achieving intertextuality (Jones 2012: 98-99). One of them is a direct quotation, which either gives prominence to the author (where it is important to quote word by word what s/he said) or reaches the opposite effect of distancing the author from the words that s/he is quoting. Another way of representation is paraphrasing the ideas, which give the author more flexibility in characterizing these words and using them to support his/her own point of view. These two strategies may also be combined (*ibid.*).

It can be observed that academic texts are highly intertextual as they have to be grounded on a theoretical basis or methodologies; thus, quotations or referencing are an inseparable part of academic discourse. Bhatia also adds that one has to relate his/her knowledge and claims to the accumulated knowledge in the discipline in order to become acceptable in the specialist community (Bhatia 1997: 363). In the academic environment, thus, the question of plagiarism is often raised, while, for instance, politicians may refer to a variety of sources in different media without being accused of plagiarising (Jones 2012: 99). As intertextuality is both common and topical in the academic environment, proper referencing is taught in style manuals and methodological books on academic writing.

In general, the views on authorship and referencing are not homogeneous. On the one hand, popular science may be viewed as a recontextualization of science for broader audiences or 'translation across contexts,' to use Bazerman's idea (Bazerman 2004: 90). Thus, 'rewriting' scientific knowledge for non-specialists is essential in popular scientific discourse and requires a substantial use of referencing and, consequently, intertextuality.

On the other hand, in many cases only the research is reported on in popular scientific articles, while the scholars remain unnoticed and unmentioned, which is unacceptable from the scholarly point of view. For instance, in 1963, Garfield very emotionally criticized the convention of excluding references to the sources used in such articles: “References to “the latest” or “a recent” issue of *Nature* or *Science* are particularly frustrating! This practice is particularly irksome as authors rarely fail to give complete citations for references to their own publications – a form of bibliographic narcissism” (1963: 392).

Another concept closely related to intertextuality is interdiscursivity. Sometimes intertextuality is referred to as an umbrella term, while interdiscursivity is viewed as a type of intertextuality, which is discussed in Section 6.2 (cf. Fairclough on ‘manifest intertextuality’ and ‘constitutive intertextuality’ 1992). Fairclough was the first to introduce the concept of interdiscursivity (based on the works of Bakhtin and Kristeva) and to emphasize the fragmentation of contemporary discourse (Fairclough 1992: 221). As defined by Bhatia, interdiscursivity refers to “more innovative attempts to create hybrid or relatively new constructs by appropriating or exploiting established conventions or resources associated with other resources and practices” (Bhatia 2007: 392). In other words, interdiscursivity refers to the mixing of discourses, genres, and styles.

As correctly noted by Bhatia, genre mixing and blending is a feature of contemporary genres, as pure forms can hardly be found. Genres are inherently embedded in social practices, changes, institutions, and knowledge, and are therefore becoming increasingly dynamic and complex (Bhatia 1997: 363). Furthermore, interdiscursivity has not only a stylistic effect, rather, it has important implications for social practice (Fairclough 2003, 2010). In other words, the changing genres reflect the social changes typical of a particular society.

Not only postmodern society, but also technological affordances have changed or modified genres, as well as new constructs which have appeared (blogs, graphic novels, or audio books, to mention only a few). Thus, most contemporary genres are dynamic, complex, multimodal, and interdiscursive in nature due to social changes, the needs of contemporary society, and technological possibilities.

Numerous studies have appeared which explore the phenomenon of interdiscursivity and its social significance. For instance, Bhatia (2007) analyses interdiscursivity in a variety of professional settings (e.g., business advertising, legal documents, and public administration); Scollon (2000, 2002) combines interdiscursive analysis with ethnographic research; Lemke (1995) explores the spread of technocratic discourse into new domains; Fairclough and Mauranen (1997) investigate conversationalization of political discourse.

### 3.1.5 Other Features

The aim of this Sub-section is to discuss other features which are associated with academic discourse, namely, nominalizations, a field-dependent terminology, lexical bundles (or pre-prepared phrases), and figurative language.

Excessive **nominalizations**, i.e., the dominance of nominal forms over verbal ones, are stressed by researchers working within systemic functional linguistics as well as other scholars (Halliday 1996: 352 quoted in McCabe and Gallagher 2008: 189; Biber et al. 2002: 458). MacDonald refers to excessive nominalization as one of distinctive features of academic writing (MacDonald 1990: 35, Biber 1995), which is related to the complexity of academic language. On the other hand, excessively complex constructions are sometimes criticised for hindering the understanding of the text. For instance, as Fuller (1998: 35) claims, high degrees of nominalizations, embedded causality, and technical lexis should be avoided in popular scientific discourse in order to simplify it.

The use of nominalization depends on the age of the users, as well as the academic level. Young writers (under 12) usually use subordinate clauses instead of nominal phrases, as they cannot think in abstractions. Nominalization then helps to achieve more concise writing and a more sophisticated discourse (McCabe and Gallagher 2008: 190). In addition, proficient language users prefer complex noun phrases, while novice members of the discourse community use only a pre-modifier or a postmodifier in addition to the nominal head (McCabe and Gallagher 2008: 193). Thus, nominalizations contribute to the complexity of academic discourse on the one hand and conciseness on the other.

**Terminology** is inextricably related to academic discourse as field-specific terminology pervades all academic genres. In MacDonald's view, terminology may impair understanding in academic discourse (MacDonald 1990: 35). This problem arises especially due to nonstandardized terms, shifting, or referentially vague terms, grammatically unstressed terms, concrete descriptions in lieu of abstract terms, and deference to insiders, while excluding outsiders (MacDonald 1990: 43). On the whole, the scholar also distinguishes between novices and professionals, as the quality of their writing differs in many aspects.

Sager et al. (1980) have also focused on specialized vocabulary and its density in texts and have observed that 'degrees of terminologization' may be distinguished depending on the subject field. In addition to that, a higher rate of repetition of lexical items can be observed in special languages than in general language. The emphasis on different subjects is important, as the same frequency of terms cannot be expected in the humanities and technical sciences.

Another feature of academic writing is **lexical bundles** (e.g., *in order to, the presence of, as a result of*) or multi-word sequences typical of this discourse type. As observed by Conrad and Biber, the idea that words are acquired in context (in collocations or phrases) rather than in isolation is not new and goes back to the research of Firth and Hymes (Conrad and Biber 2004: 56). The ideas about multi-word sequences and their use in academic language are especially developed by Biber et al. (1995, 1999) and Conrad and Biber (2004). The scholars claim that building blocks are an important resource in creating discourse both in oral communication and writing, and only the means of expression are different: in oral communication more verbal phrases are used, while academic discourse is dominated by noun and prepositional phrases (Conrad and Biber 2004: 63-64). According to their research, lexical bundles tend to form about 20% of academic discourse and can be subcategorized into four general categories: stance expressions (e.g., *the fact that the; going to be a*), discourse organizers (e.g., *on the other hand*), referential expressions (e.g., *percent of the; on the basis of*), and special conversational functions (atypical in academic prose) (Conrad and Biber 2004: 65-66). Biber (1999) also emphasizes that the use of these phrases marks academic proficiency, while their use increases with students' higher level.

The use of **figurative language** is more common to the texts addressed to outsiders or non-specialists (Nash 1990: 24). However, Ventola argues that metaphorisation is a common feature in academic discourse and provides examples of sentences where the Process becomes the Participant (e.g., *The economy grows rapidly – The rapid growth of economy*). Grammatical metaphorisation thus contributes to packing information economically and is also related to the thematic development of the text (Theme/Given – Rheme/New) (Ventola 1996: 182-183). It is also noted that an extensive use of grammatical metaphor results in a static text; therefore, such grammatical metaphorisation may result in an unreadable text or one that is very difficult to comprehend.

In addition to lexical features, **syntactic complexity** is one more feature of academic discourse. Preference for integrating information in noun phrases and complex syntax in academic discourse is also observed by Biber et al. (2002: 304; Biber 1995). Along the same lines, Bourdieu claims (1994: 84) that student essays with more complicated syntactic constructs are usually evaluated better than the use of short, simple, and coordinate sentences. Thus, despite the effect of creating a more obscure discourse, syntactic complexity is one of the features of academic discourse.

### 3.2 Interdisciplinary and Cross-Cultural Variation of Academic Discourse

Despite the existing conventions of academic writing, it varies considerably in different subgenres and across cultures. Duszak highlights that “recent insights into academic writing have shown considerable variation in text characteristics across fields, languages, and cultures” (1997: 11). This point of view is also supported by Beedles and Petracca (2001: 17) and Nash (1990: 12), who also emphasize the importance of disciplinary conventions and the variety of genres in each discipline, which is also restricted or influenced by a discourse community.

Swales (1990: 26) has introduced the concept *discourse community*, which may be defined as the community which has and utilizes one or more genres. According to Čmejrková (1996: 138), the main aim of a discourse community is to share, have common knowledge, contribute to it, and cultivate it, which is especially true of the academic community. Kreuz and Harres (1997: 182) correctly refer to an academic community as a subculture because of its diversity and homogeneity, i.e., interdisciplinary, genre, cross-cultural, and other differences.

In a discourse community, Swales (1990: 129) distinguishes between expert and novice members, who could be interpreted as polar categories. The former allow themselves to diverge from standardized patterns in academic communication, while the latter only attempt to master the socio-rhetoric of the discourse community and may need some guidance in expressing their ideas (Swales 1990: 129, Ventola 1997: 163). Accordingly, the texts produced by expert and novice members may differ to a large extent, as contemporary research shows (Hood 2005; Starfield 2005; Hinkel 2003). Thus, the discourse community and the conventions in a particular subject field condition preference or constraint towards lexical, syntactic, and pragmatic uses.

Numerous studies in international and Lithuanian contexts show that academic writing is field-dependent, drawing the basic distinction between the humanities and hard sciences. For example, Melander, Swales and Fredrickson (1997: 267) analysed journal abstracts in English and Swedish in biology, medicine, and linguistics from the genre perspective. The scholars observed that “within linguistics there appear to be strong national and cultural differences, within biology remarkable homogeneity, and within medicine a rather uncertain picture.” Duszak (1997: 11) also emphasizes that writings in the humanities and social sciences exhibit more prominent variation, as “in these research fields, communication styles respond most strongly to language- and culture-bound discursal preferences and constraints.”

Biber (1995) distinguishes genres and sub-genres on the basis of recurrent lexical and syntactic features, which are grouped into six dimensions. He notes that the analysed seven sub-genres have systematic and large differences among themselves (Biber 1995: 192). For

instance, humanities prose is informational, similar to other academic sub-genres, and has a relatively high score on narrativity, which shows a concern for concrete events and participants, while for technology/engineering the score on this dimension is low. On Dimension 3, Explicit vs Situation-Dependent Reference, technology/engineering prose has a very high mean score, which indicates that explicitness dominates in academic discourse; the same is also true of the humanities, even though the mean score is lower. With Dimension 4, Overt Expression of Persuasion, considerable variation may also be noted, as persuasion is typical of, for instance, political texts, while the social sciences may be described as non-persuasive; the humanities belong to the more persuasive sub-genres. Furthermore, technical sciences have high scores on Dimension 5, which marks abstract and technical information, while the scores are much lower in the humanities. Finally, mathematics prose is distinguished from other sub-genres in the high use of Dimension 6 features (On-line Informational Elaboration), while the score is much lower in the humanities (Biber 1995: 192-195). Thus, Biber's statistical analysis reveals that there are some general features typical of academic texts, while the subgenres of academic writing exhibit considerable differences.

Furthermore, Ventola has analysed academic texts from the point of view of modalization and noticed that the texts in humanities have more probability expressions than the texts in social sciences and natural sciences. Other authors also make a very general distinction between the humanities (especially literature and linguistics, leaving, for instance, history undiscussed) and hard sciences, such as engineering or economics. The most extensive studies on interdisciplinary variation have been carried out by Hyland, who focuses on the author's stance, engagement features, or metadiscourse in various disciplines (Hyland 2004, 2005, 2009, 2010, 2011). The research shows that applied linguistics exhibits a variety of features which express the author's presence and evaluation, while in biology or mechanical engineering, these features are less frequently expressed. Thus, it can be generalized that reader-involvement techniques and the author's presence are more typical of the humanities; on the contrary, the hard sciences tend to present a more objective scientific truth.

Fløttum et al. (2007) compared medical, economic, and linguistic texts from the perspective of the author's presence. The scholars observe that in medical texts the author is practically absent and the research is presented as completed while argumentation is implicit; in economic texts, authors present themselves in a modest way, argumentation is mostly implicit, and the research is presented as being carried out in the text itself. Linguist authors, on the other hand, are the most clearly and explicitly present in the texts (Fløttum et al. 2007: 18-19). Thus, these scholars obey the existing conventions of a discipline, as divergence from these

conventions would have an undesirable effect, and the texts would seem inappropriate for a particular discourse community.

Despite some general requirements, academic discourse exhibits individual- and field- as well as culture-specific features. As English is a dominant language, scholars have to master it in order to publish articles or theses in the international sphere; this way they have to acquire the rules of the discourse community (Duszak 1997: 22). On the other hand, cultural differences unavoidably influence academic writing as well. Fløttum et al. (2007: 16) claim that a non-native speaker can hardly be expected to reach the fluency of a native speaker; in addition, high and low context cultures<sup>6</sup> tend to exhibit differences in writing, accordingly, in academic discourse as well.

On the one hand, due to global networks and increasing intensive communication on the international scale, internationalization of academic communities has become a natural phenomenon (Duszak 1997: 32). This means that a scientist must adopt the rules of the international community; it may be questionable to what extent this is done, i.e., to what degree scholars adapt to another community language and discourse appropriateness and to what degree they keep to the discourse conventions of their own community and their own cultural identity.

On the other hand, there are numerous contrastive studies which emphasize that much cultural variation is exhibited in academic texts as “language is always bearer of culture” (Risager 2006: 134). Čmejrková and Daneš (1997: 42-43) observe that, for instance, knowledge is idealized, which conditions a complicated style challenging for the reader, while English academic texts resemble non-academic ones and emphasize the relationship between the reader and the writer. This relationship is disregarded in Russian academic writing. These examples show that each country has a certain approach towards academic writing and conventions which have to be obeyed.

Focusing on more specific lexical issues, several studies highlight a more frequent usage of hedges in English academic writing than in the texts of other languages/cultures. Ventola (1997: 168) has observed that modalization is used differently in English and Finnish, as the Finns use hedges only when writing their results, while in English hedges are also used when writing the introduction. On the whole, Ventola’s study shows that hedges are used more in English than in Finnish. These findings are similar to the ones obtained by Mauranen (1993). A contribution to the analysis of hedges from a contrastive perspective is added by Kreutz and Harres(1997: 181), who argue that “whilst they serve to downtone and mitigate arguments and

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<sup>6</sup> The terms *high-context* and *low-context* cultures were coined by anthropologist Edward T. Hall (1976). The terms are used to refer to communication styles. In high-context cultures, contextual factors play an important role, as many things remain unsaid (e.g. Eastern cultures); in low-context cultures, explicitness is valued, while the importance of contextual factors diminishes.

assertions in English texts, their main function in German writing may be one of assertion and authority.” As for the Lithuanian context, similar findings were obtained by Šinkūnienė (2011), who observed that hedges are more typical of English than of Lithuanian.

Čmejrková (1996: 141) compares academic writing in Czech and English and maintains that distinct norms between the languages and cultures exist because of different approaches to writing in theoretical linguistics, applied linguistics, and pedagogical disciplines, treatment of academic writing against the background of stylistics, historical circumstances, and cultural aptitudes.

Gardezi and Nesi (2009: 247) carried out a comparative analysis of Pakistani and British undergraduate students’ writing and analysed the use of metadiscourse, specifically, conjunctive adjuncts. The study has revealed that the most significant difference is the placement of conjunctive adjuncts in a sentence: Pakistani students tend to place them at the beginning of a sentence, while British students prefer longer sentences and use them in the initial position. Their analysis supports the notion that native speakers manipulate language more freely while writing academic texts, even though the non-natives’ English language level is high; however, the scope of this research is very small (only 56 thousand words in total) and a larger-scale study might reveal other or different aspects.

A comparative study of metadiscourse in English and Norwegian (Dahl 2003: 120-136) demonstrates that metadiscourse devices are used more frequently in English. From the interdisciplinary perspective, articles in linguistics used far more metadiscourse features than articles in medicine.

Fløttum (2003) focused on the polyphonic nature of academic texts, a subject which attracts an increasing number of researchers, and analysed bibliographical references used in research articles. The comparison of English, Norwegian, and French bibliographical references in research articles reveals that the English and the Norwegian are more frequent users of bibliographical references; concerning the subject field, the largest number of references is found in medical articles. Naturally, the analysis of interdiscursivity cannot be restricted to the analysis of bibliographical references; nevertheless, they reveal some important cross-cultural and interdisciplinary differences.

Research by scholars in different countries shows that despite some existing conventions of academic writing, it varies to a large extent depending on several factors. First, the specific discipline preconditions the dominance of some features and avoidance of others, the main distinction being between the humanities and hard sciences. Second, the features of a genre influence lexical and syntactic choices. Third, status in the discourse community (i.e., a novice member or an expert) also plays an important role in the features of the produced

academic discourse. Thus, the attitudes to what academic discourse should be change from objective, precise, and impersonal to a varied discourse influenced by a variety of factors.

### 3.3 Main Features of Popular Scientific Discourse

Contrary to academic discourse, the attitude towards popular scientific discourse is not homogeneous. Among readers, some magazines are popular not only in Anglo-Saxon countries but all over the world (e.g., *National Geographic* or *Discovery*), as they are read in English or translated and published in various countries. On the other hand, in academic circles, popular scientific discourse still takes a marginal place because academic discourse is viewed as authoritative and reliable, while popular scientific discourse is seen as unreliable or pseudo-academic (Schmalzer 2012: 590). Christidou (2011: 147) critically adds that “these information sources often promote intense, outdated, controversial, stereotypic and gender-biased images of science and its people.” Thus, this section attempts to describe the main features of popular scientific discourse and to draw the main distinctions between academic discourse and popular scientific discourse.

As noted by Schmalzer (2012: 590), the term *popular science* is loaded. It invokes negative connotations, placing academic discourse as correct and elite, while ‘popular science’ refers to something ‘other’ or unworthy. In addition, the term is ambiguous: Does ‘popular’ refer ‘to the people,’ ‘for the people,’ ‘to the culture,’ or something else? (ibid.). Myers (2003b: 265) also emphasizes the ambiguous and pejorative nature of the term by saying that “popularization includes only texts about science that are not addressed to other specialist scientists, with the assumption that the texts that are addressed to other specialists are something else, something much better: scientific discourse.” Thus, the term itself creates tension between popular scientific and academic discourse, the latter being ‘the right’ and ‘the authoritative’ one.

Definitions of popular science are varied in precision. For instance, McGowan (2009: 1) claims that “*popular science* refers to almost any presentation of science and scientific issues outside of so-called “professional” scientific venues.” Calsamiglia and van Dijk (2004: 369) explain that “popularization is a vast class of various types of communicative events or genres that involve the transformation of specialized knowledge into ‘everyday’ or ‘lay’ knowledge, as well as a recontextualization of scientific discourse.” In other words, science popularization may be understood as a dialogue between a specialist and a non-specialist, taking into consideration the reader’s needs and his/her possible knowledge. Da Silva (2010: 72) suggests conceptualizing popular science as a circular and dynamic rather than a linear process because non-specialists also contribute to the creation of popular science.

Based on other scholars' works, Schmalzer (2012: 592) comes to the conclusion that it is possible to distinguish two varieties of popular science: the serious and the sensationalist. Serious popular scientific discourse targets the readers striving for self-improvement, while sensationalist popular science is entertainment-oriented and without any scholarly value. However, it is doubtful whether it is possible to distinguish clear and distinct categories of popular science in contemporary media. In most cases, these articles serve a double purpose: to inform and to entertain the reader so that they are interesting to read. In addition, persuasion in popular scientific discourse is emphasized by some researchers (e.g. Ross 2004: 9, Charney 2003). It should be admitted that some articles are poorly grounded or their authorship is questionable; however, they do not form a distinct category.

Lexical, syntactic, and structural differences between popular scientific and academic discourses are conditioned by different purposes of the authors (see Table 1):

**Table 1.** Differences between academic discourse and popular scientific discourse (based on Charney (2003: 216))

	<b>Academic discourse</b>	<b>Popular scientific discourse</b>
Findings/results	Important if they bear on the nature of the phenomenon, its causes, or its effects.	Important if they bear great or immediate implications for the public
News	A robust set of findings; likely to stand up to challenges	Novel, non-routine, aberrant
Accuracy	Depends on qualifying one's claims to avoid inaccuracy or generalization	Less frequent hedges and qualifiers increase clarity and interest value
Results	Often mixed, inconclusive or contradictory	Clear and definitive results
Uncertainty and contradiction	Scholars modify their hypotheses and continue the research	Question the value of the research

Table 1 shows the dominant attitudes towards academic writing, which combines accuracy and imprecision and detailed analysis and open-ended conclusions; on the contrary, popular scientific discourse prefers clear and definite answers and results, as well as novel and intriguing information, which might be appealing to a lay person. Charney just refers to the authors of popular scientific articles as 'journalists,' which might not be accurate, as popular scientific articles are also written by scholars, experts in the field, and non-professionals.

Myers (2003: 271) suggests considering popular scientific discourse as a continuum because the articles may be 'more or less popularized;' i.e., some articles are addressed more to a specialist or to the person who has more knowledge in the field (like some articles at the beginning of popular scientific magazines), while others do not employ either sufficiently complex terminology or complex ideas. Furthermore, the distinction between a specialist and a lay person is not clear-cut due to differences in the shared knowledge (e.g., a lay person might be interested in a certain topic).

The use of various discourses, or interdiscursivity, is commonly referred to as one of the features of popularized discourse. For instance, Myers emphasizes the use of political, social, or cultural discourse in addition to science popularization (Myers 2003: 272). The extensive use of interdiscursivity or representation of various actors in popular scientific articles is discussed by da Silva (2010: 73-74), who observes that the articles present not only the voice of the scholar but also other participants or social actors. De Oliveira and Pagano (2006: 629) claim that in such a way interpersonal relations are created both between the writers and the authors of other discourses, as well as the writers and the readers. Thus, various actors play a role in the science popularization process in addition to scholars. This suggests a changing or a different role of a scholar in popular scientific discourse. In addition, popular scientific discourse may be viewed as hybrid because of a different 'degree of popularization' and interdiscursive practices.

Concerning linguistic features, some scholars mainly generalize their ideas or explain in a more philosophical rather than empirical way so that, from being an elite language variety, academic discourse is 'brought down' or to put it in different words, simplified in order to address the masses (McGowan 2009: 2-3). Instead of addressing other scholars in a sophisticated way, popular science changes the addressee by addressing lay people. Accordingly, the language has to be simple enough and reformulated or recontextualized in order to be understood easily or without much effort (Calsamiglia and van Dijk 2004: 371).

Some main linguistic features of popular scientific discourse may be distinguished. For instance, based on other scholars' ideas, Vogel (2010: 64) suggests that the popular scientific style differs from its theoretical counterpart by less specialised terminology, the inclusion of colloquial expressions, a higher occurrence of paraphrase, expressive language, and personality features.

Lexical cohesion is one of the aspects discussed when contrasting popular scientific and academic discourse. Vogel's research (2010: 73) suggests that cohesive devices are used differently in academic and popular scientific discourse on physics. In popular scientific discourse, grammatical cohesion is more frequent, while in academic discourse lexical cohesive devices are more frequently used. The obtained results are interesting; however, the research lacks an interpretation of the findings as the author leaves the question open as to what conditions the different uses of cohesive devices in academic and popular scientific articles.

In addition to cohesive devices which facilitate understanding of the text, interactivity devices are used to involve the reader in the text. These devices are widely analysed by Hyland (2005, 2009, 2010), who examines the use of interactive devices (hedges, boosters,

attitudinal markers, and self-mentions) in various academic subjects; however, these features are not discussed in popular scientific discourse in greater detail.

Myers (2003: 272) emphasizes the importance of visuals in the analysis of popular scientific discourse, which has so far been downplayed. He notes that “this focus on written texts ... limits studies of popularization. ... [S]ome of the most dramatic and memorable encounters with science are primarily visual, rather than verbal.” One of possible limitations of analysis on visuals, according to Myers, is copyright; in addition, the non-usage of visuals in research is conditioned by prices when printing many colourful photos or pictures.

Calsamiglia and van Dijk (2004: 376) claim that metaphors play a prominent role in the popularization discourse; they analyse the metaphors in popular scientific articles on genetics, showing how they contribute to the simplification and, accordingly, easier perception of more complex phenomena (i.e., a genome in their analysis). The importance of metaphors in popular scientific discourse is also emphasized by Price (1999: 26-29) who analysed medical articles, in particular those related to obesity. In order to highlight the importance of the problem, such metaphors as OBESITY IS A CONTAGEOUS DISEASE or OBESITY IS A COMBATANT are formed in discourse.

In addition to metaphors, other tropes such as comparisons, analogies, or metonymies are used in popular scientific discourse, which may not be limited to separate words but comprise larger text units, such as a paragraph or several paragraphs (Calsamiglia and van Dijk 2004: 382). Hart (1998) also highlights the use of connotation and personification in popular scientific discourse, which are atypical in academic language; however, the analysis is limited to the discussion of a few examples.

Reformulations and paraphrases are also used in popular scientific discourse as explanatory structures to clarify new or complex structures. As noted by Calsamiglia and van Dijk (2004: 383), in a text they are marked by such features as appositions, parentheses, quotation marks, dashes, and metalinguistic expressions. The scholars also note that exemplification, where particular cases are described, is also typical of popular scientific discourse and contributes to the personalization of popular scientific discourse (ibid.).

In Lithuania, research on popular scientific discourse is very fragmentary. The main publications regarding popular scientific discourse have been written by Petrėnienė, who focuses on the linguistic aspects and has analysed attributes (2005), comparisons (2013), explanations of terminology (2003), and metaphors (2010) in popular scientific discourse. The analysis of subject attributes reveals that semantically they can be subcategorized into main (dominating) attributes and additional attributes. The main attributes express nationality/place of

residence or academic activity, while additional attributes may provide essential facts about the person or his/her subjective evaluation (Petrėnienė 2005: 95).

Petrėnienė's research shows that comparisons and metaphors function as important stylistic devices and tropes in popular scientific discourse. Comparisons facilitate understanding more complicated issues by comparing them to everyday objects or phenomena (e.g., comparing the structure of a star to an onion), thereby not only illustrating and explaining them but also performing an expressive function (Petrėnienė 2013: 152). Similar functions are also performed by metaphors, which according to Petrėnienė (2010: 129) are not dependent on individual style, but form certain models. The disadvantage of this research is an overly generalized attitude, such that popular scientific articles are discussed in general without distinguishing the subject fields, which might also influence the metaphors used in discourse.

According to Petrėnienė (2003), the explanation of terms is a device which focuses on non-specialist users. The terms may be explained by defining them, revealing their etymology, presenting synonyms, using expressive means of language such as metaphors and similes, or by non-verbal means of expression (e.g., diagrams, schemes, or pictures.). Thus, in addition to comparisons and metaphors, broader or non-verbal explanations of terms facilitate an understanding of more complex phenomena.

### **3.4 Summary**

Even though academic discourse is sometimes described as impersonal and objective, contemporary research refers to the author's stance, metalanguage, intertextuality, interdiscursivity, and other lexical features such as terminology, nominalization, or lexical bundles as the main features of academic discourse. Despite the fact that terminology and excessive nominalizations contribute to the complexity of academic discourse, the author's stance and metalanguage contribute to the creation of interpersonal meaning, and express subjectivity or evaluation. These features are also dependent on the discipline as, according to Hyland's research, considerable differences may be observed between the humanities and hard sciences. Additionally, discourse and genres are also shaped by the conventions and requirements of the discourse communities of a particular country.

Popular scientific discourse is sometimes referred to as a 'rewriting' or a recontextualization of academic discourse. However, popularized science has a number of features, such as a particular communicative purpose or linguistic features (figurative or informal language or reliance on the visual mode, to name a few), which emphasize its clear distinctness from academic discourse.

## 4 Data and Methods

The present thesis uses a complex methodology: multimodal analysis, corpus linguistics methods, and a comparative analysis. This section describes the methods and the data used in the present investigation.

For the analysis, a specialized corpus of popular scientific articles (henceforth COPSA) was compiled. This corpus is restricted to the field of humanities, which includes architecture, art, ethnology, folklore, philosophy, linguistics, literature, library science, history, and theology<sup>7</sup>. In total, COPSA contains 1 million words, and it is composed of two sub-corpora: English (referred to as COPSA-EN), which contains 505,047 words, and Lithuanian (referred to as COPSA-LT), which contains 505,187 words. The number of articles is different in the sub-corpora: there are 376 articles in COPSA-EN and 288 articles in COPSA-LT.

The articles included in the corpus had to conform to the following criteria:

- (a) be printed in an online popular scientific magazine or a section of a newspaper on science;
- (b) belong to the field of the humanities;
- (c) be printed during the period of 2007-2011 in order to represent the most current features of popular scientific discourse;
- (d) disregard the authorship of the article as popular scientific articles are written by scholars, journalists, and non-specialists;
- (e) disregard the variety of English (British or American) as both varieties represent the Anglophone tradition.

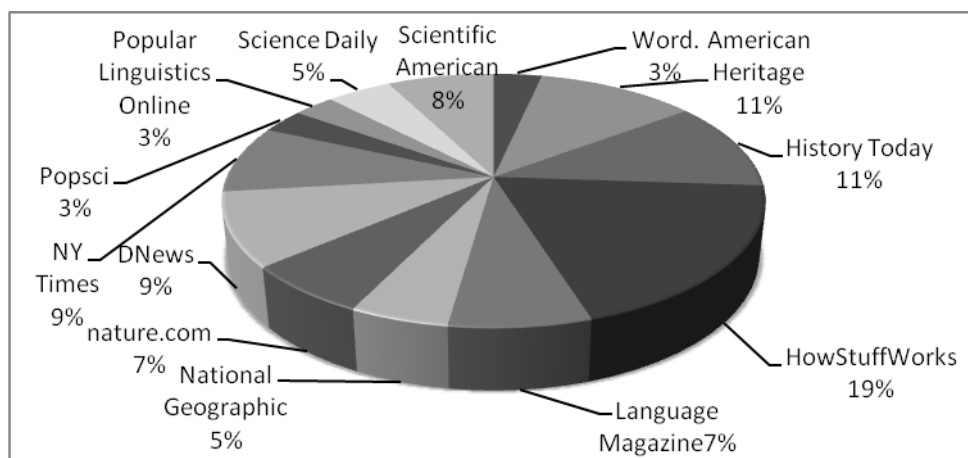
Several problems were faced while collecting the data. First, access to some popular scientific articles was restricted or archives were inaccessible; therefore, such magazines could not be used for the present research. Second, the problem of identifying a popular scientific article occurred in some cases, especially due to the blending of the news genre and popular science (e.g., the article starts with information about an event for commemorating a famous historical or cultural personality and then moves on to the discussion of the historical period, merits of the person, and his/her contribution to science or culture). In such cases, the dominant criterion was the subject-matter (presentation of scholarly information) and the addressee (lay people).

The data were collected from several different magazines or newspapers (13 in English and Lithuanian), so that a variety of writers were represented and broader generalizations about popular scientific discourse could be made (the main information about

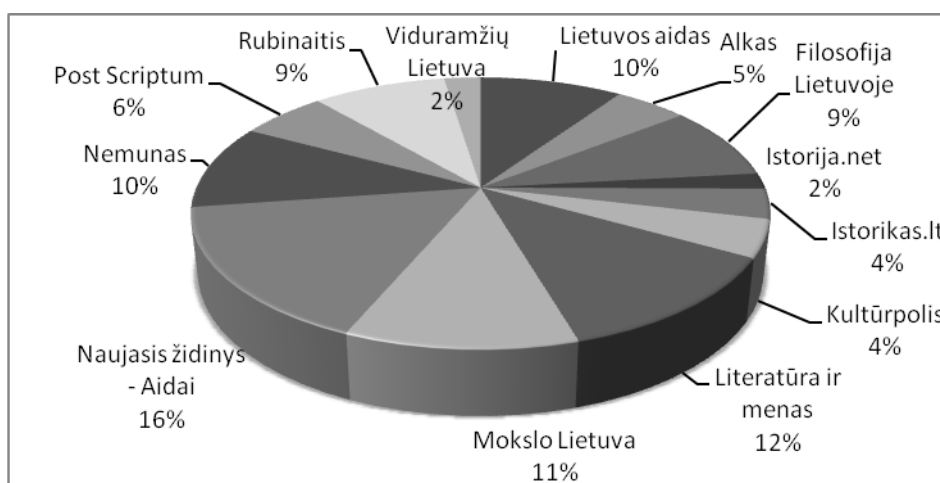
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<sup>7</sup> Based on the order of Ministry of Education and Science of the Republic of Lithuania No. 30 “Concerning the Classification of Study and Research Areas, Fields and Branches” (January 9, 1998)

the popular scientific magazines is provided in Appendix A). As can be seen in Figures 3 and 4, some magazines constitute a larger part in the corpus insofar as the number of words is concerned (e.g. 19% or 16%), while others represent only 2% - 3%.



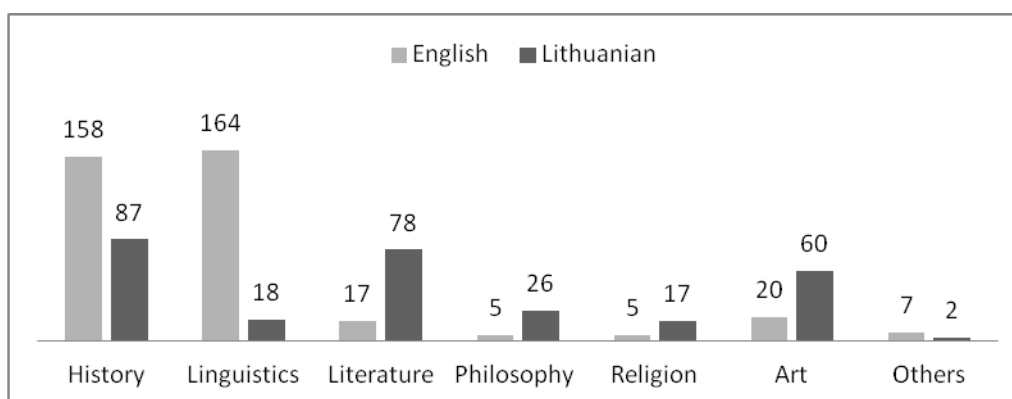
**Figure 3.** Sources of popular scientific articles in English



**Figure 4.** Sources of popular scientific articles in Lithuanian

As can be seen in Figures 3 and 4, various popular scientific magazines were chosen for the present research. No magazine is dominant in the corpus, though some of them constitute only a small proportion. The magazines could not be equally represented because of the criteria of time and field. Furthermore, access to some popular scientific magazines was restricted (e.g., *The New York Times*), and only a certain number of articles was accessible without a fee.

As the object of the present research is popular scientific articles in the humanities, an attempt was made to represent different subject areas of the humanities (see Figure 5):



**Figure 5.** Subject fields represented in COPSA (by the number of articles)

As can be seen in Figure 5 above, not all subject areas are represented equally in English and Lithuanian, as not all subjects receive the same attention in popular scientific magazines. For instance, history, linguistics, and literature are the dominant subjects, while philosophy or religion are rarely discussed in popular scientific articles. Accordingly, the number of articles of these fields is smaller in COPSA. The main difference between COPSA-EN and COPSA-LT is between linguistic and literary articles: linguistics is the most common subject field represented in the sub-corpus in English, while in Lithuanian, articles on literature dominate. The category of ‘Others’ represents those articles which were too complicated to ascribe to a particular subject field because they contained multiple foci.

Several specific features of popular scientific articles have been noted while compiling the corpus. First, the articles are longer in Lithuanian, as the English part of the corpus contains 376 articles, while there are 288 articles in the Lithuanian corpus. This comes to an average of 1,343 words per article in English and 1,736 words per article in Lithuanian. Concerning the non-verbal mode, some popular scientific articles are not illustrated; for instance, *istorija.net* contrasts with popular scientific articles on history in English, where illustrations are essential parts of the articles and serve as a reader-involvement technique.

COPSA can be described using several parameters. First, it is representative. Sub-corpora COPSA-EN and COPSA-LT contain 500,000 words each. On the one hand, the number of words is not high if compared to large corpora. On the other hand, the size of COPSA might be viewed as representative enough, taking into consideration the fact that different magazines or newspapers and authors are chosen in order to represent popular scientific discourse.

The present corpus is not annotated due to technological limitations. Even though in modern multimodal analysis centres, multimodal corpora are compiled and software is used to extract certain variables, such programmes are still unavailable in Lithuania. The absence of

the software to process multimodal documents in Lithuania conditioned that the multimodal analysis was done manually, by counting the instances in the articles.

The subcorpora (COPSA-EN and COPSA-LT) are comparable because they contain:

- (a) the same subject-field;
- (b) the same size;
- (c) identical time period;
- (d) representation of various authors and magazines.

In compiling the present corpus, the following procedure was followed. First, two versions of the files were saved. The *.txt* format was necessary to process the files in a software programme; for the present research, the non-commercial *AntConc 3.2.4* programme was used, which produces word lists, concordances, key words, collocation lists, and word clusters. Another version of the same article was saved in the *.doc* format, so that fonts, formatting, hypertext, and images were visible, which were essential for the multimodal analysis.

The multimodal analysis of popular scientific articles had two major foci: the analysis of non-verbal and verbal elements. The analysis of the visuals was done manually, i.e., the images were classified and counted both in English and Lithuanian. The analysis revealed that the images could be classified according to the following categories:

- (a) representation of various professions (e.g., scholars or soldiers);
- (b) representation of individualism and collectivism;
- (c) representation of gender;
- (d) representation of non-Western cultures;
- (e) other categories.

In each category, the most distinctive and repetitive variables were identified, counted, and compared in English and Lithuanian.

The next step of the analysis of non-verbal elements was to discuss the functions of the visuals in popular scientific articles. In this case, the analysis was based on Halliday's theoretical foundations on metafunctions (1996) and Kress and van Leeuwen's works (cf. Kress and van Leeuwen 2006; Kress 2001, 2009, 2010). In the present investigation, textual, interpersonal, and ideational functions of visuals were distinguished; additionally, the analysis showed that the ideational function may be subcategorized further into informative, narrative, aesthetic, and entertaining on the basis of the dominant variables in the image.

The analysis of the relationship between the textual and the visual mode was conducted partly using corpus linguistics tools and partly manually. When the relationship between the textual and the visual was close, a concordance and a word list were used to

identify the frequencies of words or collocations and phrases. During the analysis, it was observed that the visuals (e.g., pictures or photos) may not be referred to textually; thus, in order to identify such kind of relationship between the modes, the analysis was done manually.

The analysis of the verbal mode was limited to the author's stance, intertextuality, and interdiscursivity, as these features were identified as the most distinctive in popular scientific articles in English and Lithuanian. For the analysis of the author's stance (hedges, boosters, attitude markers, and self-mention) in COPSA, the software programme *AntConc 3.2.4* was used to generate a word list, in which author's stance features were identified based on Hyland's research (cf. Hyland 2009, 2010, 2011 to name a few). Minimal occurrences (1 or 2 words) were disregarded as possibly being occasional uses.

The feature of the identified author's stance in English and Lithuanian were checked in reference corpora in English and Lithuanian in order to discuss the difference between popular scientific and academic discourse. In English, the academic section of *The Corpus of Contemporary American English* (henceforth COCA) was used; namely, its sub-sections on history and the humanities.<sup>8</sup> Even though COPSA-EN involves other subjects such as art or philosophy, they form only a very small part of the sub-corpus. Thus, COPSA-EN and these sub-sections of history and humanities of COCA are comparable. Additionally, the time period is similar, as COCA is constantly updated (the last update was in 2012), while the time period of popular scientific articles under the present investigation is 2007-2011. Naturally, the size of the two sub-sections of COCA is much larger; in total, they comprise 24,171,183 words. For this reason, normative frequencies of 100,000 words were counted.

*Corpus Academicum Lithuanicum* (henceforth CorALit) served as a reference corpus. It is a specialized synchronic corpus of written Lithuanian academic discourse. It also represents current uses, as it contains academic texts published in 1999-2009. For the present investigation, its sub-section of the humanities was used, which comprises 890,000 words. It is comparable to COPSA-LT with respect to subjects represented: history, literature, linguistics, philosophy, art, and religion in COPSA, and architecture, art, ethnology, folklore, philosophy, linguistics, literature, library science, history, and theology in CorALit.

For the analysis of intertextuality, only explicit intertextuality was taken into consideration (i.e., quotations or paraphrases with reporting verbs). This, as well as the analysis on interdiscursivity, was carried out manually. In the case of interdiscursivity, both markers in

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<sup>8</sup> COCA contains different sub-sections of academic discourse: education, history, geography/social sciences, law/political sciences, humanities, philosophy/religion, science/technology, medicine, and miscellaneous texts. From these sub-sections, history and humanities were chosen so that the data were comparable.

the text and in the near context were taken into consideration, as they are inextricably related to the article.

In addition to the analysis of verbal and non-verbal modes, a comparative analysis of English and Lithuanian popular scientific discourse was carried out, which revealed not only the existing differences between academic and popular scientific discourse, but also the culture-dependent differences of the genre. The comparative analysis revealed linguistic features of popular scientific discourse, as well as a different use of non-verbal elements, which suggests a different attitude by the linguistic communities towards popular science.

## **5 Analysis of Non-Verbal Modes in Popular Scientific Articles in the Humanities in English and Lithuanian**

The present chapter investigates the main non-verbal modes in popular scientific articles in English and Lithuanian. First, Section 5.1 discusses the distribution of various modes in popular scientific articles in English and Lithuanian. Photos and pictures, as the dominant modes, are discussed in greater detail in Section 5.2, while Subsections 5.2.1 – 5.2.8 analyse the most prominent variables of the social participants and objects represented visually. Based on the subject-matter of the photos and pictures, such aspects as the representation of scholars (Subsections 5.2.1 and 5.2.2), other professions (Subsection 5.2.3), individualism and collectivism (Subsection 5.2.4), gender (Subsection 5.2.5), and non-Western cultures (Subsection 5.2.6) are discussed. The analysis focuses on the cross-cultural differences between popular scientific discourse in English and Lithuanian and their conventions.

### **5.1 Distribution of Modes in Popular Scientific Articles in English and Lithuanian**

The use of modes in discourse is conditioned by many factors, such as genre conventions, readers' preferences, or even cultural norms and traditions. The aim of this section is to discuss the use of verbal and non-verbal modes in popular scientific articles in English and Lithuanian, focusing on how the use of different modes changes the genre itself, as well as which cultural differences become apparent in popular scientific articles in English and Lithuanian.

As indicated by Kress and van Leeuwen (2006), discourse is usually multimodal as various semiotic resources are used in meaning-making. This is especially true for popular scientific discourse, which attempts to represent information in a clear and understandable way as well as to attract the readers' attention. Naturally, colourful pictures and photos, representative graphs and maps, or audio and videos catch attention and can contribute to the fulfillment of the aim of popular scientific discourse.

Furthermore, the increasing technical possibilities of the electronic domain allow for various combinations of modes. Printed books or magazines mainly rely on unmoving images, colours, and layout, whereas the internet provides the possibility to include videos, audio, or slideshows into the articles, thereby increasing interdiscursivity of popular scientific articles. The reader/viewer then can either use the multiplicity of modes in order to get the meaning of the article or just selectively choose a more appealing mode.

It is assumed in this thesis that the use of various modes in discourse is culture-dependent due to the fact that some discourse communities accept technological advances more quickly, while others are more reluctant to changes and attempt to maintain more traditional

genres. In addition, the existing traditions and conventions of certain genres also influence the use of modes: even though genres change, the speed at which these changes occur depends on the existing cultural traditions and attitude towards the use of other affordances in discourse.

As the analysis of the distribution of different modes reveals, English popular scientific discourse can be referred to as an ‘open’ genre, which adopts technological advances easily; consequently, a variety of modes are incorporated. On the contrary, in Lithuanian popular science, the affordances of the electronic domain are employed very little, relying mainly on photos which are used for illustration in popular scientific articles most frequently. The results of the quantitative research are provided in Table 2:

**Table 2.** The number of modes in popular scientific articles in English and Lithuanian

Photos		Pictures						Videos		Audio	Total	
EN	LT	Drawn pictures		Maps		Graphs		EN	LT	EN	EN	LT
422	342	197	160	48	7	20	10	41	1	3	731	520
57.7%	65.7%	26.9%	30.7%	6.5%	1.3%	2.7%	1.9%	5.6%	0.1%	0.4%	100%	100%

As can be seen in Table 2, 731 non-verbal elements in total are used in popular scientific articles in English in addition to text, which forms the basis for the article; in Lithuanian this number is lower and reaches 520 non-verbal elements in total. The most common mode is photos as they comprise more than half (57.7%) of the modes in English and even 65.7% in Lithuanian. A more subjective attitude or interpretation of events or phenomena is provided by pictures or their reproductions (26.9 % in English and 30.7% in Lithuanian). Maps comprise 6.5% of non-verbal elements in English and only 1.3% in Lithuanian despite the dominance of the field of history in the articles under investigation. In English, the use of maps is exceptionally restricted to the field of history, while in Lithuanian it is atypical to use this mode. Graphs are mainly used to represent certain linguistic trends or features, especially in the magazine *Nature* in English, while the use of graphs in Lithuanian makes up less than 2% of all non-verbal elements. Videos incorporated in the articles are a common mode in English (5.6%); on the contrary, only one video is found in popular scientific articles in Lithuanian. Audio, which allows the reader/viewer listen to a broadcast or an interview, seems to be the least extensively used mode in English as these comprise less than 1% of all modes used in English, and are not used in Lithuanian at all.

The frequency of each mode per article also differs in English and Lithuanian. In English popular scientific articles, most typically, one or two photos or pictures are used in an

article, and in most cases one photo represents the author of the article, while the other is related to the content of the article. In the corpus, three slideshows with pictures or photos are included, and in such a case the number of photos reaches ten, and the number of pictures reaches twenty per article. The number of videos is limited to one per article, while the number of graphs and maps ranges from one to four per article.

In Lithuanian the number of non-verbal elements ranges from zero to the average of two or three photos. For instance, the magazine *Istorikas.lt* relies only on the verbal mode, while in contrast, historical magazines in English are illustrated abundantly. The average number is higher in such popular scientific magazines as *Mokslo Lietuva*, *Nemunas*, and *Rubinaitis*, which are illustrated by an average of six photos or pictures, while the maximum number of photos in one article is fourteen (*Rubinaitis*).

Thus, the number of modes in English and Lithuanian popular scientific articles forms genre expectations. Predominantly, two pictures, photos, or a combination of two modes is used in English, while in Lithuanian some popular scientific magazines rely only on the verbal mode and others are abundantly illustrated. In Lithuanian the use of modes is preconditioned by the conventions of the magazine rather than features of the genre.

Apparently, photos and pictures seem to be the conventional modes in popular scientific articles in English in addition to the verbal mode; however, the combination of various modes can be observed in almost all popular scientific magazines in English, which means that the genre of popular science is composed of various semiotic resources. In Lithuanian, on the other hand, the combination of modes is restricted to a minimum (see Table 3):

**Table 3.** The combination of modes in English and Lithuanian popular scientific articles

Mode	Photo + video		Picture + photo		Map + photo		Picture + video	Picture + map	Graph + photo	Photo + audio	Picture + photo + video	Photo+ video+ audio	Photo+ picture +chart
	EN	LT	EN	LT	EN	LT	EN	EN	EN	EN	EN	EN	LT
Articles	19	1	40	34	4	2	8	5	8	2	7	1	1

As can be seen in Table 3, various combinations of modes also occur, especially in English. For instance, the combination of photos and videos (19 articles), pictures and photos (40 articles), and pictures and videos (8 articles) is common in English. In Lithuanian, the combination of a picture and a photo is the most common (34 articles), while other combinations seem to be atypical.

Even though in most cases the numbers are not high in English, text is not the only dominant mode in popular scientific articles, as it can be supplemented by other modes very easily because of the affordances of the internet. For instance, readers can not only read the article but also watch a related video or listen to an audio. Another tendency is that the use of various modes is becoming a feature of popular scientific articles in English, while in Lithuanian photos and pictures are dominant in addition to the verbal mode. These modes can be considered as ‘more traditional’ ones, as they are typically used in printed magazines. Thus, no significant difference between Lithuanian printed and online popular scientific magazines can be observed.

In general, concerning the use of various modes in popular scientific articles, a number of differences can be observed between English and Lithuanian (see Table 4):

**Table 4.** Comparison of the use of modes in English and Lithuanian popular scientific articles

<b>Modes in popular scientific articles in English</b>	<b>Modes in popular scientific articles in Lithuanian</b>
731 non-verbal elements (per 500 thousand words)	520 non-verbal elements (per 500 thousand words)
Average - 1-2 photos or pictures per article	Average - 3-4 photos or pictures per article
Maps, videos, and graphs are also used as common modes	Other modes are atypical (they make up only around 4%)
Photos and pictures are used in combination with other modes	Usually either photos or pictures are used
All popular scientific magazines rely on several semiotic modes	Two magazines rely only on the verbal mode
Dominant non-verbal modes are photos and pictures	

As can be seen in Table 4, popular science in English and Lithuanian shares several differences. First, the number of non-verbal elements is higher in English. Second, a variety of modes and their combinations are used in popular scientific articles in English. Even though the percentage is not high, the reliance only on text is highly atypical, while in Lithuanian other modes (in addition to text, photos, and pictures) are atypical. The only similarity is that the dominant non-verbal modes both in English and in Lithuanian are photos and pictures.

## **5.2 Photos and Pictures as Modes in Popular Scientific Articles**

As indicated in Section 5.1, photos and pictures (drawn pictures, graphs, and maps) are the most typical modes in popular scientific articles in English and Lithuanian. The aim of this section is to discuss the features of photos and pictures and the possible reasons for using them in popular scientific articles in both languages.

There may be several reasons for the abundant **use of photos** in popular scientific articles. First, they depict real life and real people; thus, current events and research may be

more interesting and engaging. In addition, while reading non-scientific newspapers and magazines, people are used to abundant illustration, which influences reading style: readers obtain information visually by focusing on photos or pictures and, therefore, simply skim the text instead of reading it carefully. Photos therefore attract more attention and facilitate the understanding of the message, which is important for lay people who are the intended audience of popular scientific articles.

Second, photos create the effect of immediacy and a having-been-there feeling, as indicated by Barthes (1985: 32). This is especially true for historical and archeological articles which are sometimes illustrated with a number of photos and, by looking at them, the reader may feel as if s/he were a participant in the action. For instance, it is complicated or impossible for every lay person to see archaeological excavations in real life; however, the photos provide an opportunity to see the most exciting findings not in a museum, but rather during the process when they are being excavated.

Third, the readers may visualize the scientific research better (or at least they can see the people who carried out the research), which facilitates the understanding of the process, arouses interest or personalizes the research more. Possibly, the reader is interested not only in the research but also in the personality of the researcher himself/herself, and can see him/her in the photo. Thus, photos are dominant in popular scientific articles because of their immediacy and the expected reading habits and interests of the target audience.

**Pictures** are also used abundantly in popular scientific articles. They may be subcategorized into drawn pictures (reproductions of famous paintings are sometimes chosen as an illustration of the article), maps, and graphs. Maps are used exclusively in historical articles, while graphs are typical of both articles in history and linguistics. The purposes of picture usage, however, are different.

First, drawn pictures are more subjective as they express the point of view and imagination of the painter; therefore, people or things are represented through the perspective of another person, not necessarily as they are in reality, and usually distanced by a time span (e.g., writers or artists who lived several centuries ago are drawn by contemporary painters).

In addition, pictures are more expressive and artistic, as their aim is not to depict the view accurately but rather to provide a general impression or the information in such a way that it would arouse people's emotions, while photos, on the contrary, tend to record information more accurately (despite the fact that their choice or the frequency of usage may be biased or encourage interpretation). For instance, the pictures of mass scenes (e.g. war) are not realistic because of saturated colours or unrealistic people's faces; however, they cause a more emotional viewer's/reader's reaction and arouse imagination.

Furthermore, a number of pictures under the present investigation are created by famous artists; therefore, the readers/viewers can see famous pieces of art. This way, popular science combines informative content with artistic expression: even though the article discusses the features of the writer or debatable issues related to a piece of art, the picture by a famous artist serves an artistic or expressive function.

Contrary to drawn or painted pictures, maps and graphs are computer-generated. Maps are used exclusively in articles on history while graphs or charts appear in articles on history and linguistics. The most important feature is that they are highly informative. For example, maps present the changes in the territory of a country in a compact way, while a linguistic representation would be elaborate and might still cause confusion for a person who is not well-aware of the territorial changes. In addition, the tendencies or changes are clearer when they are visualized rather than only described. This is true not only of maps but also of graphs and charts.

As for the subject matter of photos and pictures, people (i.e., individuals, pairs, and mass scenes) are represented the most frequently. Furthermore, other categories might be distinguished; the photos in popular scientific articles also frequently depict (a) texts, (b) landscapes, and (c) objects (historical artifacts or everyday objects). In addition to portraying people, a part of pictures may be referred to as (a) caricatures because of their humorous or ironic effect. Pictures can also be classified into such categories as (b) landscapes or (c) body parts (namely, brain); however, these categories are only episodic.

The following sections focus on the representation of social actors, describing such variables as individuality, pair, and group representation, stereotypes in portraying scholars, other professions, gender, and Western vs non-Western cultures. In Sections 5.2.7 and 5.2.8, other categories of objects depicted in photos and pictures are analysed.

### **5.2.1 Representation of Scholars as Authors of the Articles**

A substantial portion of people represented (87 photos, or 15% of all images) is comprised of the scholars who are the authors of the popular scientific articles. The representation of scholars as authors of the articles can be discussed only for English cases, as in Lithuanian popular scientific articles only four authors are represented visually. Thus, this section discusses the main features of the depiction of scholars in English popular scientific articles. First, the position of a photo in an article will be discussed; second, the stereotypical portrayal of the authors is analysed by taking into consideration such variables as body position, facial expression, and features of setting.

There are three possibilities for indicating the author of an article: (a) only the author's name and surname; (b) the name, surname, and photo; or (c) the name, surname, photo, and a short description of the author. In very few cases the author is not indicated at all. If the photo is included, structurally, it is placed either below the title or below the article.

When only the name and surname of the author are included, the information about the author is minimal. Usually there is even no title or any other indication that the person has an academic degree. Thus, the author may be viewed as a journalist rather than a scholar. This modifies the status of the scholar in the society, as s/he is viewed more as a lay person than a representative of an elite profession.

The author completely 'disappears' from the online magazine *Science Daily*, which does not even include the author's surname. Referencing is limited to a sentence, such as "The above story is reprinted from materials provided by Michigan State University." However, even though references are included at the end of the text, the authorship of the article presented in the online magazine remains unclear, as the reader does not know whether the article is a part of broader research or whether someone simplified the information from an academic journal. Even though this tendency is not typical of all online popular scientific magazines, it suggests that in some cases academic research is becoming depersonalized. Furthermore, the reliability of the research or of the article may be questioned, as the authorship of the article remains unclear.

When the photo is included, it provides more prominence to the author, as it attracts the readers' attention, and is distinct from the whole article. Additionally, the author is immediately recognizable by regular readers of the magazine, and they may also associate the photo of the author with a certain topic (e.g., one author usually writes about history or archeology, another about music, etc.). However, these ways of presenting the author are not systematic, and variation is apparent even in the same magazine. Furthermore, it seems that the choice to include or not to include the photo of the author of the article depends on the 'in-house style' of the magazine; for instance, *Popular Linguistics Magazine* and *DNews* usually present the photo of the author at the beginning of the article, while *nature.com* and *The New York Times* include only the name and surname of the author.

The most extensive representation of the author of the article is when not only his/her name but also his/her photo and a short description are included. In this case, the author receives considerable attention because the reader/viewer can see the author and can find out about his/her research interests or academic achievements. The description may be quite succinct, as in Examples (1) and (2), or more elaborate, as in Example (3):

- (1) By Lauren Hall-Lew, Lecturer in Sociolinguistics, University of Edinburgh

- (2) By Janet M. Fuller, Director of Women's Studies, Southern Illinois University – Carbondale
- (3) Warren Merkel (merkelthree@yahoo.com) is a teacher trainer and visiting professor currently working at Chonnam National University in Gwangju, South Korea. He received his BA in German from Miami University and MA in TESOL from the School for International Training in Brattleboro, Vermont.

Thus, the information about the author is either restricted to only his/her name or elaborated to his/her job position, education, profession, and address or email. The main publications can also be mentioned.

One more aspect related to the presentation of the author is that his/her surname is sometimes hypertextual, and by clicking on the name and surname, the reader can access a website which contains all the articles by the same author. Thus, the available technologies and the affordances of the internet are used to provide access to more articles written by the same author. However, no academic information about him/her is given; again the reader may associate him/her with a journalist rather than a scholar.

The role of the scholar, the author of the article, is different in Lithuanian. As has been mentioned, in all the articles, only four represent the author visually, while only in a few articles the title of the person is indicated (e.g. *prof.* or *prof. habil. dr.*); all other articles include only his/her first name and last name, even though the article may be written by a well-known scholar. Thus, the reader is expected to have some background knowledge on who the author is; otherwise, he/she is not provided with any additional information about the author. Furthermore, the author either remains unnoticed or at least his/her role is diminished (especially if we take into consideration the dominant trend in English of including the author's portrait or a short description).

As has been mentioned, because of the existing 'in-house' style of popular scientific online magazines, some authors of the articles are represented by using a photo. The variables discussed below (such as facial expression of the scholar, eye-contact, and setting) allow for the assumption that the representation of the scholars is quite emblematic or stereotypical. Scholarly writing is expected to be innovative, creative, and devoid of stereotypes. However, one may observe certain pervasive stereotypes expressed visually, which counterbalance the new and sometimes intriguing information expressed textually. For instance, the stereotype of a scholar is created by photos, probably chosen by the scholar himself/herself.

The choice of a photo indicates that, first, the person is viewed as an official person because the traditional photo usually put on official documents is chosen to represent the author of the article. Compared to other photos in the articles, the photos representing the author

are very small so that they would not occupy much space; an example of such a photo can be seen in Pictures 1 and 2 (the reproduced size is original):



**Picture 1.** Photo of Rosella Lorenzi (*DNews*)



**Picture 2.** Photo from the article “You Say Potato, I Say Cassava: Language, Culture and Perception” (*Scientific American*, February 6, 2008)

What the viewer can see in Pictures 1 and 2 is the headshot of the person or, in some cases, neck and shoulders as well. In neither of the collected examples is the whole body of the scholar/author of the article visible. Thus, the viewer cannot see any other context, only such distinctive features as the author’s hair, eyes, and facial expression. These features facilitate the identification of the person and are the most distinctive and unique.

The eye-contact of the authors of the articles is very strong, as they look directly at the reader/viewer. In Kress’s (2003, 2010) and Kress and van Leeuwen’s terms (2006), the representation angle is horizontal, which implies that there is no hierarchical differentiation: the author and the viewer have an equal status. Furthermore, a direct gaze is more persuasive and involving rather than, for example, no eye-contact at all. Thus in general, direct eye-contact of the author of the article serves the purpose of attracting and engaging readers.

The facial expression of the authors of the articles is almost always the same: they look kind, calm, and smiling; no personal emotion is revealed. The same holds true both for males and females, different age groups, or various scientific fields (linguistics, history, archeology, or music), which implies that the represented scholars are significantly unindividualised, as their social role is more important than their personality.

To conclude, in the examples where authors of the articles are portrayed, the reader cannot identify any concrete context, as only a neutral light or dark setting can be seen behind the author in the background. The chosen portrait genre restricts the possibilities of representing the scholar; thus certain conventions of taking an official photo are followed. In addition, the creation of the stereotype of a scholar is reinforced in the representation of scholars as social participants in the articles.

### **5.2.2 Representation of Scholars as Social Participants in the Articles**

This section discusses the representation of scholars as social participants or the subject matter of the articles, which means that the tasks or achievements of the scholars are focused on both

textually and visually. The main aspects that contribute to a certain standard of depicting scholars are the following: (a) features of the photo, (b) posture and actions of the scholar, (c) facial expression, and (d) setting. It can be argued that repetitive patterns of these variables form certain expectations concerning the appearance, actions, or typical features of scholars, as well as the academic domain in general.

First, the photos that portray the scholars as the subject-matter of the article are larger than the ones depicting the author of the article. The photos of the authors usually reach a size of 10mm x 10mm, while the photos depicting scholars as the subject-matter of the article vary from 10mm x 10mm to 130mm x 110mm. Examples of such photos can be seen in Pictures 3 and 4:



**Picture 3.** Photo from the article “The Secret Language Code” (*Scientific American*, August 16, 2011)



**Picture 4.** Photo from the article “Morphology: How Are Words Formed?” (*Popular Linguistics Magazine*, January 6, 2011)

The size of the photo provides more prominence to the photos of scholars, the subject matter of the articles, because the small repetitive photos of the scholars/authors may not be very noticeable to the reader. On the other hand, larger photos contain more information expressed visually, or more details are visible than in the small portraits of the authors.

Similar to the depiction of scholars, the authors of the articles, the viewer cannot see the whole body of the scholar, only his/her close-up, i.e., the head and shoulders. It is not clear what his/her bodily position is (whether s/he is sitting or standing), as only his/her portrait can be seen, which means that the face and expression are predominant, while in some cases a three-quarter view is chosen. Thus, the position of the scholar is apparently restricted. As the photo is highly emblematic, this reinforces the image of the scholar as an official person, disregarding the age, position, or field of interest of the scholar.

Another similarity between scholars as authors of the articles and scholars as social participants is that the person portrayed in the photo maintains a strong eye contact with the viewer. It is not typical of the scholar to look sideways. A strong and direct eye contact has more impact on the reader, which is also a typical feature of a portrait, establishing interactivity.

Furthermore, the look contributes to the creation of a general atmosphere of the photo. As can be seen in Pictures 3 and 4 above, the look of the represented people is calm and pleasant. This presupposes that they attempt to present themselves as pleasant people.

On the contrary, the portrayed Lithuanian scholars do not maintain a strong eye-contact with the viewers. In the photos, they look sideways, i.e., either to the left or to the right. This is illustrated by Picture 5:



**Picture 5.** Photo from the article “Vytautas Rubavičius: filosofija – tai mąstymas apie veiksmąžodį „yra“<sup>9</sup>” (*Filosofija Lietuvoje*; January 1, 2010)

The lack of eye-contact affects the relationship between the represented person and the reader/viewer, which is not as engaging as the portraits of English scholars who maintain a strong eye-contact. Furthermore, the sideways look creates the impression of an uncontrolled situation and momentariness if compared to emblematic portraits in English popular scientific articles.

**Facial expression** of the scholars in English is also more neutral or pleasant; however, gender differences can be observed. Most male authors look more serious, while all female authors smile quite broadly, this way creating a more relaxed atmosphere (an example could be seen in Picture 4 above). However, the representation of both genders is relatively neutral as the facial expression and eye-contact are restricted to only a few possibilities. Thus, it could be generalized that the scholar is represented without revealing too much about his/her scholarly interests or personal character features.

The variable of facial expression is also dominant in popular scientific articles in Lithuanian, and this variable contrasts highly with the representation of scholars in English popular scientific articles. Lithuanian scholars are mainly serious and calm, as in total there are only two portraits with smiling participants. An example of a Lithuanian portrait of a scholar can be seen in Picture 6:

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<sup>9</sup> “Vytautas Rubavičius: Philosophy is Thinking about the Verb ‘To Be’” (here and henceforth the translation is mine – T. R.)



**Picture 6.** Photo from the article “Didysis prasmės ieškotojas – Algirdas Julius Greimas<sup>10</sup>” (*Alkas*; March 9, 2011)

This variable may be considered a contrast to the stereotype of scholars in English, who are almost all smiling. Possibly, the explanation can be cultural differences and different norms concerning appearance, posture, and facial expression of a scholar. In English, the portrait of a kind and pleasant person is created, while in Lithuanian the scholar is understood as a serious and thoughtful person.

Concerning facial expression, gender differences cannot be distinguished in Lithuanian, as almost all individually portrayed scholars are males (only four of all photos representing scholars are females). This tendency supports the presumption about male dominance in the academic community similarly to the representation of scholars in English. As indicated in the analysis, this tendency is more pervasive in Lithuanian than in English.

As the photos of scholars who are the subject matter of the articles are larger, they also reveal more about the scholars' appearance. An observation can be made that the represented scholars in English popular scientific articles tend to wear formal clothes. For instance, male scholars tend to wear suits or a shirt, while women tend to wear dresses or two-piece suits. Furthermore, neutral colours are chosen, such as white, grey, blue, or black. Thus, clothing is one more aspect which is emblematic and contributes to the creation of the stereotype of the scholar as an official person.

The appearance of Lithuanian scholars contrasts with the appearance of the scholars in English popular scientific magazines. In the majority of cases the scholars are dressed in more casual or informal clothes, as can be seen in Pictures 5 and 6 above. Without textual information, it is impossible to indicate the profession of the depicted person unless the reader recognizes him. Thus, either the knowledge of the reader or the text is essential in the identification of the scholar. In this way, an impression is created that the scholar is portrayed in an everyday context, and there are no features to distinguish or distance him/her from ordinary people. This tendency is in contrast with a widespread perception that scholars are an elite social

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<sup>10</sup> “The Greatest Searcher of Meaning - Algirdas Julius Greimas”

group and, possibly, a way to attract a wider audience (in English this function is performed by a high interactivity of the websites and the substantial use of various modes).

As for the popular scientific articles in English, in 21 photos (8% of all the represented people, and 3.5% of all the images), the **actions** performed by the scholars are visible. This aspect is more typical of male scholars. However, the actions are also very restricted, as they are limited by academic activities in academic settings and field research in open areas. The examples of the activities can be seen in Pictures 7 and 8:



**Picture 7.** Photo from the article “Indian Tribes Go in Search of Their Lost Languages” (*The New York Times*, April 5, 2010)



**Picture 8.** Photo from the article “Roman Naval Power: Raising the Ram” (*History Today*, August 2011)

As can be seen in Picture 7, the scholars are represented in their working space: the viewer can see many books behind them; the scholars stand at a desk looking at some papers or books or discussing something. Eye contact is not maintained with the viewer, focusing on the fact that the scholar is involved in his/her tasks.

Another group of photos exemplified by Picture 8 represent the scholars involved in physical activity related to their research. In this photo they are raising some ruins from the water; other examples where archaeologists are doing excavations can also be found. These activities may be related to the subject field under investigation, i.e. humanities. Therefore, history or archaeology are represented by field research, especially excavations, while linguistic research is visualized by the photos of recordings being made of endangered languages. In this way, emphasis is placed on intriguing or yet undiscovered aspects of these scholarly areas. This contributes to the purpose of popular science to attract and intrigue the reader; furthermore, the photos add immediacy to the textual information.

Similar to popular scientific articles in English, in Lithuanian articles the scholars are more represented rather than active. Their activities are significantly restricted, as they are mainly depicted at a conference or book presentation (e.g., sitting at a table, discussing

something, or giving a speech), i.e., engaged in an academic activity. An example of this activity, in this case a conference, can be seen in Picture 9:



**Picture 9.** Photo from the article “Įvairiaspalvis XVII Klaipėdos miesto ir valsčiaus gyvenimas<sup>11</sup>” (*Mokslo Lietuva*, July 9, 2009)

It can be maintained that certain objects are typical of the identification of scholars, namely, a table, papers, or books. In English examples, one more common object is a computer; however, such examples are not observed in Lithuanian articles. A distinctive difference from popular scientific articles in English is that field research or work by historians/archaeologists are not depicted, even though a significant part of the articles in Lithuanian are concerned with topics in history.

Finally, the reader/viewer can see more **setting** in the photos depicting scholars as subject-matter of the articles, as compared to the photos representing scholars as authors of the articles. The following different settings may be distinguished in English and in Lithuanian:

- (a) unidentified space;
- (b) academic setting;
- (c) open space.

In the first category, there are no place indicators, as the viewer can only see a light or dark background without any objects to identify the place. The examples when the wall of a room is visible in the background are also added to this category, as this place is neutral, and does not carry any additional information. This is typical of portraits, as shown in Pictures 3 and 4, where the focus is the scholar himself/herself, and there are no other objects to distract the reader/viewer.

On the contrary, the academic setting contributes to the creation of the stereotype of a scholar. Stereotypically, the setting is a room or an auditorium full of books or papers. The objects that can be seen in the photos are books (both on a shelf and the table), papers, computers and, pens (an example can be seen in Picture 7). This type of setting suggests

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<sup>11</sup> “A Multicoloured Life of Klaipėda City and its Rural District in the 17th Century”

scholarly work and contributes to the understanding about academic life, people, and environment, as well as highlights the stereotypes about academic environment.

One more category of setting is open spaces, as exemplified in Picture 8. Such photos show the actual environment where historians or archaeologists make their research. This allows the readers/viewers to visualize their research better and provides additional information about the process of archaeological excavations.

It can be generalized that portraits dominate in the representation of scholars. A neutral and depersonalized portrait is created by the combination of such variables as a direct gaze at the viewer, a smile, formal clothing, or unidentified setting. Thus, such strongly emblematic photos contribute to the creation of the stereotype of a scholar and create certain expectations from the readers/viewers, while the textual information presents new research and a variety of topics in the humanities.

### **5.2.3 Representation of Other Professions**

The professions depicted in the popular scientific articles are quite restricted. The previous section discussed the representation of scholars as authors of the articles and scholars as subject-matter of the articles; this profession is predominant in popular scientific articles. Two other dominant professions depicted in English popular scientific articles include soldiers and artists (singers and actors), while in Lithuanian the represented professions include writers, translators, artists, and politicians/public activists.

The representation of soldiers is pre-conditioned by the field of history. The articles on history which describe military conflicts such as WWI, WWII, or the American Civil War form a substantial portion of the corpus in English; therefore, some significant military leaders are portrayed.

The category of artists, which includes pop singers and actors, is an unexpected finding. Typically, science and popular culture are viewed as unrelated phenomena. However, it appears that it is possible to relate them in popular scientific articles, which focus on, for instance, linguistic aspects of African-American English, its vocabulary or grammatical features, and gives examples from popular songs performed by African-Americans, while the photos in such articles depict the singers. Possibly this is a way for the writers of popular scientific articles to attract a younger audience who listens to this music, and to make linguistic research more interesting and attractive for the reader.

It cannot be said that this tendency is pervasive in all magazines under investigation. The majority of these examples are taken from the online magazine *Word.*, which focuses on African-American English and its typical features. However, there are also a

few examples taken from *nature.com* and *The New York Times*. Thus, it can be assumed that this tendency to relate science and popular culture is becoming more common and, possibly, is a good way to attract a broader, especially younger audience by analysing well-known song texts rather than simply enumerating the typical features of African-American English.

As has been mentioned, the most common profession depicted in the articles is scholars, while the other professions are not numerous. The quantitative data on the distribution of professions are provided in the table below:

**Table 5.** Representation of other professions in popular scientific articles in English and Lithuanian

	Soldiers		Artists		Writers	Translators	Politicians/ public activists	Total	
	EN	LT	EN	LT	LT	LT	LT	EN	LT
No.	15	19	24	35	4	14	34	77	
%	44.4%	56%	31.1%	45.5%	5.1%	18.2%	100%	100%	

The qualitative data reveal that soldiers are depicted in 15 photos representing people. In 6 photos, the portraits of famous military men are presented, while 9 photos depict war scenes. The category of artists is slightly larger, as there are 19 photos representing artists. In Lithuanian articles, more varied professions are represented; the most dominant one is the category of writers (35 instances) predetermined by the subject field. The categories of artists, politicians/public activists, and translators are represented in 24, 14, and 4 cases, respectively.

First, in the representation of **soldiers**, a distinction can be made between portraits and war scenes. Even though the portraits of soldiers form only a small part of the photos, they create a stereotype of a high-ranking military officer. Such photos are deliberate choices as they are taken in the manner typical of the time, as can be seen in Picture 10 (they are not as important concerning sociocultural context as undeliberate choices), while unidentified soldiers are depicted in war scenes (see Picture 11):



**Picture 10.** Photo from the article ‘Fort Sumter Falls’ (*American Heritage*, V61, issue 1)



**Picture 11.** Photo from the article ‘Girl Computers’ (*American Heritage*, V61, issue 2)

In the photos like Picture 11, the general atmosphere of war can be felt immediately by looking at the photo. There are a number of clear indicators of context: men dressed in military clothes, a shooting cannon, and the trenches. Despite a typically masculine activity, the photo is remarkably emotional and conveys a strong emotional load expressed by the facial expression of the man in the foreground. Thus, in the photos of war scenes, the actions, setting, and facial expression of the soldiers are the main variables that carry an emotional load and create the main difference from the officers represented in the portraits.

The category of **artists** in English refers to actors and singers. Actors are depicted only in 5 photos. A common feature is that a scene from a film is depicted in all the cases where the actor performs a certain role (see Picture 12):



**Picture 12.** Photo from the article “White People Speaking AAE” (*Word.*, July 9, 2010)

It is complicated to decide about the actual action from the context that can be seen in the photo; however, the dichotomy ‘black’ vs ‘white’ is very clear, which is reinforced by the standing position of the men. Furthermore, the white male is speaking and holding one arm next to his chest as if defending himself, while the dark-skinned one has his arms crossed, which suggests being closed and unwilling to communicate from the point of view of non-verbal communication. Thus, these different postures create tension between the two people and raise the question of power relations.

It can be observed that in the photos representing singers, the stereotype of a pop star is reinforced, which is especially highlighted by the posture, actions, clothing of the participants, and setting. Thus a double focus is achieved. First, the photo of a famous singer could be a motivation to read the article, especially for a younger audience. Second, the text analyses linguistic features of African American English and draws differences between Standard American English and other varieties.

As can be seen in Pictures 13 and 14, the singer’s posture is not as neutral as it was in the case of scholars’ portraits, where the facial expression, clothing, and setting were highly neutral and depersonalized:



**Picture 13.** Photo from the article “When I Say Dirty, You Say South” (*Word.*, July 10, 2010)



**Picture 14.** Photo from the article “Music Monday: African American English Goes Global” (*Word.*, July 11, 2011)

In both photos above, the emphasis is placed on body posture. In Picture 13, the young man stands in a relaxed position and claps his hands, while the girl in Picture 14 seems to be seductive, as emphasis is placed on her figure and her naked shoulders (gender issues are discussed more in Section 5.2.5). Apparently, Picture 13 portrays a stereotypical hip hop singer, while Picture 14 a stereotypical female pop singer. Neither posture, nor facial expression, nor clothing are individualized, as these variables merely contribute to the identification of the music style that the represented singers prefer; thus, the portraits are emblematic and stereotypically represent social actors.

As Table 5 shows, only the category of artists coincides in English and Lithuanian popular scientific articles when representing other professions. On the one hand, the professions depicted visually are predetermined by the subject matter; on the other hand, it is important how these professions are portrayed and what socio-cultural significance is attached to them.

In English the artists represented in the photos can be referred to as representatives of pop-culture as they depict pop singers or actors of popular films. In Lithuanian articles, theatre artists or classical performers are mainly depicted. The most dominant variable to indicate their profession is their clothing, as can be seen in Picture 15, while in English the participants are represented as engaged in an action:



**Picture 15.** Photo from the article “Gyva atmintis: Mikui Petrauskui – 135-eri<sup>12</sup>” (*Nemunas*, November 13, 2008)

The represented participants dressed as characters in a performance function as examples of interdiscursivity, as they depict scenes from a performance and relate popular science and theatre. Another feature of the photos of artists is the focus on classical performances or music. Thus, in English, the aim of such visual representation is to attract a younger audience and to make popular science more accessible; on the other hand, in Lithuanian articles the elite nature of science and art is retained, and the aim is to arouse the reader’s interest in classical art.

The representation of **writers** in Lithuanian articles is similar to the representation of scholars because writers are represented similarly to official people in Lithuanian popular scientific articles. The image of an official person is created by such variables as facial expression, posture, clothes, and setting, as exemplified in Pictures 16 and 17:



**Picture 16.** Photo of poet R. Keturakis in the article “R. Keturakis: Mėlynojo kraujo poezija<sup>13</sup>” (*Kultūropolis*; June 28, 2010)



**Picture 17.** Photo of writer and scholar Vincas Krėvė in the article “Vincas Krėvė – tautininkų sąjungos įkūrėjas<sup>14</sup>” (*Alkas*; August 7, 2011)

Similar to the photos of scholars, writers in the photos are serious, dressed in formal clothing, and mainly portrayed in an unidentified setting; thus, they are represented more as official people rather than creative personalities.

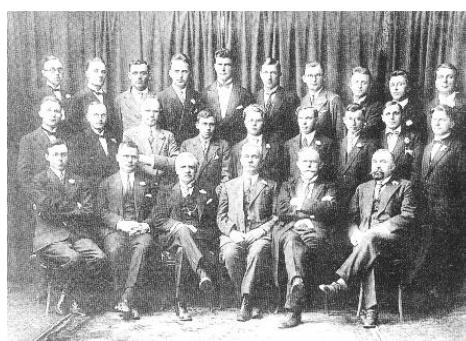
<sup>12</sup> “Memory Alive: 135<sup>th</sup> Anniversary of Mikas Petrauskas”

<sup>13</sup> “R. Keturakis: Poetry of Blue Blood”

<sup>14</sup> “Vincas Krėvė, the Founder of the Nationalist Union”

One more social group represented in Lithuanian popular scientific articles is **politicians** or public activists (e.g., people who fought for Lithuanian independence without entering the political arena). In English, the visual focus was on soldiers or war scenes; in Lithuanian, historical events and fights for Lithuanian independence are revealed by focusing on famous politicians and their influence on Lithuanian culture rather than military activities.

Several aspects are typical of the representation of politicians in Lithuanian. First, the stereotype of an interwar period intellectual is reinforced (taking into consideration the fact that the people represented were not only politicians but also had high education and a position in their society). As in Picture 18, the viewer can see portraits of serious men dressed in formal clothes and portrayed in a formal environment:



**Picture 18.** Photo from the article “Taikos nebuvo ir sudarius taikos sutartį<sup>15</sup>” (*Mokslo Lietuva*; September 17, 2009)

The clothes, black-and-white photo, and hued colours suggest that the photo is original, i.e., valuable from a historical point of view, and also reflects typical features of taking pictures at the time. Thus, various variables (e.g., serious facial expression, static posture, or formal clothes) contribute to the creation of the stereotype of a politician (especially before regaining independence in 1918 and the interwar period) in Lithuanian culture.

The category of **translators** is a small one; however, culturally it reveals an interesting tendency not observed in popular scientific articles in English, i.e., considering translation a scholarly issue topical for Lithuanian culture. Furthermore, the aim of the articles is to present translators as people and as professionals and to provide their point of view towards translated books or literature in general.

In addition to photos, drawn portraits of historical personalities or artists are also used in popular scientific articles, and this tendency is more typical of popular scientific articles in English (see Table 6):

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<sup>15</sup> “No Peace even after the Peace Treaty”

**Table 6.** People represented in drawn portraits in English and Lithuanian

	Historical personalities		Artists		Other	Total	
	EN	LT	EN	LT	EN	EN	LT
No.	23	17	13	7	5	41	24
%	56%	71%	32%	29%	12%	100%	100%

As can be seen in Table 6, drawn portraits of historical personalities are more typical of popular scientific articles in Lithuanian (56 % in English and 71% in Lithuanian), while the portraits of artists are more commonly used in English. The most obvious reason for choosing a drawn portrait of a historical person or an artist is the period when they lived, as in most cases photography had not been invented at that time (e.g., Shakespeare, King Henry VIII, Mozart, or van Gogh). Thus, in some cases it is impossible to choose any other mode in order to show the person's appearance visually. This is done very accurately, especially when historical personalities are portrayed, and their portraits are very realistic, as can be seen in Pictures 19 and 20:



**Picture 19.** Portrait of Napoleon Bonaparte in the article “How the French Revolution Worked” (*HowStuffWorks*)



**Picture 20.** Portrait of Pranciškus Bizauskas in the article “Kazys Bizauskas: brandos metai” (*Naujasis Židinys-Aidai*; July 7, 2011)

In such portraits, the viewer can see a person portrayed realistically from a horizontal angle, which creates the effect of closeness and involvement; however, some details, such as clothing or the setting, which can be seen in some cases, suggest that this is not a contemporary person. As in Picture 19, the appearance of the person portrayed and the design of the chair visible in the background suggest a certain historical period or his occupation.

Despite the realistic representation of Napoleon, the picture is more subjective compared to the photo because it does not record an actual reality. Rather, this is a reality seen and conceptualized by the author of the picture. Thus, certain details (e.g., the posture, the eye contact, or the setting) are not chosen accidentally and contribute to the creation of meaning and the identity of the person. For instance, the look and the posture of the person in the picture above is quite menacing, as he turns towards the viewer, which is reinforced by the sword which

can be seen at his side. Therefore, it can be argued that the aim of the painter is not only to reflect reality, but also to characterize the subject as a strong leader.

In addition, the photos of painters, writers, or musicians are more artistic and can be viewed as artwork more than a reflection of reality. The facial expression or the setting in which the person in question is portrayed is more suggestive and expressive (see Picture 21):



**Picture 21.** Picture from the article “Music on the Brain” (*nature.com*; October 5, 2010)



**Picture 22.** Picture from the article “Hoffmanno pasakos<sup>16</sup>” (*Nemunas*, December 29, 2008)

The facial features of the person in Picture 21 are not very clear; his posture suggests that he is thinking deeply. It is also clear that he is composing music. However, it might be difficult for a lay person to identify him as Robert Schumann, the famous Romantic composer. It is only apparent that the man depicted is undergoing a personal drama suggested by the unrealistic dark setting, while the light is focused only on the papers in front of him and his face. Such a visual representation serves as a clue or a puzzle that the reader has to uncover by reading the article (the article talks about Schumann’s neurological disorder, which destroyed his hopes of becoming a concert pianist).

Like pictures in popular scientific articles in English, in Lithuanian personalities related to culture or artists (especially writers or poets) are portrayed. Similar to the representations in English, a more subjective portrayal is chosen, or the person is viewed from a slightly humorous perspective, as can be seen in Picture 22: Hoffmann’s portrait is more of a cartoon rather than an accurate representation of a person. In addition, such famous cultural/historical personalities as Vincas Kudirka, Maironis, or Kristijonas Donelaitis are depicted in pictures. The reader/viewer can observe the portrait of the famous person and a piece of art (the picture drawn by an artist), which is more subjective and interpretative than a photo.

As the examples show, the representation of professions in popular scientific articles is highly stereotypical and emblematic. They sustain the stereotypes existing in the society and combine informative content with stereotypical beliefs about certain professions. In other words, the visual expresses the conventions concerning certain professions (e.g., scholars,

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<sup>16</sup> “Hoffmann’s Tales”

soldiers, or artists). Drawn portraits are less realistic and invoke interpretation more than the portraits in photos. This tendency is more typical of English popular scientific articles, while in Lithuanian photos are used more often in order to represent a historical personality or an artist, thereby creating the effect of accuracy and reliability.

#### 5.2.4 Representation of Individualism and Collectivism

Concerning the representation of people, a main distinction can be made according to the number of people represented, i.e., one, two, three to five people (referred to as a small group of participants), and mass scenes, where it is difficult to indicate the actual number of people.

The quantitative results provided in Table 7 indicate that individuals are represented more frequently in English, while small groups and mass scenes are more typical of popular scientific articles in Lithuanian.

**Table 7.** Representation of the number of people in popular scientific articles in the humanities

	Individuals		Pairs		Small groups (3-5 people)		Mass scenes		Total	
	EN	LT	EN	LT	EN	LT	EN	LT	EN	LT
No.	184	115	23	28	22	32	23	56	252	231
%	73%	50%	9%	12%	9%	14%	9%	24%	100%	100%
% of all images	31%	21%	4%	5%	4%	6%	4%	11%	43%	43%

The data in Table 7 reveal that individuals dominate in the representation of people both in English and Lithuanian; nevertheless, this tendency is considerably stronger in English where the representation of individuals makes up 73% of the people represented, or 31% of all images. In Lithuanian individuals comprise half of all represented people (21% of all images).

There might be several reasons for the dominance of individuals in English. First, almost half of this number (47%) is comprised of authors of the articles. In Lithuanian it is not common to provide a photo of the author; however, the articles are related to findings or works by individual scholars. Thus, the assumption can be made that the reader/viewer perceives popular science as being dominated by individual scholars. Furthermore, such fields in the humanities as art or history are also dominated by individuals, i.e., famous politicians or artists; thus, the representation of individuals is conditioned by the subject field. Third, a cultural factor, the ideological dichotomy between individualism and collectivism, must be taken into consideration. According to Hofstede's cultural dimension theory (2001), individualism is more typical of Western nations, while collectivism is more typical of Eastern nations.

The category of ‘Pairs’ comprises 9% of the total number of photos depicting people in English, while in Lithuanian this number reaches 12%. In this category, two individuals are depicted (male+female, female+female, male+male, and parent+child). Pairs are usually restricted to the academic domain, i.e., the people are colleagues, or a lecturer and a student. Another variable is the relationship between the participants, such as a husband and a wife or a parent and a child, thereby representing family relationship as a value.

The category ‘Small groups’ refers to the representation of 3 to 5 people; it shows a difference between English and Lithuanian. In English, 4% of all images depict small groups, while in Lithuanian the number reaches 6% of all images. This category either emphasizes a family relationship (parents and children or siblings are depicted) or represents a group of scholars, a lecturer and a group of students or a scholar and a group of lay people.

The category of ‘Mass scenes’ refers to the photos which depict larger groups of people. The focus is placed on a large number of people participating in the action or the scope of the action itself (e.g., war scenes or Muslims praying). This category establishes a difference between English and Lithuanian representations of individuals, as of all images in English articles, only 4% depict mass scenes, while in Lithuanian ones this number is almost triple, at 11%. The emphasis in these photos is laid on a common activity or goal; furthermore, a significant number of the photos in Lithuanian depict a scholar in a large group of people. Such articles are devoted to the memory of a famous scholar or public person, while the visuals depict a group of people who commemorate him/her in a conference or in a cemetery.

Thus, the representation of ‘Mass scenes’ contributes to the image of a scholar. In English popular scientific articles, there is a strong tendency to portray the scholars individually, while in Lithuanian popular scientific articles the scholars are depicted in groups of lay people or in their childhood or adolescence. An example of such a photo can be seen in Picture 23:



**Picture 23.** Photo from the article “Didelis dalykas rašyti vaikams, arba literatūra buvo mano svajonė<sup>17</sup>” (*Rubinaitis*, January 2, 2009)

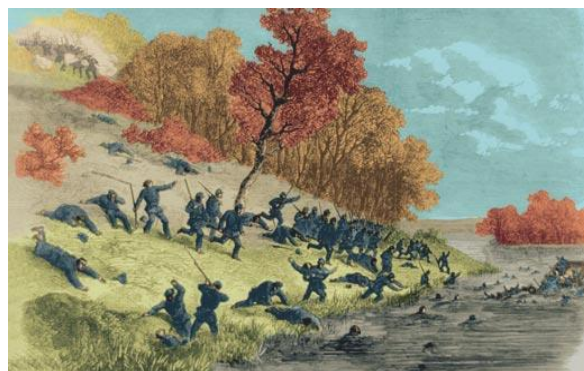
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<sup>17</sup> “It’s a Big Thing to Write for Children, or Literature Was My Dream”

The article discusses the famous Lithuanian linguist Kazimieras Župerka; the focus is not only on his career as a scholar, but also on his childhood, interests, and family. Thus, the article has a double focus: to represent him as a scholar and as an ordinary person. The latter focus is also highlighted by the use of an old photo (colours, clothes of social participants, and frame of the photo) and the relationship between the people. Without the textual context, the viewer sees only a group of friends, and it is even impossible to distinguish the scholar from others; however, the combination of the text and the photo emphasizes new features in the representation of Kazimieras Župerka; namely, a relationship with friends or life conditions when he was young. The representation of the scholar functions as a way to attract broader audiences to scholarly issues, as the popular scientific article is then a combination of popular science and a biography.

Mass scenes are also represented in pictures, which in most cases portray historical events, such as battles, conquests, or the Crusades. Compared to photos, pictures of mass scenes are used more often, and there may be several reasons for this. First, they depict historical events which happened many years ago; thus, this is the only possible way to provide visual material about them. Second, the works of famous painters are used; thus, the possibility of visualizing a historical event and seeing a famous piece of art is provided.

Most depicted mass scenes in pictures and photos belong to the field of history, especially that related to military activities. An example of such a picture can be seen below:



**Picture 24.** Picture from the article “Battle of Ball’s Bluff” (*American Heritage*; Vol 61, issue 2)

Picture 24 does not depict the battle scene in detail, as neither the people’s faces nor clothing or guns are clearly visible; furthermore, red trees and the black figures of people reinforce the emotional and dramatic effect of the picture.

The data strongly suggest that individualism in popular scientific articles in the humanities is related to the subgenre of popular science. From a cultural point of view, the dichotomy ‘individualism’ vs ‘collectivism’ may be drawn. It is clear that popular science is

dominated by individuals in English and Lithuanian articles, while the representation of a scholar in a larger group of people is also typical of Lithuanian popular scientific articles. This emphasizes the difference in the relationship between the scholar and lay people, as in Lithuanian cases this division is sometimes blurred visually.

### 5.2.5 Representation of Gender

Gender issues are more common to other discourse types than science. For instance, in literary texts or newspapers/magazines the readers may find quite elaborate descriptions or photos/pictures, depicting men or women. Typically, scientific writing would not be associated with gender stereotypes, as the primary aim of such texts is to inform the reader and to be maximally objective. However, the analysis of popular scientific texts has revealed that even though the textual mode primarily serves an informative purpose, the visual mode reveals or reinforces existing gender stereotypes.

Quantitative analysis has demonstrated that the represented person most often is a male, while the numbers of male and female authors of the articles are practically the same. Second, social actors depicted in pairs, small groups, or mass scenes (see Table 8) reveal some typically feminine or typically masculine features, which are discussed in this section.

**Table 8.** Visual representation of individuals concerning gender in English and Lithuanian

	Authors represented visually				Social actors represented visually				Total			
	EN		LT		EN		LT		EN		LT	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
No.	28	27	4	-	62	35	92	19	90	62	96	19
%	18%	18%	3%	-	41%	23%	80%	17%	59%	41%	83%	17%

As can be seen in Table 8, a distinction can be made between the visual representation of authors of the articles and the social participants in the articles in English and Lithuanian. In English, the number of represented male and female authors of the articles is almost the same. However, this is true only for the articles which represent the author visually. Taking into consideration all the articles under investigation, the results are different. In total, men wrote 126 articles and women 86, while in 110 articles the author is not identified.

As has already been mentioned, it is not common to represent authors of the articles visually in Lithuanian. As Table 8 indicates, only 4 male authors of the articles are represented visually by including their photo, but there are no photos of female authors.

Furthermore, more articles are written by men in general, 129, while women wrote only 59 articles. Thus, male authors dominate both in English and Lithuanian, but in English they are given more prominence by including their photo.

A typical social actor is also a male both in English and Lithuanian articles. As can be seen in Table 8, as many as 80% of the represented individuals in Lithuanian images are male, which make up 18% of all images in popular scientific articles, whereas in English images, male social actors make up 41% of represented individuals, or 11% of all images. The number of represented women social actors is smaller, i.e. they are represented in 23% (6% of all images) of articles in English, and only 17% (4% of all images) of articles in Lithuanian.

The quantitative analysis demonstrates that a more common author and social actor in popular scientific articles is a male. This tendency raises several questions: is this a conscious choice? Why are men represented more frequently? What are the cultural influences that dominance of masculinity is more apparent in Lithuanian articles? These questions do not have easy and obvious answers. What is definitely evident is the fact that the reader may get the impression that the academic domain (specifically, the humanities) is dominated by men, as the photos mostly depict male scholars, especially in Lithuanian articles.

In addition, in English a photo of a male is chosen as an illustration in the articles related to more general topics, not to males directly. The photos of baby boys are used for the same purpose even though the article talks about children in general, while the photos of females are not used for this purpose. For instance, the article “Human Ancestors Interbred with Related Species” (*nature.com*, September 5, 2011) (see Picture 25), provides the information that 35,000 years ago genetic mixing occurred in Africa. The illustration could potentially have depicted both males and females or children; nevertheless, the photo shows a skinny male, preparing to cook some vegetables in a shabby tent:



**Picture 25.** Photo from the article “Human Ancestors Interbred with Related Species” (*nature.com*, September 5, 2011)



**Picture 26.** Photo from the article “Gender differences in the brain” (*Popski*, November 3, 2008)

Another example where males seem to be deliberately chosen as social actors is the article “Gender differences in the brain” (*Popsci*, November 8, 2008), where the photo depicts 4 boys even though the article explores the topic of gender differences in learning (see Picture 26). Despite the general topic, a tendency to portray males can be observed. These tendencies are not observed in Lithuanian popular scientific articles, as more general articles cannot be found, i.e., they are related to a particular person; accordingly, his/her photo is incorporated in the article. Thus, in both languages/cultures male dominance is highlighted by visual means, either by illustrating the person described in the article or choosing a photo of a male for general articles.

As for the authors of the articles or the represented scholars, masculinity and femininity features are unmarked, as the photos are more neutral. When other professions are depicted, more stereotypical masculine or feminine features are expressed; i.e., the women artists are beautiful, have long hair, and are dressed in fashionable clothes, while males seem to be physically strong, look serious and confident, wear a short beard or moustache, or engage in an activity that requires physical strength.

Furthermore, typically masculine or feminine features are expressed in the representation of pairs, small groups, or mass scenes with the exception of an academic environment. As in the case of the representation of individual scholars or authors of articles, masculine or feminine features are not highlighted in mass scenes. What is emphasised more is the collegial relationship when a group of scholars are engaged in a discussion or common scholarly activity (as exemplified in Picture 7 above) or a power relationship when a teacher/lecturer and students are depicted (as in Picture 27):



**Picture 27.** Photo from the article “The Island” (*The New York Times*, June 15, 2008)

In this example, the lecturer occupies the central position, which signifies importance; he demonstrates a picture, while the students surround him and listen. Clearly, the lecturer is the one who provides knowledge, and is superior, and the position of the students can be described as inferior; they are the ones who passively receive the lecturer’s knowledge.

Masculine or feminine features are mainly expressed through a relationship with other people, especially when a pair or a small group (3-5 people) are depicted. When mass scenes are represented, either both genders are mixed or the focus is on a large number of participants or a common activity. As can be seen in Table 9 below, masculine is the dominant gender when pairs are depicted:

**Table 9.** Representation of pairs of social participants in English and Lithuanian images

	Representation of pairs in English				Representation of pairs in Lithuanian			
	Male+Female	Female+female	Male+male	Parent+child	Male+female	Female+female	Male+male	Parent+child
No.	7	2	10	4	11	2	13	5
%	30%	9%	43%	18%	35%	6%	42%	16%

As can be seen in Table 9, in English and Lithuanian images, the representation of two men dominates (43% and 42%, respectively), while the representation of two women makes up only 9% in English and 6% in Lithuanian.

In addition, men also dominate in the representation of small groups. The quantitative data are presented in Table 10:

**Table 10.** Visual representation of small groups in English and Lithuanian images

	Representation of small groups in English			Representation of small groups in Lithuanian		
	Male	Female	Male+female	Male	Female	Male+female
No.	12	5	5	19	3	9
%	54%	23%	23%	61%	10%	29%

As indicated in Table 10, small male groups are more typical of Lithuanian popular scientific articles than those in English. This can be related to the subject field, as a significant part of the articles are concerned with Lithuanian history. Males dominated in the main events described in the articles, such as the declaration of Lithuanian independence or the interwar period, so that such photos reflect the tendencies in the society of the time. However, in English the articles are not necessarily directly related to males; thus, a male is a typical representative not only in the representation of individuals but also in the representation of pairs and groups.

In the representation of pairs and small groups, both masculine and feminine qualities are highlighted by close physical distance and common activities. This is especially noticeable when a male and a female are depicted. Affection is expressed by a very close

distance, as the people sit or stand next to each other, sometimes so close that they touch or embrace. A typical example can be seen in Picture 28:



**Picture 28.** Photo from the article “Couples who Say “We” Do Better at Resolving Conflicts” (*Science Daily*, January 28, 2010)

In Picture 28, the contrast between the black background and the white clothes of the participants reinforces the focus on their relationship. The man is presented as stereotypically masculine, while the woman is stereotypically feminine: a strong man who comforts and protects his woman, and a more fragile and weaker woman happy to find the support and strength in her partner, in this way emphasizing typical gender roles.

When two or more males are depicted in English popular scientific articles, such typical masculine features as physical strength, courage, or competitiveness are expressed by their physical features, activities, or position in relation to each other. Concerning professions, this is highlighted when soldiers are portrayed or war scenes are depicted (see Section 5.2.3), while in a few cases males symbolically confront each other or are in a power relationship to each other, as can be seen in Picture 29:



**Picture 29.** Photo from the article “Can Gary Chapman Save Your Marriage?” (*The New York Times*, November 19, 2011)



**Picture 30.** Photo from the article “Įvairiaspalvis XVII amžiaus Klaipėdos miesto ir valsčiaus gyvenimas<sup>18</sup>” (*Mokslo Lietuva*, July 9, 2009)

<sup>18</sup> “A Multicoloured Life of Klaipėda City and its Rural District in the 17th Century”

The impression is created in this photo that the men are in a power relationship: they are positioned in front of each other, one is standing on the stage, while the other is at the stage, and there is no bodily contact between them, while the eye contact is direct. Similar to the expression of feminine features, such photos serve the purpose of emphasizing typically masculine features and contributing to the existing gender stereotypes.

However, the representation of males in Lithuanian is more neutral, as a more collegial rather than competing relationship is expressed. The depicted males either shake hands, discuss something, or sit/stand and look at the camera, which suggests a more controlled environment. An example of typical male representation in a group in Lithuanian can be seen in Picture 30. The men depicted in the foreground are dressed in more formal clothes and are engaged in a common activity, i.e., ceremonially opening a building by cutting a ribbon. This photo illustrates the tendency of the majority of photos which represent groups of men in Lithuanian, i.e., collaboration or a common activity is more typical than confronting or competing relationships. In this way, the representation of male social actors is similar to the representation of scholars, where gender roles are not highlighted.

In general, representation of males dominates in the photos of popular scientific articles in English in Lithuanian. The representation of individuals and pairs or groups contributes to the existing gender stereotypes expressed by the appearance, typically masculine or feminine activities, or affection between the depicted social actors. Masculine stereotypes are more common in English than in Lithuanian, where males are depicted in a more neutral way or by emphasizing cooperation. The visual highlights traditional gender roles; it also implies the values in a society, such as family relationship. However, male and female scholars are portrayed in a neutral way and neither masculine nor feminine features are highlighted.

### **5.2.6 Representation of Non-Western Cultures**

As for the nationality of people represented in popular scientific articles in English, most of them are Europeans or Americans. Popular scientific articles in Lithuanian depict Lithuanians exclusively; thus, this section analyses the representation of non-Westerners in English. African-Americans are mainly represented in the magazine *Word.*, which discusses linguistic differences between African-American English and Standard American English. Here there are 18 photos (only 3% of all the images) that depict people of non-Western cultures, both individuals and pairs, or small groups. The photos of non-Westerners reveal how distant and exotic cultures are represented in contrast to Western cultures, and what stereotypes are formed visually about non-Western nations. Several distinct variables need to be discussed in relation to the representation

of non-Westerners and the stereotypes that are reinforced. Most prominently, ‘otherness’ is expressed by clothes, facial features, individuality vs collectivity, and setting, which are discussed in this section.

First, clothing is probably the most obvious feature which helps identifying the represented people as ‘unknown,’ ‘strange,’ or ‘exotic.’ Even though these words may seem racist, they are still perhaps the most common when describing unknown or distant cultures. The clothing is very colourful and embroidered, women wear much jewelry, big earrings, and head covers or, on the other hand, they look very poor and shabby (see Pictures 31 and 32):



**Picture 31.** Photo from the article “How Could a Tribe Remain Undiscovered in the Amazon in the 21<sup>st</sup> Century?” (*HowStuffWorks*)



**Picture 32.** Photo from the article “Music Is in Our Genes” (*nature.com*, December 10, 2007)

In Picture 31, the contrast between a Westerner and a non-Westerner is apparent. The man’s casual T-shirt can be contrasted to the embroidered and colourful woman’s dress, bright yellow head cover, and big ring in her lip. On the other hand, Picture 32 depicts an African tribe, whose people dance with spears, their bodies wrapped only with pieces of fabric. Probably such visual representations strengthen the stereotype about non-Western cultures as exotic, strange, or poor.

Second, such variables as hair, eyes, ears, cheeks, or lips serve as indicators that the represented person is a non-Westerner. On the one hand, these variables help to identify the person as a non-Westerner; on the other hand, they may also impose a derogatory attitude towards the represented person. For instance, the person depicted in Picture 25 above can be not only identified as ‘exotic’ but also provokes the readers’/viewers’ emotional attitude. In addition to his poor appearance and the environment that he lives in, his position as inferior is reinforced by the vertical angle of the shot. The impression is created that the viewer is looking down at the portrayed man, and it could be stated that such a choice of the photo is racist (people are similarly represented in three cases).

As has been mentioned, the total number of the represented non-Westerners is eighteen, which makes up 7 % of all the depicted social actors. Only three photos portray individuals, while the remaining fifteen photos represent pairs or small groups. These numbers suggest that, contrary to the abundant representation of individual Westerners, the people of non-Western cultures are portrayed as collectivists. Belonging to a group is emphasized not only by a common appearance but also by common activities, such as communicating, doing manual labor, or dancing. An example of collectivist non-Westerners can be seen in Picture 32 above, where in-group dependence is expressed by the same activity and purpose.

Finally, setting also contributes to the representation of ‘exotic’ cultures, as non-Westerners are depicted either near or inside their house or in an open space, as in Picture 32. The full picture of the houses is not given; still, the buildings look wooden, poor, or even shabby, as, for instance, the shelter in Picture 25 is made only of big leaves and other natural materials. Open spaces are not very typical (only four examples), which signifies freedom or being closer to nature. Thus, the stereotype is reinforced that non-Westerners are poor and live in a more natural environment, or are closer to nature than Westerners.

To generalize, non-Westerners are represented as strange and exotic people dressed in colourful and embroidered clothes, who wear massive jewelry and live in poor houses, or simply shelters. Furthermore, their collectivism is highlighted by common activities. In addition to the reinforcement of this stereotype, the chosen photos provoke a certain attitude from the readers or even encourage looking at them as inferior people.

### **5.2.7 Other Categories of Photos**

As has been discussed, the representation of people is the most frequent in photos and pictures, and reinforces gender, professional, or national stereotypes. However, visual representations are not limited to people; for instance, photos typically depict texts or their facsimiles, landscapes, or objects, especially historical artifacts. The photos depicting objects or facsimiles are related to the subject field, such as history and linguistics. These objects visualize the ideas described textually and add authenticity to discourse as the readers can see authentic objects, excavations, or original texts, which are not easily accessible for ordinary readers. In addition, the depicted landscapes are atypical of academic discourse. The photos of the sea or broad views at the city from a vertical angle add figurativeness or expressiveness to the discourse and modify it.

The photos which represent **objects** form a comparatively substantial category of the photos used in the popular scientific articles (103 photos, or 18% of all images) (see Table 11). An object here is understood as a thing used in everyday life or a historical artifact.

**Table 11.** Categories of represented objects in popular scientific articles in English and Lithuanian

Objects							Texts		Landscapes		
EN		LT					EN	LT	EN	LT	
Historical artifacts	Everyday objects	Buildings	Memorials	Coat of arms	Historical artifacts	Other	Facsimiles	Book covers			
92	11	18	6	9	9	3	17	60			
<b>103</b>		<b>45</b>					<b>22</b>	<b>77</b>		<b>23</b>	<b>19</b>
<b>69.5%</b>		<b>31.9%</b>					<b>14.8%</b>	<b>54.6%</b>		<b>15.5%</b>	<b>13.4%</b>

A typical historical artifact is a statue, money, inscriptions, mummies, etc., found during archaeological excavations and photographed in an original position and state; therefore, the reader/viewer can feel involved in the archaeological research and see the views that are usually seen and experienced only by the specialists, i.e., archaeologists. An example of such a photo can be seen below:



**Picture 33.** Photo from the article “Roman Statues Trace Back to Troubled Dynasty” (*DNews*; February 2, 2009)

Even though the reader/viewer does not have the possibility to see the excavations in reality, he/she can see the process or the result in the photos, in this way creating the impression of participating in the research.

In addition, the photos of this category are more contextualized, as the reader/viewer can see not only the object, but also the location where it was found, its position, depth of excavation (see Picture 33 above), or the surrounding places (e.g., the ruins with Augustus’ possible birthplace in the article “More Findings, Uncertainty about Emperor’s Birthplace” *DNews*; November 10, 2011). This helps to understand the archaeological research better and provides additional information, which is not mentioned textually.

In other photos, the objects (e.g. jewellery) are depicted without any context as a black background is chosen. These objects would be very difficult to describe accurately or it would take much space; furthermore, the description still might be interpreted differently based on the different knowledge of the readers. Thus, the photo provides the possibility to avoid ambiguity, to save space, and to represent the object accurately. Because of these reasons, the

objects are not described in great detail in the articles, which focus on other aspects, such as the archaeologist, the location where the object was found, or its historical significance.

Another category is the representation of everyday objects which are typical of contemporary society, such as computers, mobile phones, robots, a plastic bag, and fruit. The importance of the newest technologies and indirect suggestions for using them are highlighted by the representation of technical devices, such as mobile phones, computers, or robots. These photos appear in the articles on linguistics; thus, they relate linguistic research with technologies and create a difference between popular scientific articles in English and Lithuanian.

In Lithuanian, only a small subcategory of objects visualizes historical artifacts; rather, the focus is placed on the commemoration of historical events or personalities. For instance, buildings where famous Lithuanians were born or lived, or the memorials (tombstones or monuments) are photographed, as exemplified in Picture 34:



**Picture 34.** Photo from the article “Per amžius neblėstanti šviesa<sup>19</sup>” (*Lietuvos aidas*, November 22, 2011)

The tombstone depicted in Picture 34 was built for the priest and book carrier Jonas Šoblickas, while the article relates his life to broader cultural and historical issues. Thus, the informative function of the article is combined with the patriotic idea to commemorate Lithuanian cultural activists and their work. Furthermore, instead of portraying noble Lithuanian personalities, their coat of arms is chosen, which also serves as the metonymy of a person or the whole family; however, this feature is typical only of a small number of articles.

Another category of represented objects in photos is the **representation of texts**, i.e., photos of book covers or open books, facsimiles of documents, photos of ancient texts, or photos of dictionary pages with an entry or entries (22 examples). The reproduction of texts in popular scientific articles may be justified by the field of the humanities. Texts are important sources for linguistic or literary analysis as well as history; consequently, the articles where texts are reproduced are concerned with either linguistics or history.

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<sup>19</sup> “The Light Which Does Not Fade for Centuries”

First, photos of a dictionary entry are related to the title or the topic of the article, as the photo contains a key word of the article, which is also included in the title. An example of this representation can be seen in Picture 35:



**Picture 35.** Photo from the article “Artificial Grammar Reveals Inborn Language Sense, Study Shows” (*Science Daily*; May 16, 2011)

The article reveals the results of new linguistic research which shows that human beings are born with knowledge of certain syntactic rules. The key word ‘grammar’ is also repeated in the title; this word is reemphasized once again by the visual, thereby highlighting its importance in the present text. A dictionary is chosen as a reliable and typical source for meanings of words, in this way emphasizing the importance of written sources; however, the reader/viewer can see only a part of the definition, which is also typical of other photos of this type.

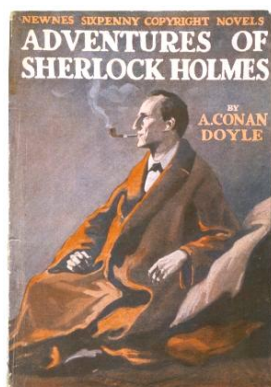
Photos of ancient documents depict manuscripts dated thousands of years ago, such as the Code of Hammurabi or an ancient Biblical script. The value of these manuscripts is placed by including their photo so that lay people can see these documents. Even though a non-specialist is not able to read them, interest is aroused by looking at mysterious inscriptions in clay or marble. An example of such a manuscript can be seen in Picture 36:



**Picture 36.** Photo from the article “First Arabic Crusader Inscription Found” (*DNews*, November 15, 2011)

More prominence is given to the inscription by the black background and close shot; therefore, the reader/viewer may see every detail of the document, even though it is not understandable. The photo serves several functions, i.e., to attract the reader, to facilitate writing and reading about the document in question, and to emphasize its value. Similar functions are performed by document facsimiles (e.g., documents written during the French Revolution or duels among American politicians).

Finally, the photos of books, both covers, and open books serve as metonymies for all works of a person (e.g., Arthur Conan Doyle), as exemplified in Picture 37:

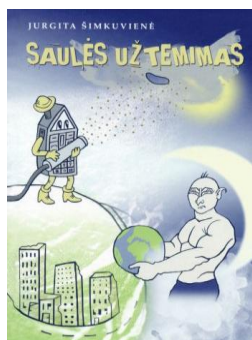


**Picture 37.** Book cover from the article “Detective Novels: A very British Crime Wave” (*History Today*; December, 2010)

The article discusses the works by Arthur Conan Doyle and other British detective writers and explains how the writers mirrored the society and why changes in social mores eventually affected their sales. Sherlock Holmes is a typical detective and one of the best known characters in detective fiction. Thus, the cover of the book is chosen as a typical example of detective fiction and a metonymy for all detective books.

The representation of texts (facsimiles and book covers) is especially typical of Lithuanian popular science. Facsimiles of important documents add authenticity to the discourse; accordingly, readers can visualize the documents described in the article, which are significant from the scholarly point of view (e.g., documents related to Lithuanian independence).

Despite the fact that the articles appear online and much information may be accessed electronically, a printed book is represented as a value in Lithuanian by including book covers in popular scientific articles. The reader thus receives the information provided textually and is indirectly encouraged to read the book. This tendency is especially noticeable in the magazine *Rubinaitis*, which focuses on children’s literature (see Picture 38):



**Picture 38.** Book cover from the article “Pasakos – vis dar pasakos<sup>20</sup>” (*Rubinaitis*; January 1, 2011)

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<sup>20</sup> “Tales are still Tales”

The reader is introduced to the main tendencies in children’s literature; furthermore, the cover serves as an advertisement for the reader to attract his/her attention and, possibly, buy the book.

To generalize, the representation of texts performs the following main functions: to attract the reader’s attention, to highlight the importance of a phenomenon described in the article, to emphasize the value of old texts, or to represent a broader issue metonymically. In addition, the representation of book covers is more typical of Lithuanian, thereby emphasizing the importance and value of printed books.

**Landscapes**, which are typically not associated with academic genres, can be grouped into two categories: urban and rural landscapes (23 examples in total, or 4% of all images). There are several features common to urban landscapes. First of all, they are represented from a vertical angle, so that the viewer/reader can see the city, its houses, streets, and skyscrapers from above (see Picture 39):



**Picture 39.** Photo from the article “Carnaval of Culture” (*Language Magazine*; October 4, 2010)



**Picture 40.** Photo from the article “Terms of Engulfment: Changes in the Skies” (*Scientific American*; May 11, 2011)

The reader/viewer can admire the view of the city and use his/her imagination to consider how it looks in reality, as the photo also functions as a representation of a certain country or culture. Furthermore, the article explains that Brazil flourishes, provides some information about the country itself, and focuses on the education system. The relationship between the text and the image can be described as complementary, to use Nikolajeva and Scott’s (2006) term, as the text provides information, while the visual functions as a representation of the culture described. The same examples can also be given about French or Italian culture.

The feature most common for photos of rural landscapes is open spaces photographed from a horizontal angle, which allows the reader/viewer to see far into the distance and admire the view. The photos also contain some traditionally romantic images, such as a sunset, the mountains, or the blue sky (see Picture 40). The photo in Picture 40 is an example of how the textual and the visual join two at first sight unrelated issues, i.e., a beautiful and romantic landscape and textual information on a threatening disappearance of some languages in the Pacific because of climate change. However, the relationship between the textual and the visual can easily be observed, as, first, the visual provides the context of where

the action takes place; second, the view to the distance may symbolically be related to the disappearing languages. Thus, the depicted landscape performs both a contextual and symbolic function, which is apparent in other articles of this category as well.

In Lithuanian articles, the symbolic relationship between the represented landscape and the article cannot be observed. The photos, instead, depict easily recognizable and typically Lithuanian rural landscapes, which are related to the issues discussed in the articles (e.g., the landscape of the village where a Lithuanian writer, cultural activist, or scholar was born is photographed) (see Picture 41):



**Picture 41.** Photo from the article “Mokyklos ir kaimo likimai panašūs<sup>21</sup>” (Mokslo Lietuva, July 23, 2009)

In other photos of landscapes, Lithuanian towns are depicted; however, all the landscapes are exceptionally Lithuanian, thus emphasizing the nationalistic aspect, while in English articles global, rural, and urban panoramas are represented.

### 5.2.8 Other Categories of Pictures

Part of the drawn **pictures** represents people, either individuals or mass scenes as discussed in Section 5.2.4. In addition, other categories of pictures, such as caricatures, graphs, and maps, may be distinguished in English and Lithuanian articles; they are presented in Table 12:

**Table 12.** Categories of pictures in English and Lithuanian popular scientific articles

	Caricatures		Graphs		Maps		Other	Total	
	EN	LT	EN	LT	EN	LT	EN	EN	LT
No.	10	2	20	10	48	7	31	<b>109</b>	<b>19</b>
%	9.2%	10.5%	18.4%	52.6%	44%	36.8%	28.4%	<b>100%</b>	<b>100%</b>

As can be seen in Table 12, the total numbers differ almost six times in English and Lithuanian popular scientific articles, which indicate that the representation is dominated by people in Lithuanian cases, while more varied modes are chosen in the English ones.

The subjective and expressive, as well as the humorous effect is reinforced by the use of caricatures in popular scientific articles. Despite the small number of the caricatures (i.e.,

<sup>21</sup> “Destinies of the School and the Village are Similar”

ten caricatures in English and two in Lithuanian, as indicated in Table 12 above), certain tendencies can be observed and their functions in popular scientific articles may be discussed.

First, caricatures depict the information provided in the article in a humorous way, which could be related to the subgenre, i.e. popular science. Its aim is to attract the reader and to present scientific information in an interesting and understandable way; thus, a humorous representation may facilitate the understanding of the ideas described in the article. Furthermore, caricatures express the author's stance, i.e., a certain attitude or opinion towards the topic described in the article. For instance, the rise of e-books is visualized as follows:



**Picture 42.** Caricature from the article “Technology: Rise of the E-book” (*nature.com*; December 22, 2011)

In this caricature, the rise of the e-book is metaphorically understood as a high pile of books, on top of which a person is holding a tablet and reading an electronic book, which is given prominence by a shiny white colour. In addition, the introduction of the article tells a humorous story about the wife of the author of the article, who used to read many books while on holiday, which were very difficult to carry, until she started reading e-books, which facilitated their life. Thus, a part in the article (an introduction in this case) and the picture add personalization and humour to the article, while the rest of it discusses the issues in a scholarly way.

Furthermore, caricatures contribute to the conceptualization of more complex or unknown phenomena. For instance, the ongoing discussion about yetis, or snowpeople, is visualized in the following way:



**Picture 43.** Caricature from the article “Yeti Finger’ Mystery Solved” (*DNews*; December 29, 2011)

Despite the ongoing debate and attempts to find some clear proof about the existence of yetis, no one has seen one in reality. The article provides the information that an oversized finger, long claimed to belong to a yeti, has been identified as human, while the picture visualizes the yeti in an amusing and slightly ironic way, thereby expressing the author's attitude. Thus, the aim of caricatures in such cases is to help the readers create a certain image about an unknown issue and to entertain them, which is also essential in popular culture in general (cf. Fiske 1995).

In Lithuanian popular scientific articles, more abstract drawings are chosen in order to illustrate historical articles; however, the relation between the text and the visual has to be found by the reader himself/herself. For instance, the article about the Lithuanian independence movement 'Sajūdis' is illustrated by the following picture:



**Picture 44.** Picture from the article “Kas surimavo Sajūdi?”<sup>22</sup> (*Post Scriptum*, 2010, Nr.17)

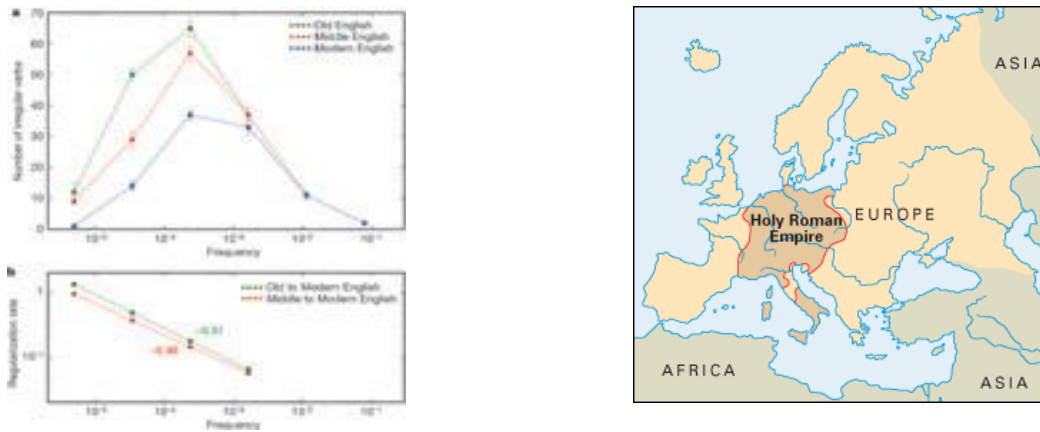
The article discusses the beginning, influences, and effects of the movement for Lithuanian independence, and the picture by Sandi Billingsley can be related to the ideas discussed in the article: such a representation may be described as more expressive and artistic.

In the present thesis, graphs and maps are viewed as a type of picture, despite the fact that they are computer-generated rather than drawn or painted. The usage of maps is conditioned by the subject field, as the articles in history, where maps are typical, form a substantial part in the corpus, while graphs are dominant in linguistics. In addition, the magazine which includes most maps is *HowStuffWorks*. Despite the substantial number of historical articles, most maps appear only in this magazine; thus, the appearance of maps in popular scientific articles is conditioned not only by the subject field, but also by the magazine itself.

Furthermore, a difference in the choice of colours can be observed between graphs and maps. In the former case, quite contrasting colours are chosen to illustrate different trends, while in the latter case, neutral or similar colours are chosen (see Picture 45):

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<sup>22</sup> “Who Rhymed Sajūdis?”



**Picture 45.** Graph from the article “Quantifying the Evolutionary Dynamics of Language” (*nature.com*; October 11, 2007); Map from the article “Holy Roman Empire” (*HowStuffWorks*; February 27, 2008)

As can be seen in the original graph, three contrasting colours, i.e. blue, red, and green are used to illustrate three different trends of irregular verb regularization, while yellowish and brownish colours are chosen to depict the map of Europe with more emphasis expressed by a darker colour for the Holy Roman Empire, which is the subject matter of the article. Only the boundaries of the countries, empires, or routes are signaled by red colour.

The analysis has revealed that both maps and graphs present the information in a compact and concise way. This is also a space-saving strategy, as long and precise descriptions would be necessary to convey the same information. The only difference is that a graph is typically followed or preceded by textually presented information, while maps function as more independent entities, as they are not necessarily described in the text. However, the viewer can see the territories mentioned in the text visually or note the change in territories very clearly. Thus, the visual, i.e., the map, serves a clarificatory function, as it accurately shows the territories being written about.

Graphs, on the other hand, combine two modes, the visual and the textual more, as the figure is described in the text to some extent. Nevertheless, the descriptions are not very accurate and mainly only the basic tendencies are described. In this case, the visual provides more information, which can be retrieved by analysing the graphs in greater detail, but which is not essential to understanding the whole text.

### 5.3 Functions of the Visual in English and Lithuanian Popular Scientific Discourse

Discourse functions have been widely discussed and analysed by various scholars. Starting with the basic model of informative, expressive, and persuasive texts, different authors enumerate various discourse functions and forms. For instance, Jakobson distinguishes between referential, emotive, poetic, conative, phatic, and metalingual discourse functions (Jakobson 1960: 350-377). Steger (1974) discusses six functions of oral discourse, namely, presentation, message,

report, public debate, conversation, and interview. Werlich (1982) describes five basic forms fundamental to discourse types (descriptive, narrative, explanatory, argumentative, and instructive) and distinguishes between subjective and objective presentation. Furthermore, on the basis of lexico-grammatical features, Biber distinguishes eight text prototypes (Biber 1989). The list could be continued with other authors as well; however, it should be noted that their focus has been mainly on written texts, while the visual, which forms an inseparable part in most discourse types, has not received considerable attention. Thus, the aim of this chapter is to discuss the main functions of the visual in popular scientific discourse in the humanities.

A seminal framework of text metafunctions has been proposed by Halliday (1994), who distinguishes three text metafunctions: textual, interpersonal, and ideational. Textual metafunction refers to ways of joining sentences and their elements into cohesive and coherent unity, while interpersonal metafunction refers to creating or negotiating relationships with other people; the ideational function refers to the representation of the world.

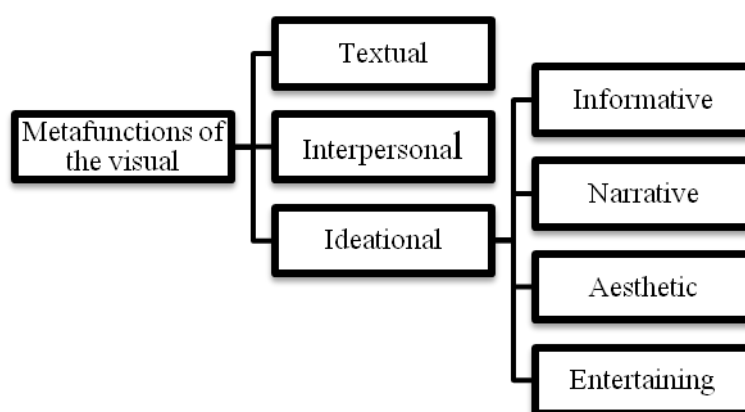
Halliday's model is also applied to the analysis of visuals by Kress and van Leeuwen (2006, 2010) and other scholars working in this field (e.g., Calsamiglia and van Dijk 2004, Forceville 2006, Norris 2012, and others). In the analysis of visuals, the ideational metafunction refers to the ability of semiotic systems to represent objects and their relations; the interpersonal metafunction refers to the ability of the semiotic system to project the relations between the producer of the sign, the viewer, and the object represented; the textual metafunction refers to the ability of the semiotic systems to produce texts.

As has already been mentioned, electronic discourse is multimodal in nature, as it combines texts, photos, pictures, sounds, videos, and other modes. Consequently, each mode has a certain function and contributes to the overall message of the article. By its nature, popular scientific discourse is informative; in addition, its entertaining function can be distinguished as a tool to attract wider audiences (this is also culture-dependent, as the analysis of English and Lithuanian popular scientific articles reveals). However, the visuals may express different functions and highlight different aspects when compared to those expressed textually.

The functions of the images are distinguished on the basis of their content and the most significant variables. In popular scientific discourse, the reader/viewer not only acquires the informative content but is also provided with the opportunity to visualize the ideas discussed in the article, receive additional information not expressed textually, admire landscapes of distant countries or famous artworks, or even identify with the emotional load expressed in pictures or photos. Thus, popular scientific discourse can be described as polyphonic, i.e., having the features or combining various genres. In academic discourse, on the contrary, illustrations are closely related to the text, as they support or visualize the textual information,

i.e. their function is primarily informative. In addition to genre-specific features, one can also observe cultural differences between popular scientific discourse in English and Lithuanian.

The basis for the present research is Halliday's theory on text functions and works by Kress and van Leeuwen. While analysing popular scientific discourse, it has been observed that, for instance, the textual and interpersonal metafunctions are homogeneous, while the ideational metafunction may be subcategorized further (see Figure 6):



**Figure 6.** Metafunctions of the visual in popular scientific discourse

As the data show, three main metafunctions of the visuals may be distinguished in popular scientific discourse. The textual metafunction refers to the structure or ‘grammar’ of images; the interpersonal metafunction is concerned with the relationship between the social actors, while the most typical one is ideational, as most visuals depict reality (people, objects, or places). Still, the effect of the visuals may be different, which forms the basis of distinguishing subcategories of the ideational metafunction. As the analysis of non-moving images in this investigation has revealed, the aim of informative visuals is to represent an objective reality, while other visuals ‘tell’ a narrative about the events. Even though the aesthetic and entertaining metafunctions may seem to overlap, their aims in discourse are different: aesthetic visuals are usually reproductions of famous paintings or photos of sculptures, while the authors of entertaining visuals remain unknown, and such visuals are incorporated into popular scientific discourse to attract the reader’s attention and to present the information from a humorous or figurative perspective.

Naturally, multiple functions of the visuals in popular scientific discourse can be expected, as the same visual may perform informative and narrative or interpersonal and textual metafunctions in discourse. Even though their analysis might produce interesting results, the present thesis is limited to the discussion of the possible metafunctions of the visuals in popular scientific discourse and their effect; thus, multiple functions and their combinations are not analysed here, and the primary metafunction of the visual is focused on.

As proposed in Kress's framework, most non-moving visuals have a certain structure, or a 'grammar' as he puts it, and may be divided into left and right or bottom and up areas, which carry an information load, or are said to have a **textual** metafunction. However, as has been observed while analysing images in popular scientific discourse, not all of them can have a textual metafunction, as for instance, the aim of a portrait (discussed in greater detail in Sections 5.2.2 and 5.2.3) is only to represent a person; thus, the visual grammar, even though applied in many cases, does not work for all genres. Despite some salient cases of examples with a textual metafunction (e.g., advertisements are usually structured according to certain 'rules'), this concept cannot be applied in all instances, especially photos, which tend to reflect the reality in many cases as precisely as possible.

The images which focus on relationship rather than convey information express the **interpersonal** metafunction. Such images, usually photos, add emotionality to the discourse and are more personalized in contrast to academic discourse where the visuals usually serve the informative purpose.

The interpersonal metafunction is mainly expressed by the portrayal of pairs in the photos, i.e., parents and children or couples, who express warm feelings, closeness, or affection, as exemplified in Pictures 46 and 47:



**Picture 46.** Photo from the article "Can Gary Chapman Save Your Marriage?" (*The New York Times*; November 19, 2011)



**Picture 47.** Photo from the article "The Gift of Learning" (*Language Magazine*, December 1, 2010)

In Picture 46, many couples holding their hands and looking at each other create the impression of intimacy and affection. The emotional content is highlighted by the massive scale of the activity. In Picture 47, the participants have no physical contact; however, the vectors created by the looks of the girls and directed towards the elderly man and smiles on their faces contribute to the creation of interpersonal relationship. The importance of interpersonal relationship is also emphasized textually, as the article talks about collaboration of the younger and the older generation to teach the latter certain skills, such as computer literacy.

The interpersonal metafunction is treated differently in Lithuanian popular scientific articles. Even though the social participants are similar in both cultures in the sense that their portraits, family members, colleagues, or friends are represented, the emotional aspect is apparent only in English popular scientific articles. This is also influenced by photographing traditions of the interwar period or the Soviet period: typically the participants are serious and look straight into the camera. Consequently, in Lithuanian articles, the social participants are more reserved or neutral compared to those in English articles (see Pictures 48 and 49):



**Picture 48.** Photo from the article “Vaikystės knygos – ir žaidimų šaltinis”<sup>23</sup> (Rubinaitis; January 3, 2011)



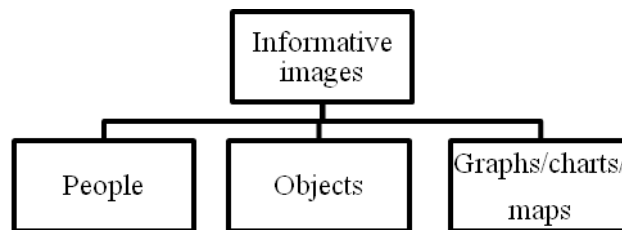
**Picture 49.** Photo from the article “Maja+Jonas=Rumanas” (Rubinaitis; April 3, 2009)

The social participants in Picture 48 are a family, parents and their son. Even though they share a very close relationship, which is also apparent from the article, the facial expressions or body language of the participants do not signal affection or warm feelings. The positioning of the people rather suggests a controlled environment while taking the photo. Picture 49 depicts a group of schoolchildren and, similarly to Picture 48, no particular emotions are revealed, as the social participants are standing or sitting next to each other and looking at the camera. Facial expressions signify the seriousness of the moment rather than an in-group relationship.

As has been mentioned, the **ideational** metafunction of the images refers to the representation of social participants or objects. The following subcategories can be distinguished: (a) informative, (b) narrative, (c) aesthetic, and (d) entertaining. Each of these categories will be discussed in greater detail.

**Informative** photos or pictures represent people or objects in detail with a focus on accuracy; thus their aim is to provide detailed information. Informative images can be subcategorized, as can be seen in Figure 7:

<sup>23</sup> “Childhood Books Are also a Game Source”



**Figure 7.** Subcategories of informative images

The images in the subcategory of people mainly provide information about scholars, both as the authors of the articles and the social participants of the photos. The reader thus can acquire information about the appearance of the person, about his/her facial expression, or actions; consequently, this information facilitates the understanding of scholarly activities or contributes to the creation of stereotypes of scholars, as discussed in Sections 5.2.1 and 5.2.2. Examples of such photos can be seen in Pictures 50 and 51:



**Picture 50.** Photo from the article “Linguists Discuss the “Hidden” Koro Language, Search for Last Speakers” (*The National Geographic*, October 6, 2010)



**Picture 51.** Photo from the article “Geriausi 2009-ųjų vertimai. Laimantą Jonušį ir Jurgą Katkuvienę kalbina Neringa Mikalauskiene”<sup>24</sup> (*Literatūra ir menas*, March 12, 2010)

The photos in Pictures 50 and 51 are informative in several aspects, as for instance, in Picture 50, the reader/viewer notices the differences between the appearance of the linguist and the person from the Indian tribe speaking an unknown Koro language. Second, the reader/viewer gains information about linguistic research of distant and disappearing languages. Third, one can also note the details of the setting, a typical room where the people of the tribe live. In addition, certain aspects, such as the clothing of the woman, are too difficult to verbalize accurately; for this reason the photo is chosen as a mode to perform the informative metafunction.

Picture 51 is also primarily informative, as the reader gains information about the participants, the action depicted in the photo (i.e. the interview), and the setting. Naturally, Picture 51 is not as informative as Picture 50 because the situation (the interview) and the social participants are recognizable much more easily and are more familiar to the reader/viewer; nevertheless, the primary aim of Picture 51 is to provide information.

<sup>24</sup> “Best translations of 2009. Neringa Mikalauskiene Interviews Laimantas Jonušis and Jurga Katkuvienė”

Drawn portraits of people take a distinct position in popular scientific discourse, as they are informative on the one hand and subjective pieces of art on the other. In the present thesis, it is considered that they primarily perform an informative metafunction, as they are maximally realistic and reach a high level of accuracy (see Picture 52):



**Picture 52.** Illustration from the article “Be šaknų lietuviybės medis nelapotų”<sup>25</sup> (*Mokslo Lietuva*; November 19, 2009)

The engraved portrait of Abraomas Kulvietis in Picture 52 is accurate and detailed. Furthermore, informative content is provided in the background of the picture as well: the reader/viewer can see not only the church, which suggests that the social participant was a scholar and a reformer of the church, but also the main information about the person written behind him on the right (i.e., his name and surname, approximate date of birth, and his position). The combination of different modes in the picture provides more concrete and detailed information about the person in question even though the subjective aspect cannot be denied.

The subcategory of ‘Objects’ provides information about historical artifacts or archaeological findings both in English and Lithuanian. The photos of the artifacts contribute to clarity and accuracy of the text as their verbal descriptions would either be elaborate and take much space or they would not achieve the same effect as the photo, which adds immediacy and represents the information in a clear and compact way (as, for instance, in Picture 53):

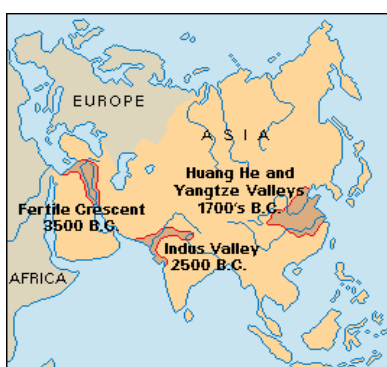


**Picture 53.** The photo from the article “Found Coins May Unveil a Lost Viking” (*DNews*, December 15, 2011)

<sup>25</sup> “The Tree of Lithuanianism Would Not Come into Leaf without its Branches”

The photo represents jewellery, every-day objects, and coins, which belonged to a Viking king and were found in the UK. In the photo, the reader/viewer can see the decorative ornaments on the jewellery, the size of the coins, and the shape and the size of the objects. In addition, there are more images in the article, which show these objects separately, i.e., a close-up of the coins or bracelets. Thus, the reader/viewer can see these objects in great detail, while the article provides information about the owner of these objects.

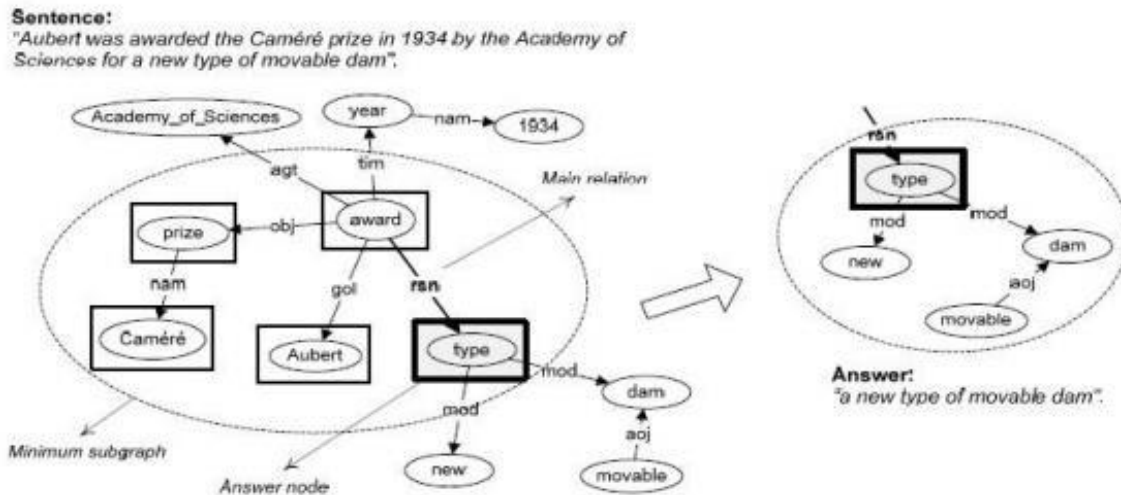
Both in English and Lithuanian articles, graphs, charts, and maps are also used to provide information in a compact and accurate way; furthermore, they also contain additional information, which is not discussed in the article (e.g., in maps, more territories can be seen in addition to the ones discussed in the article), as can be seen in Picture 54:



**Picture 54.** The map from the article “History of Asia” (*HowStuffWorks*)

Even though the map is not detailed and shows the borders of the continents only schematically, which are also highlighted by different colours, the reader/viewer can not only visualize the information described in the text, but also gain some additional details (e.g., the location of the Fertile Crescent or Indus Valley). It should be noted that in a few articles the maps are not described textually; thus, the text and the visual function as separate entities, and the reader has to relate them himself/herself.

The purpose of graphs or charts is to represent information in an accurate, compact, and structured way. Graphs and charts are usually described textually, which is a feature of academic discourse. Such a double textual and visual representation serves a clarificatory metafunction. An example of a graph can be seen in Picture 55:



**Fig. 5.** Answer deduction in the minimum UNL subgraph

**Picture 55.** Graph from the article “Computer Scientists Create a Multilingual Search Engine” (*Science Daily*, March 16, 2010)

The graph above demonstrates how a multilingual search engine works by giving a particular example, while a broader explanation, more examples, and information about the author of this engine are provided in the text. The same ideas are thus represented twice, only through different modes, the written and the visual, which is a common feature shared by academic and popular scientific discourse.

Another type of the ideational metafunction is **narrativity**, which underlies most images, as they tell at least a minimal narrative; therefore, several degrees of narrativity can be observed in popular scientific articles both in English and Lithuanian: (a) minimal narratives, (b) one-image narratives, (c) several-image narratives.

First, minimal narratives refer to portraits. On the one hand, the reader/viewer cannot see an elaborate narrative; on the other hand, he/she can discern a certain narrative in the social participant’s facial features<sup>26</sup>, as in Picture 56:



**Picture 56.** Photo from the article “R. Keturakis: mėlynojo kraujo poezija”<sup>27</sup> (*Kultūropolis*; June 28, 2010)

<sup>26</sup> The idea of minimal narratives is proposed by Bal (2004)

<sup>27</sup> “R. Keturakis: Poetry of Blue Blood”

Even though the reader's/viewer's attention is focused on the social participant in the foreground, the setting in the background not only highlights the poet's figure by the colour red, but also suggests an aristocratic personality and indirectly encourages a narrative: Where is the person? What is he doing there? What kind of place is he in?

One-image narratives include those instances when a story is told in one picture, or a photo, which is usually presented at the very beginning of the article. Typically, such a narrative expresses the main idea of the article, as for instance in Picture 57:



**Picture 57.** Photo from the article “Fun and Free World Language Learning” (*Language Magazine*; November 4, 2011)

The photo in Picture 57 appears immediately after the title and sets the scene for the whole article. The narrative is apparent: a group of young people are using their mobile phones. The reader has to read the whole article in order to find out the relation between the photo and the text; however, the narrative in the photo suggests that the article is concerned with contemporary IT or mobile telephone technologies. Thus, the narrative of the photo serves as the main idea for the whole article; this feature is particularly common in English popular scientific articles.

The most elaborate type of narrativity is when several photos are used in combination to create a narrative; therefore, the reader can explore two parallel narratives, the textual and the visual one. This type of narrativity is especially common to Lithuanian popular scientific articles. It can be only partially exemplified here due to lack of space (see Picture 58):



knygų...

Bet mano biblioteka buvo kitokia – ne namų, neturėjo. Mama buvo pradžios mokyklą tai per mokyklą? Man įstrigo tai, kad ji mums *„Aukštas kalnas, Birute vadintas, Žaliom*



buvusios vienuolyno žemės, reikėjo darbo jėgos, valstiečių. Tai gal vienuolai buvo atsivežę jų iš savo krašto... Tėvas kalbėjo lietuviškai su akcentu, o mama nemokėjo nė žodžio lenkiškai, jei ką ir pasakydavo, tai savaip, juokingai – buvo tikra aukštaitė nuo Survilaiškio. Mes, brolis ir sesuo, tarmės iš mamos neperėmė... Gelainiuose niekas tos tarmės nepalaidė. Gražiai kalbantys lietuviškai, savo tarme, buvo suvažiavę, visi atvykėliai. Daugelis šeimų „kombinuotos“ – vienas, vyras ar žmona, iš nutautusios šeimos. O baigiau Dotnuvos Akademijos vidurinę. Tai toks dvigubas, keistas gyvenvietės pavadinimas – Dotnuvos Akademijs (dabar – tiesiog Akademijs; seniau ten kurį laiką buvo Dotnuvos žemės ūkio akademija). Mes didžiudavomės nosį užriėtę, va, mes akademijoje mokomės!

– Ar buvo knygų namie?

– Stovėjo virtuvės kampe toks baldas – etažerė. Knygų spintos neturėjom, ne knygų spintoj užaugau, kaip apie Sartrą pasakyta. Kokių tų knygų buvo, dabar negaliu pasakyti, bet labai aišku, kad buvo kažkas iš Lietuvos istorijos, senesnių. Ten buvo kunigaikščiai, karaliai, jų portretai, ir aš juos piešdavau. Mane vis girdavo, ir krikštaitėvis (mamos brolis), kai atvažiuodavo iš Survilaiškio, būsi dailininku, sakydavo, ir aš būdavau laimingas. Vėliau piešdavau *štalinus*... Buvo gal ir pasakų



ne sava. Mokslo didelio tėvai baigus, sakė, šešis skyrius, kas iš mokyklos deklamuodamas: *pušelėm viršus apsuodintas*.

Nežinojau, aišku, tada, kieno tas eilėraštis, tik paskui sužinojau, kad Valiūno „žemaičių poeto“.

O biblioteką augdamas didelę turėjau, svetimą. Tai čia ta klėtis – istorinė. Toje klėtyje ir buvo ta biblioteka. Į mūsų kaimą atsikėlė gyventi tokia agronomė Lukošūnienė su penkiais vaikais. Vieni buvo mano amžiaus, kiti vyresni. Vyras miškininkas buvo išvežtas į Sibirą, ir ji, bijo dama, kad ir visą šeimą gali išvežti, bėgo iš savo krašto. Jie buvo inteligentai, turėjo didelę biblioteką, o čia gavo mažą butelį mūsų kaimė (Akademijoje dirbo bandymų stoty), neturėjo kur dėti knygų – jų buvo kelios didelės medinės dėžės. Mes turėjom daug erdvės: buvė ūkininkai, o dabar jau kolūkiečiai, neitų javų, grūdų beturim, neiką. Klėtis sausa, patogu, sako, ar nepnintumėt. Tai ten tų knygų, žurnalų, dabar galima būtų tik pasvajoti „Tautos mokyklą“, „Karys“, „Židinys“... Ko tikten nebuvo! Kai kurių laikraščių, žurnalų nebrangino, sakė – galit sviestą vyniot... O skaityt leido viską, paskaitai ir padėk. Nesu su draskęs, suplėšęs. Neskolindavom niekam – ne mūsų knygos. Skaitydavau ten viską iš eilės. *Tai gi* suaugusiųjų daugiausia literatūros buvo. Prisimenu, kad dar vaikas *Velnio eliksyrą* perskaičiau. Didelį įspūdį padarė – tas žmogaus susidvejinimas kažki koks... Daugiau tos knygos nesu skaitęs nuo vaikystės.

– Tegu tai ir banalus klausimas, bet vis dėlto – ar turite mėgstamiausią vaikystės knygą?

**Picture 58.** Print screen of a page from the article “Didelis dalykas rašyti vaikams, arba literatūra buvo mano svajonė”<sup>28</sup> (Rubinaitis; January 2, 2009)

As can be seen in the example above, the photos are incorporated in the text and follow a certain usually repeating pattern. The textual narrative provides the information about certain aspects of the scholar’s life, while the visual narrative visualises the same ideas and include additional aspects (e.g., the scholar as a child/pupil/student, his parents, grandparents, or friends). Clearly, popular scientific discourse is polyphonic, as the narratives supplement each other and only in this way can the reader acquire a more detailed picture. Furthermore, the abundantly used photos contribute to the vividness of the text, which engages the reader more effectively.

The polyphonic nature of popular scientific discourse is especially noticeable when the articles contain several images; in the case of Lithuanian articles this number may even reach 11-13 photos per article, which have different functions. Popular scientific discourse then becomes multilayered, as the basic dominant metafunction of the articles is informative (it is expressed both visually and textually), while the visuals add expressiveness, figurativeness, aesthetics, or emotionality to the genre. In addition, different functions of the visuals increase the interdiscursivity of the genre because they present not only people described in the article but also pieces of art, book covers, and maps (discussed in greater detail in Section 5.2.8).

<sup>28</sup> ‘It’s a Big Issue to Write for Children, or Literature Was my Dream’

The **aesthetic metafunction** of images refers to the photos or pictures which depict a piece of art, i.e., a painting, an architectural building, or a sculpture. In this way, the readers are introduced not only to the famous artists and can find out intriguing stories related to them, but can also see their works. The readers/viewers can thus admire these pieces of art; furthermore, the informative nature of the text is complemented by a different genre, such as a painting or a sculpture, as exemplified in Picture 59:



**Picture 59.** Photo from the article “Search for Lost Da Vinci Gets Desperate” (copy of Peter Paul Rubens’ *The Battle of Anghiari*; *DNews*, December 1, 2011)

While the article tells the mysterious story of a lost Leonardo da Vinci painting and the research being done in order to find it under another painting, the included picture is painted by another famous artist, Peter Paul Rubens, who painted a copy of da Vinci’s masterpiece. The readers both acquire intriguing information and can see the painting, its forms, colours, and style. The painting thus has an aesthetic effect, while the text provides the information regarding the painting, thereby merging two different genres, i.e., popular science and art.

The aesthetic metafunction can be observed in the visuals of Lithuanian popular scientific articles as well. The main difference which arises between the aesthetic visuals in English and Lithuanian is that sculpture is not typical of Lithuanian popular scientific articles; however, there are a number of photos with paintings and theatre artists during a performance, as exemplified in Picture 60:

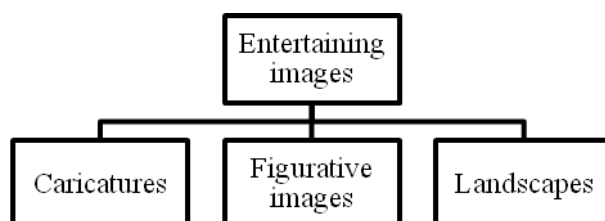


**Picture 60.** Photo from the article “Laiškas į užribį, šviesios atminties spektaklio „Amerika pirtyje“ režisieriui Valdui Lencevičiui”<sup>29</sup> (*Nemunas*; June 26, 2009)

<sup>29</sup> “A Letter beyond the Boundaries: to the Director of the Performance ‘Amerika pirtyje’”

The photo above has an aesthetic metafunction; it metonymically stands for the whole performance, especially for the readers/viewers who have seen it in the theatre. Furthermore, the viewers can see a moment from the performance, which creates a certain mood and a having-been-there feeling. The photo from the performance also functions as a different type of discourse incorporated in the article, which discusses the performance ‘Amerika pirtyje.’ Thus, such photos are also examples of interdiscursivity in popular scientific discourse.

**Entertaining** images refer to ones that are not related to the informative content of the article, but entertain the reader. As can be seen in Figure 8, the entertaining images can be subcategorized into more distinct subtypes:



**Figure 8.** Subcategories of entertaining images

First, some popular scientific articles are illustrated by caricatures, which provide a subjective and evaluative point of view towards the events described in the article. On the one hand, they reflect the realia in a humorous way; on the other hand, they also aim at entertaining the reader/viewer on the basis of historical events or linguistic research. Therefore, the reader/viewer receives both more objective and more subjective information, which is humorous in most cases. An example of a caricature can be seen in Picture 61:



**Picture 61.** An illustration of the article “Language: The Language Barrier” (*nature.com*; May 21, 2008)



**Picture 62.** Photo from the article “Linguistic Gem or just Another Pidgin?” (*nature.com*; August 29, 2007)

The humorous effect in Picture 61 is achieved by using anonymous and only schematized figures of the people who are facing an exaggerated language barrier: one is ‘talking’ in binary codes (i.e. 0 and 1), while the other is using Greek letters or English phonetic symbols. Thus, a language barrier is visualized in a humorous and exaggerated way.

In figurative images, an entertaining effect is mainly created by metaphors and metonymies, which add creativity and figurativeness to popular scientific articles. This contributes to the conventions of popular scientific discourse, as visual metaphors or metonymies are typically associated with other genres, such as advertisements or political cartoons. However, figurative images (see Picture 62) and language are typical features of popular scientific articles, especially in English.

Finally, landscapes incorporated in popular scientific articles entertain the reader, as they do not transmit any particular informative content, and the reader/viewer can see panoramic views of distant rural or urban places (see Pictures 63 and 64):



**Picture 63.** Photo from the article “Carnival of Culture” (*Language Magazine*, October 4, 2010)



**Picture 64.** Photo from the article “How the Great Wall of China Works” (*HowStuffWorks*)

It can be maintained that the reader is entertained by the views of unknown or distant countries. For instance, in Picture 63 the reader/viewer can see the lights and skyscrapers of a city and the panoramic view of the Great Wall of China in Picture 64. The choice of such photos is likely to be purposeful in order to arouse the reader’s interest and motivate him/her to read the article.

It should be noted that the entertaining metafunction is common to popular scientific articles in English, while it can hardly be observed in Lithuanian. No humorous images, caricatures, or figurative images can be found in Lithuanian, which possibly points to a cultural difference between popular scientific articles in the two cultures. In English an attempt is made to attract the readers, motivate them, and engage into reading the articles; in Lithuanian, the entertaining aspect is reduced to a minimum. The reader/viewer can only find some more abstract pictures/photos (e.g. Picture 65) and landscapes (e.g. Picture 66):



**Picture 65.** Image from the article “Paminklosaugos sąjūdžio alternatyva”<sup>30</sup> (*Post Scriptum*; 2010)



**Picture 66.** Photo from the article “Ir mes Juodojo jūroje žirgus girdėm”<sup>31</sup> (*Viduramžių Lietuva*; February 22, 2011)

<sup>30</sup> “Alternative to the Monument Protection Movement”

<sup>31</sup> “We also Watered Horses in the Black Sea”

Picture 65 titled ‘Superimposed forms’ was drawn by Jessica Dismorr in 1938, as indicated below the picture in the article. The picture is very abstract, and the reader/viewer can interpret the meaning of it himself/herself or just admire the forms depicted in the picture. The photo from the article “Ir mes Juodojoj jūroj žirgus girdëm” (Picture 66) entertains the reader by the beautiful landscape, but also has a historical significance: the Black Sea depicted in the photo connotes the period of Lithuanian strength and majesty. However, in general the entertaining metafunction of the visuals is not common in Lithuanian popular scientific articles. As has been noted, the interpersonal, aesthetic, and entertaining metafunctions are not typical or hardly used in popular scientific discourse in Lithuanian. On the contrary, in English they are employed to add vividness and figurativeness to popular scientific discourse.

Undeniably, different or more detailed metafunctions of the visuals in popular scientific articles may be distinguished. However, this thesis focuses only on the most distinctive and the most salient metafunctions, in order to show the main features of the genre and describe the interaction of various modes in popular scientific discourse. Future research might focus on a more systematic description of the metafunctions of the visuals, as well as the combination of different metafunctions in popular scientific articles.

#### **5.4 Relationship between the Textual and the Visual Mode**

The present investigation has revealed that there are several types of relationships between the textual and the visual in popular scientific articles. The types vary from a very strong relationship when the graphs or charts are described textually and represented visually, to a loose relationship when the visual is used only as a decoration. Mainly, the following types of relationship between the textual and the visual may be distinguished:

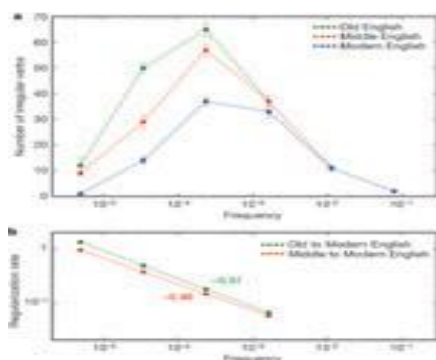
- (a) data are represented visually and textually;
- (b) the visual illustrates the social participants/objects described in the text;
- (c) the visual mode extends the textual mode;
- (d) the visual reflects the title;
- (e) no relationship between the visual and the textual modes exists.

These types of relationship between the textual and the visual will be discussed in this section.

**Visual and textual representation of data** refers to a close interaction between the textual and the visual mode. This is especially common of maps and graphs represented in the popular scientific articles and their textual descriptions. The usage of maps or graphs is magazine-dependent; for instance, in the magazine *HowStuffWorks*, the highest number of maps

is used in comparison to other magazines. In Lithuanian, on the other hand, graphs and maps are not among the most frequent modes, as discussed in Section 5.1.

In the popular scientific articles analysed, graphs usually represent certain changing linguistic tendencies, while maps focus on territorial changes during historical events or different periods (see Pictures 67 and 68):



**Picture 67.** Graph from the article “Quantifying the Evolutionary Dynamics of Language” (*nature.com*; October 11, 2007); **Picture 68.** Map from the article “Holy Roman Empire” (*HowStuffWorks*; February 27, 2008)

As can be seen in the original of Picture 67, three contrasting colours chosen in the original graph: blue, red, and green are used to illustrate three different trends of irregular verb regularization. In Picture 68 yellowish and brownish colours are chosen to depict the map of Europe with more emphasis expressed by a darker colour on the Holy Roman Empire, which is the subject matter of the article. In general, the maps are not very detailed, with the territories marked only schematically. Only the boundaries of the countries or empires or routes described verbally are signalled by red, thereby achieving a double, i.e., visual and verbal, focus.

The linguistic mode is closely related to the graphs or maps included in the articles. The frequency of the words *map*, *figure*, *table*, *chart*, and *graph* was checked in the COPSA; the data show (see Table 13) that these images are typically described textually:

**Table 13.** Frequency of the words *map*, *figure*, *table*, *chart*, and *graph* in COPSA

English		Lithuanian	
Word	Frequency in COPSA-EN	Word	Frequency in COPSA-LT
Chart	5	Diagrama	1
Figure	23	Lentelė	11
Graph	6	Žemėlapis	18
Map	67		
Table	10		
<b>Total</b>	<b>111</b>	<b>Total</b>	<b>30</b>

As can be seen in Table 13, the most frequent words in COPSA-EN are *map* and *figure*, which are used 67 and 23 times, respectively (verbs and nouns referring to a person are disregarded while counting the frequencies of the word *figure*). Furthermore, the words *table*, *chart*, and *graph* are used 10, 5, and 6 times, respectively, in popular scientific articles in English. As has been discussed in Section 5.1, such modes as maps or figures are not common in Lithuanian popular scientific articles. Accordingly, the words *žemėlapis* or *lentelė* do not appear frequently in COPSA-LT (18 and 11 occurrences, respectively).

Another feature of the verbal mode is that some collocations or phrases tend to repeat themselves in COPSA-EN. For instance, the collocation *the map shows* is repeated 18, and the prepositional phrase *from the graph* 6 times in COPSA-EN; furthermore, the pattern *figure+its title* is repeated 18 times. In Lithuanian, the data are too small to make broader generalizations; however, a tendency to use certain phrases or collocations can also be observed. For instance, the phrases *iš lentelės* or *žr. 1 lentelę* tend to appear 2 and 3 times in COPSA-LT. These repetitive lexical bundles suggest that the language used to describe maps and graphs is formulaic, especially in English, but a broader investigation is necessary in Lithuanian.

The analysis demonstrates that the visuals present the information in a compact and concise way. This is also a space-saving strategy, as long and detailed descriptions would be necessary to convey the same information. Maps and graphs are also referred to and discussed textually, at least to some extent. It may be claimed that the textual serves a clarificatory purpose by commenting on the images, while the visual also contains additional information, which is not discussed textually, but can be perceived by analysing the images.

In a number of cases, **the images illustrate (a) the social participant(s) or (b) the object(s) described in the text**. Because of the visual representation, people and objects receive more attention, and the reader/viewer can obtain more detailed or additional information, as sometimes an accurate description of an object might pose some difficulty. The illustration of social participants or objects is typical of both English and Lithuanian popular scientific articles, which suggests that this is a more universal feature of popular scientific discourse. Visual variables of the **social participants** are discussed in greater detail in Subsections 5.2.1 – 5.2.5.

In order to analyse the relationship between the scholars' photos and the textual mode, the frequency of the possible references to scholars was checked in COPSA. In English, only the singular form was taken into account because of the dominant reference 'profession+surname' (e.g., *linguist K. David Harrison*). In Lithuanian, singular masculine and feminine forms, as well as various cases of nouns were taken into consideration (e.g., *profesorius*, *profesorė*, *profesorius*, etc.). Plural forms are not analysed because they are

mainly used to generalize, not to refer to a particular scholar. The results, which can be seen in Table 14, reveal that English popular scientific articles rely on the visual, while Lithuanian popular scientific articles resort more to the textual mode:

**Table 14.** References to scholars in popular scientific articles in English and Lithuanian

References to scholars in English	Number of occurrences in COPSA-EN	References to scholars in Lithuanian	Number of occurrences in COPSA-LT
Archaeologist	41	Archeologas (ė)	10
Assistant	-	Asistentas (ė)	4
Associate professor (assoc. prof.)	-	Docentas (ė) (doc.)	18
Doctor (dr.)	144	Daktaras (ė) (dr.)	246
Historian	68	Istorikas (ė)	99
Lecturer	9	Lektorius (ė)	9
Linguist	60	Lingvistas (ė)	3
Professor (prof.)	165	Profesorius (ė) (prof.)	378
Scientist	35		
Scholar	26	Mokslininkas (ė)	89
<b>Total</b>	<b>548</b>		<b>856</b>

As can be seen in Table 14, the total number of references to scholars is larger in Lithuanian. The words under analysis refer to the speciality of the scholar (e.g., *linguist* or *historian*), to pedagogic titles (e.g., *professor*), or to an academic degree (e.g., *doctor*). The data have revealed that the frequency of almost all words is higher in Lithuanian with some apparent differences: the word *profesorius* (*professor*) is used 378 times in Lithuanian, while its frequency is 165 in English; the word *daktaras* (*doctor*) is used 246 times in Lithuanian, and only 144 times in English. Some words, such as *associate professor* or *assistant*, do not appear in COPSA-EN. On the other hand, the word *lingvistas* appears only three times in the Lithuanian corpus, while *linguist* in English amounts to 60 occurrences; the word *archaeologist* appears 40 times in English and only 10 times in Lithuanian. This leads to the generalization that it is more typical to refer to scholars using an academic position in Lithuanian, without specifying their field.

The data presented in Table 14 have also revealed that more prominence is given to Lithuanian scholars textually, as their pedagogic and academic degrees are repeated. Typically, high pedagogic degrees (e.g., *profesorius*) are repeated more often than other degrees, such as *asistentas* or *lektorius*. On the contrary, in English articles, the incidence of such references is lower; however, as discussed in Sections 5.2.1 and 5.2.2, the photos of scholars, especially authors of the articles, are typical of English popular scientific articles. Thus, the importance of institutions and scholars in popular scientific discourse is reinforced both in

English and Lithuanian, only the means are different, as in Lithuanian traditionally the textual mode is given more prominence, while in English the visual mode serves the same purpose.

In addition to social participants, various **objects** are illustrated, such as historical artifacts or archaeological excavations. Most of the objects contain many distinctive details, which are difficult to describe textually or the description would lack accuracy; thus the visual mode can provide the information in a compact way, as can be seen in Picture 69:



**Picture 69.** Photo from the article “The Meaning of Words: New Evidence of Ancient Maya History” (*National Geographic*; April 25, 2011)

In the photo, the reader can see an example of a Mayan vessel, which is also described textually below the photo:

- (4) One of the polychrome vessels recovered by Kenichiro and his team is a cylinder vase with a painted decoration representing a fire ritual scene with two rulers seated on benches and their servants standing in front of them. Between the two rulers are painted animal-like flames and glyphs.

The description includes the most important details, such as the shape (*cylinder*), the decoration (*painted decoration*), and what is represented in the decoration (*a fire ritual scene with two rulers seated on benches; animal-like flames and glyphs*). The photo of the vessel not only visualizes the aspects included in the description, but the reader/viewer can also see the colours, the shapes, the ornaments, and the style of the decoration in general; thus, the photo serves the purpose of providing more detailed and specific information.

As the present analysis has revealed, **the visual mode may also specify or extend the textual mode**, i.e., provide additional details, facts, or events which are not described textually. In addition, the visual extension may be expressed in one or several photos, which are arranged in a narrative different from the one told in the text.

A cultural difference among popular scientific articles can be observed in this relationship between the textual and the visual as well: visual extension is dominant in the Lithuanian articles, while in English only a few examples can be found. In English, the photos or pictures seem to be closely related to the textual mode; however, in Lithuanian the photo or picture may not necessarily be described in the text, even though both the textual and the visual mode are necessary in order to perceive the whole message.

The additional information provided visually falls into several categories. The visual mode is concerned with additional information related to the social participants' personal lives (i.e., scholars, historical personalities, or artists) or certain historical events are described textually. The main categories can be seen in Table 15:

**Table 15.** Relations between the modes in Lithuanian popular scientific articles when the visual extends the textual

The textual mode	The visual mode
Social participant and his/her activities/merits/achievements described	Birthplace or former living-place of the social participant
	Family members/friends of the social participant
	The social participant during various periods of life (a baby, a schoolboy/schoolgirl, a student, etc.)
	Commemoration of the social participant after his/her death

Textually, the achievements, merits, or main activities of the social participants are described, while the visual mode reflects two different domains: a personalized one marked by details from the personal life and an institutionalized one marked by educational institutions or work places.

For instance, the article “Arkivyskupas Mečislovas Reinys – psichologijos terminijos kūrėjas”<sup>32</sup> (*Mokslo Lietuva*) describes the biography of Archbishop Reinys and his merits in creating a Lithuanian terminology of psychology, while the photo visualizes the participants of a gathering at the memorial for the archbishop (a roadside pole with a statuette of a saint, Lith. *koplytstulpis*). Furthermore, the article “Po Šakių kraštą pasidairius”<sup>33</sup> (*Nemunas*) is a short summary about significant people in the Šakiai region, while the photo depicts a stone memorial for Doctor Jonas Basanavičius, one of the most famous Lithuanian historical personalities and scholars from this region (see Pictures 70 and 71).



**Picture 70.** Photo from the article “Arkivyskupas Mečislovas Reinys – psichologijos terminijos kūrėjas” (*Mokslo Lietuva*; July 9, 2009)



**Picture 71.** Photo from the article “Po Šakių kraštą pasidairius” (*Nemunas*; December 6, 2008)

<sup>32</sup> “Arch-Bishop Mečislovas Reinys, the Creator of Psychology Terminology”

<sup>33</sup> “After Wandering around in Šakiai Region”

Furthermore, the article “Vaikystė – amžinos maudynės” (*Rubinaitis*) is an interview with the writer Jonas Mačiukevičius, who remembers his childhood, school times, his health problems when he was a teenager, and his family. These memories are more general, as the writer remembers the places or impressions from his childhood; however, the photos provide more specific details not textually described, as for instance, his friends, his family, or his portrait when he was a student.

It is clear from the given examples that the visual mode extends the information provided textually. This can be achieved in one photo or a series of photos (even 6 or 8), which can be joined into a visual narrative, extending the textual narrative. Such a pattern contributes to the creation and perception of the text: it seems that the two modes are interwoven in order to create a more exhaustive message. The abundant use of photos functions as a space-saving strategy and as an information load, which gives more details and context unrelated to the text.

The portrayal of scholars’ birth or living places, as well as their parents, siblings, and friends reveal interpersonal relationships and provide more context about their personalities. The reader/viewer can see the scholar not only in his/her professional environment but also identify him/her as a child, pupil, friend, or parent. These different aspects of identity are apparent from the photos taken from the above mentioned article “Vaikystė – amžinos maudynės” (see Picture 72):



**Picture 72.** Photos from the article “Vaikystė – amžinos maudynės”<sup>34</sup> (*Rubinaitis*; March 1, 2009)

Clearly, the reader/viewer can see three different identities of the writer, i.e., as a writer, as a child/pupil, and as a parent. Thus, the visual narrative adds additional aspects to the text, makes it more specific, and contributes to the creation of the identity of the person.

The commemoration of famous Lithuanian scholars or historical personalities is a feature of popular scientific articles in Lithuanian. Textually, the biographies or merits of the people in question are described; the visual mode thus functions as an ideological yet indirect means to remember the past and historical personalities.

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<sup>34</sup> “Childhood is the Eternal Bathing”

In some cases, **the connection between the title of the article and the image** is direct and obvious. It may also be observed that some images depict a part of the body. In addition, they can be metonymical with respect to the whole article, i.e., the article describes a certain phenomenon, while the photo represents only a certain aspect of it.

The relationship between the title of the article and the visual may be described as complementary. The most common strategy used is taking a key word from the title and depicting it visually, as can be seen in Table 16 (the bold font of the key word is mine):

**Table 16.** The relationship between the title and the visual in popular scientific articles in English

No.	Title of the article	Visual image
1.	Sign language study shows multiple <b>brain</b> regions wired for language	Brain with certain regions marked
2.	New thoughts on language acquisition: <b>toddlers</b> as data <b>miners</b>	Feet of a child with gumboots and a spade
3.	<b>Speaking and understanding</b> speech share the same parts of the brain	Lips and an ear
4.	Linguistic <b>gem</b> or just another pidgin?	Clasped hands with something light inside
5.	Cultural goldmine lurks in digitized <b>books</b>	Hands holding a book
6.	Signs of the times: deaf find their voices via <b>mobile video</b> and apps	Hands holding a mobile phone

Not all the existing examples are provided in Table 16 above, but the strategy used and the relationship between the title and the visual are the same in all the cases, i.e., the key word is depicted visually. However, the title contains more information; for instance, it is clear from Title 2 (“New thoughts on language acquisition: toddlers as data miners”) that the article talks about some new research on language acquisition, while the image presents this information in a more compact and a more direct way (a child has a spade), as can be seen in Photo 73 below:



**Picture 73.** Photo from the article “New Thoughts on Language Acquisition: Toddlers as Data Miners” (*Science Daily*; January 29, 2008)



**Picture 74.** Photo from the article “Linguistic Gem or just Another Pidgin?” (*nature.com*, August 29, 2007)

Furthermore, the verbal metaphor may also be expressed visually, as is the case with the title "Linguistic gem or just another pidgin?" and its visual representation, which shows hands holding something light (see Picture 74). Both the title and the visual refer to a new pidgin metaphorically, i.e. a gem; the reader/viewer can see the imaginary gem represented as something light between the person's hands. Thus, in general, the relationship between the title of the article and the visual representation is very close, only the visual is more direct and depicts just one aspect, idea, or key word of the title.

Second, the relationship between the article and the visual representation can be metonymical. The article discusses linguistic issues or phenomena, while in the photo the viewer can see only a part of the issue, thing, or person. For instance, the article "Speaking and understanding speech share the same parts of the brain" is concerned with language production and perception; however, in the photo, speech production is represented as the lips of the person, speech perception is represented as the ear of another person, and the communication channel is depicted as a palm between the lips and the ear (see Picture 75):



**Picture 75.** Photo from the article "Speaking and Understanding Speech Share the Same Parts of the Brain" (*Science Daily*, August 16, 2011)

Here an attempt is made to depict more complicated phenomena in a simpler and more understandable way. On the one hand, the visual serves as a metonymy of larger linguistic issues; on the other hand, these issues are simplified so that they are more understandable for lay readers.

This leads to another important point, i.e., the features of the field and popular scientific discourse. All articles that visualize parts of the body are in linguistics. The data are too limited to make any broader generalizations; however, more figurative or expressive visual representations may be a feature of popular scientific articles in linguistics. In this way an attempt may be made to play not only on words, but also to provide figurative and thought-provoking images. Furthermore, a typical feature of popular science is to facilitate understanding and to attract the readers; therefore, the images are chosen in such a way that

more complicated issues are represented by using everyday objects or depicting situations; the reader may be more attracted by an interesting or figurative image.

In some articles, **no direct relationship between the textual and the visual modes** can be traced, which creates the impression that the visual and the textual modes function as unrelated entities, i.e., it is very difficult or impossible to trace any textual or semantic relationship between the article and the image. Possibly, the image (a photo or a picture) functions as a decoration or a reader-involvement technique, i.e., to make the discourse more vivid or to attract the reader's attention. Another reason could be that the reader is provoked to think and to relate an artistic image with the ideas expressed in the article.

The articles when the textual and the visual modes are unrelated are typical only of Lithuanian popular science, in particular the popular scientific magazine *Post Scriptum* published by the student corporation RePublica at the Institute of International Relations and Political Sciences, Vilnius University. It is difficult to comment why such decisions are made concerning the choice of the image; however, this seems to be a culture-specific and, partly, a magazine-dependent feature of popular scientific articles in Lithuanian.

Furthermore, the images unrelated to the article increase interdiscursivity, as they are mainly pieces of art. Thus, their use in an article combines two genres, i.e., popular science and photography or art, and shapes genre expectations. The reader not only expects to visualize scholars, their work, certain objects, or places, but can also see artistic and thought-provoking images which encourage the search for connections between the textual and the visual.

A typical feature of images directly unrelated to the text is abstraction. The focus is on shapes and colours rather than on realistic images. Examples of such images can be seen in Pictures 76 and 77:



**Picture 76.** Illustration of the article “Paminklosaugos sąjūdžio alternatyva”<sup>35</sup> (*Post Scriptum*; 2010, No.17)



**Picture 77.** Illustration of the article “Šimtas atgimimo metų”<sup>36</sup> (*Post Scriptum*; 2010 No. 17)

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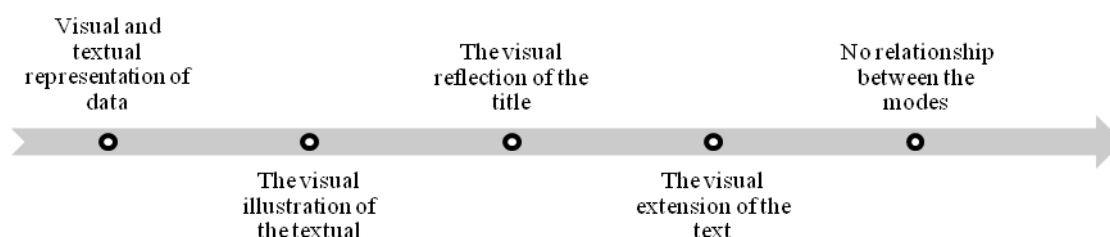
<sup>35</sup> “Alternative to the Monument Protection Movement”

<sup>36</sup> “A Hundred Years of Rebirth”

The reader/viewer cannot see any realistic images in the pictures, even though the topics of the articles are concrete and contemporary, i.e., the preservation of historical monuments and the Rebirth movement in Lithuania. Thus the reader/viewer is required to reflect and interpret the pictures and their relation to the text himself/herself. It seems that the authors of the articles expect an educated, knowledgeable, and well-read reader who would be interested in reading the articles and would enjoy trying to interpret the meaning of the pictures.

The analysis of popular scientific articles in English and Lithuanian has revealed that this genre exhibits a variety of relationships between the textual and the visual mode and leads to the generalization that the relationship between various modes is genre and culture-dependent.

As for genre features, the relationship between the textual and the visual mode ranges from interdependence, when the visual images are described textually, to a looser relationship when the reader has to interpret the visual as a piece of art and find the connection between the textual and the visual himself/herself. Graphically, different types of relationship between the textual and the visual mode may be visualized in a continuum (see Figure 9):



**Figure 9.** Types of relationship between the visual and the textual modes

As can be seen in Figure 9, moving from left to right, the relationship between the modes becomes looser. Naturally, different interdependencies between the modes may be distinguished in different genres; in the case of the humanities, these categories of relationship between the modes seem to be the most distinctive.

In addition, the cultural factor has to be taken into consideration, as some of these categories are more typical of English, while others of Lithuanian popular scientific articles. It can be generalized that the relationship between various modes is not unified and changes depending on the genre and on culture. In some cases the images are clearly incorporated into the visual grammar; however, the illustrative purpose of the images cannot be denied as well.

## 5.5 Summary

This chapter focused on the use, features, and functions of the non-verbal mode in popular scientific articles in English and Lithuanian. The analysis has revealed that, concerning the

frequency of modes and their combinations used in popular scientific articles, English differs considerably from Lithuanian: in English the frequency of modes is higher and they are more varied, while in Lithuanian only pictures and photos dominate, even though the internet provides various possibilities.

The representation of professions (e.g., scholars, writers, or pop-stars) is highly emblematic both in English and Lithuanian; thus, the present research supports Kress and van Leeuwen's (2006) idea that constant repetition of some variables in representation leads to stereotyping. Visual representation also reveals other predominant stereotypes, such as gender stereotypes or dominance of individualism in English popular scientific articles.

The present investigation demonstrates that there are several metafunctions of the visuals in popular scientific discourse. The predominant metafunction is ideational, which can be subdivided into several subtypes. The major cultural difference is that in English articles the readers are not only informed but also entertained by the visuals, while in Lithuanian ones the depiction of reality is the primary goal.

The relationship between the text and the images is multiple. Some visuals are very closely related to the text, while the relationship is not that direct in other cases. The relationship between the modes is closer in English, while in Lithuanian the visuals tend to represent additional information, which is not described textually.

## **6 Analysis of the Verbal Mode in Popular Scientific Articles in the Humanities in English and Lithuanian**

This chapter focuses on the linguistic features of popular scientific discourse in English and Lithuanian. The analysis is restricted to three main aspects: the author's stance, intertextuality, and interdiscursivity. These aspects have been chosen for several reasons. First, the analysis has revealed that these are the most distinctive features of popular scientific discourse in the humanities. Even though such aspects as informal language, tropes, or narrativity could also be analysed, the thesis is limited in scope; thus, it aims to discuss only the dominant and most distinctive features. Second, as the analysis of non-verbal elements has shown, stereotypes of scholars are formed visually; thus, the verbal presence of the scholar is an interesting research aspect. Furthermore, the author's stance, intertextuality, and interdiscursivity are not well-researched areas in popular scientific discourse, while other features, such as informality or the rhetoric of popular scientific discourse has already attracted some attention (e.g., Charney 2003, Musolff 2007, Calsamiglia and van Dijk 2004). Therefore, Sections 6.1.1-6.1.4 analyse such features as hedges, boosters, attitude markers, and self-mention in English and Lithuanian popular scientific discourse; Section 6.2 discusses intertextuality, and Section 6.3 focuses on interdiscursivity in popular scientific discourse in English and Lithuanian.

### **6.1 The Author's Stance in Popular Scientific Articles**

Hedges may be defined as strategies to soften and mitigate the author's position (e.g., *might*, *suggest*, *imply*), while boosters can be viewed as an opposite strategy, i.e., they reinforce the author's attitude (e.g., *determine*, *state*, *sure*). Attitude markers express the author's affective stance towards the proposition (e.g., *interesting*, *remarkable*, *valuable*), while self-mention is the expression of the author's presence by singular and plural personal pronouns (e.g., *I*, *we*) (Hyland 2011, 2009, 2004, 2005, 1999).

Hyland also distinguishes between stance and engagement, the former being writer-oriented features of interaction, and the latter, reader-oriented features of interaction, such as reader mention, directives, questions, knowledge reference, and asides (Hyland 2011: 198). These features form an interactivity of discourse. However, despite being writer-oriented, stance contributes to the formation of the relationship between the reader and the writer; in addition, according to Hyland's research, stance features are more frequent or sometimes overlap with engagement features. Therefore, the present research is limited only to stance features.

In the present thesis, in order to analyse the author's stance, Hyland's methodology was employed. First, by using software<sup>37</sup>, word lists were compiled in order to produce lists of the features of the author's stance. Minimal frequencies (i.e., one or two occurrences) were disregarded as possibly accidental instances rather than typical features. Various word forms (e.g., singular, plural, or cases in Lithuanian) were comprised under one lexeme. The next step was to check the frequencies in the academic sections<sup>38</sup> of two reference corpora, i.e., COCA and CorALit, in order to determine the existing differences between academic and popular scientific discourse (relative frequencies per 100,000 words were counted).

The analysis has revealed numerous genre and cross-cultural differences between popular scientific and academic discourse in English and Lithuanian. As indicated in Table 17, the expression of the author's stance in English is not very different between academic and popular scientific discourse, while in Lithuanian the number of occurrences is more than twice larger in popular scientific discourse. As for cross-cultural differences, these engagement features are slightly more common in Lithuanian than in English popular science, which indicates different traditions of academic and popular scientific writing in the two cultures.

**Table 17.** Features of author's stance in English and Lithuanian

Stance feature in English	Popular scientific discourse (occurrences per 100,000 words)		Academic discourse (occurrences per 100,000 words)	
	EN	LT	EN	LT
Hedges	997.8	947	1,076	448.3
Boosters	816.4	1,089.8	959.3	608
Attitude markers	1,093.6	1,278.1	1,271.3	587.7
Self-mention	949.8	724	683.1	112.1
<b>Totals</b>	<b>3,857.6</b>	<b>4,038.9</b>	<b>3,989.7</b>	<b>1,756.1</b>

As the data have revealed, a different addressee (a member of the academic community vs a lay person) requires different means of expression: in English, fewer author's stance features are used in popular scientific discourse, while in Lithuanian, the frequency of author's stance features is twice as large in popular scientific as in academic discourse. The data suggest that, depending on the sub-genre, the authors choose either a more personalized or a more detached discourse. These features and their significance will be discussed in greater detail in Sections 6.1.1-6.1.4.

<sup>37</sup> *AntConc 3.2.4w*

<sup>38</sup> In order to make the research comparable, the sub-sections of the humanities were chosen in the reference corpora

### 6.1.1 Hedging

As has been discussed in Sub-section 3.2.1, hedging devices serve several important functions in academic discourse; namely, to mitigate propositions, to create the relationship between the author and the reader, and to express the author's stance. Even though a number of scholars have discussed hedging devices in academic discourse, popular scientific discourse has not been analysed from this perspective.

For the present analysis, the lists of hedging devices were compiled from the word lists in English and Lithuanian (see Appendices B and C). In the case of Lithuanian, various forms of the same word were included if they have a hedging function, with the exception of verbs, as, for instance, the subjunctive form of the verb *sakyčiau* can be considered as a hedge, while the indicative mood of this word does not have this function. Finally, the results were checked against the academic sub-sections of the humanities of COCA and CorALit in order to observe the difference between academic discourse and popular scientific discourse.

The analysis has revealed the existing cross-cultural and genre differences between hedging devices in English and Lithuanian. In English, the difference between popular science and academic discourse is not that clear-cut: in COPSA, 997.8 hedges are used, while in COCA the number of hedges reaches 1,076. Even though the difference is not great, interestingly, hedges are more frequent in academic discourse. On the contrary, in Lithuanian more hedges are used in popular scientific discourse, where the frequency is 947 occurrences, while in academic discourse the frequency is only 448.3. In contrast to English, the author of a popular scientific article in Lithuanian is more hesitant and mitigates ideas more than in academic discourse.

In English, some of the hedges are used with the same frequency in academic discourse and popular science; verbs with a hedging function are especially more frequent in academic discourse. As can be seen in Table 18 (see Appendix B), in popular scientific discourse hedging is typically expressed by the same parts of speech as in academic discourse; namely, modal verbs, lexical verbs, adjectives, and adverbs (Hyland 1995: 36). According to the present data, nouns as hedges are not common in popular scientific discourse, while other parts of speech as hedges are more frequent in academic discourse than in popular scientific discourse in English. Each category of hedging devices will now be discussed separately.

The use of verbs as hedges is different in popular scientific discourse and academic discourse in English. As indicated in Table 18, the frequency of some verbs does not differ greatly in popular scientific and academic discourse. For instance, the modal *could* is slightly more frequent in popular scientific rather than in academic discourse (116 and 100.5 occurrences, respectively); the modal *would* is also more typical of popular scientific discourse (186.2 occurrences in popular scientific and 178 occurrences in academic discourse) in the present

research. Only the frequency of the modal *may* is higher in academic discourse (118.8 occurrences to 89.4 occurrences in popular scientific discourse). According to Biber's research, *may* is the most common modal expressing possibility in academic discourse (Biber 2002: 178-179). Thus, different frequencies of hedging modals in the genres reveal that popular scientific discourse in English deviates from traditional academic discourse.

The use of lexical verbs shows more differences between popular scientific and academic discourse. Only the verb *believe* is more frequently used in COPSA, while other verbs, such as *seem*, *suggest*, *assume*, or *consider* are more frequently used in academic discourse. In some cases, the difference is especially noticeable; for instance, the frequency of the verb *seem* is 46.4 in popular scientific discourse, while its frequency in academic discourse is 61.4; the frequency of the verb *consider* is 25.8 and 60.8 occurrences in popular scientific and academic discourse, respectively. Thus, lexical verbs as hedges are more frequently used in academic discourse, while, supposedly, other means expressing the author's stance are more frequent in popular scientific discourse.

The category of adjectives is not very large; only the adjective *probable* is more frequent in popular scientific discourse (1.4 occurrences in popular scientific and 1.1 occurrences in academic discourse). Other adjectives are predominantly used in academic discourse (e.g., *possible*, *plausible*, or *considerable*). A different tendency can be observed in adverbs used as hedges, i.e., their frequency is the same in COPSA and COCA (335.4 occurrences). In the case of approximators, the difference between popular scientific and academic discourse is slight; for instance, the adverb *roughly* is used at the same frequency in popular scientific and academic discourse; in the case of *somehow*, *barely*, *hardly*, or *seemingly*, the frequency differs in only 0.1 – 0.2 occurrences. There are also examples where the difference between popular scientific and academic discourse is wide; for instance, the frequency of the adverb *possibly* is twice larger in popular scientific discourse (10.8 occurrences in COPSA and 5 occurrences in COCA); the frequency of the adverb *perhaps* is 21.8 in popular scientific and 30.7 in academic discourse. Apparently, some adverbs are preferred in popular scientific and others in academic discourse. The general tendency is that the frequency of adverbs is the same in both discourses, while hedges are slightly more frequent in academic discourse.

The use of hedging devices in Lithuanian shows more differences between academic and popular scientific discourse. As Table 19 (see Appendix C) indicates, hedges are used more frequently in popular scientific than in academic discourse. Similarly to English, the most common category with a hedging function in Lithuanian is adverbs, even though other parts of speech, such as particles (e.g., *gal*) or pronouns (e.g., *keletas*) are also used.

The most noticeable tendency is that hedging devices are employed more frequently in popular scientific rather than academic discourse in Lithuanian, and the difference is more than double (the total number of hedges in COPSA is 947, while in CorALit it is 448.3). In some cases the difference is not very high (e.g., the verb *tėra* is used 6.6 times per 100,000 words in popular scientific discourse and 4.1 times in academic discourse); however, all hedges in Lithuanian are used more frequently in popular scientific than academic discourse. In some cases, the differences are especially noticeable; for instance, the particle *gal* appears 71.8 times per 100,000 words in COPSA, while its frequency in academic discourse is only 8.4; the adverb *gerokai* is used 19.8 and 8.6 times in popular scientific and academic discourse, respectively.

The difference in using hedging devices reveals that the author's stance is expressed extremely differently in popular scientific and academic discourse in Lithuanian. In popular scientific discourse, the authors exhibit less certainty towards their propositions and leave more space for interpretation, which may be conditioned by the sub-genre. As the addressee of a popular scientific article is a lay person rather than a professional, the propositions are less strict and accurate (possibly, the expected readers are more interested in the main tendencies and observations than in the precision). Additionally, more frequent hedging devices contribute to maintaining a more collegial relationship with the readers rather than establishing the authority of the scholar.

The analysis of hedging devices also reveals cultural differences between popular scientific discourse in English and Lithuanian and different authors' strategies to approach the reader. As has been observed, hedging devices in English are more frequent in academic discourse in opposition to Lithuanian, where popular science is hedged more. Thus, the authors of popular scientific articles in Lithuanian tend to approach the reader by providing less strict and accurate propositions, i.e., by using more hedging devices. Accordingly, the author of popular scientific discourse in Lithuanian seems less authoritative or chooses a tone closer to other discourse types (as indicated by Biber (1995), spoken discourse or literary texts are less precise and accurate). Such a stance might seem more appealing for lay people.

In general, the analysis of hedging devices in popular scientific discourse in English and Lithuanian has revealed cross-cultural and genre differences between popular science and academic discourse. Most hedging devices are used at a similar frequency in popular scientific discourse and academic discourse in English, while in general academic discourse is hedged more. On the contrary, hedging devices are used more frequently in popular scientific discourse in Lithuanian. Different usages of hedges create a different author's tone: a more authoritative and certain tone in English and a less authoritative tone allowing for interpretation in Lithuanian.

### 6.1.2 Boosters

Boosters may be viewed as the opposite strategy to hedges, as they emphasize or strengthen the proposition (Hyland 2004: 139) (see Sub-section 3.2.1). As discussed in Section 6.1.1, more hedging devices are used in academic discourse than in popular scientific discourse in English. The present analysis of boosters has revealed similar tendencies: the author's certainty and conviction in English are also expressed more frequently in academic discourse than in popular scientific discourse, while in Lithuanian more boosters are used in popular scientific than academic discourse.

The parts of speech which are used as boosters are the same in English and Lithuanian (see Appendices D and E); namely, verbs, nouns, adjectives, and adverbs, with only nouns and adjectives less common in Lithuanian. In English popular scientific discourse, boosters are more frequent in all parts of speech, except adverbs, where their frequency is slightly higher in academic discourse (i.e., 283 occurrences in popular scientific discourse and 274.7 occurrences in academic discourse). In Lithuanian, on the other hand, boosters are more frequent in all parts of speech in popular scientific discourse, similar to the use of hedges.

Apparently, a clearer position by the author is expressed in academic language in English, even though it might be expected that popular scientific discourse is more personalized, or a personal opinion is reinforced by choosing a certain vocabulary. However, it seems that the authors of academic discourse in English attempt to reach a convincing rhetorical effect by avoiding too firm propositions in some places and highlighting their own point of view in others, while in popular science different stylistic means are used to attract the reader. In Lithuanian, on the other hand, the author's stance in popular scientific discourse is expressed not only by hedges but also by boosters more typically than in academic discourse. As indicated in Table 21 (see Appendix E), adverbs quite frequently function as boosters in popular scientific discourse in Lithuanian (487.4 occurrences), while in academic discourse their usage reaches only 173.4 instances.

The use of boosters in English is similar to the use of hedges in the sense that some boosters are preferred in popular scientific, while others in academic discourse. For instance, words *determine*, *sure*, *completely*, or *exactly* are predominantly used in popular scientific discourse and the difference is large (e.g., the adverb *exactly* is used 13.6 times in popular scientific discourse and 5.3 times in academic discourse). Other words are more frequently used in academic discourse, such as *to debate*, *to focus*, *evident*, or *clearly* (e.g., the frequency of the adverb *clearly* is 11.2 in popular scientific discourse and 20.2 in academic discourse).

The use of boosters in Lithuanian reveals similar tendencies to the use of hedges, i.e., boosters expressed in various parts of speech are used much more frequently in popular scientific discourse. Only the modal *privalėti* is more frequent in academic discourse (7.6 occurrences in academic discourse and 6 occurrences in popular scientific discourse), as well as the verbs *akcentuoti*, *pateikti*, and *pagrįsti*, and the adverb *nuolat*. In other instances, the frequencies are much higher in popular scientific discourse: for instance, the frequency of the adverb *labai* is 210.6 in COPSA and only 47.4 in CorALit, which is more than 4 times higher in popular scientific discourse. Other examples are adverbs *visada* (36 instances in COPSA and 12.9 instances in CorALit), *būtent* (34.4 instances in COPSA and 19.6 instances in CorALit), and *žinoma* (29.6 instances in COPSA and 13.9 instances in CorALit).

In addition, the comparison of the use of boosters in popular scientific discourse in English and Lithuanian shows that this feature is more common in Lithuanian, while differences in the part of speech can also be observed. Verbs and adverbs are most typically used as boosters in English (468.8 and 283 words, respectively). Verbs are commonly used as boosters in Lithuanian as well, at 452.6 instances, which is very similar to English. However, the frequency of adverbs as boosters is almost two times higher in Lithuanian popular scientific discourse (487.4 instances), which indicates that it is more common to modify a proposition in Lithuanian rather than choose a verb or a noun with a similar function.

These differences show that the personal attitude of the author is expressed more clearly and specifically in popular scientific discourse in Lithuanian, which is the opposite tendency when compared to English. It seems likely that certain cultural conventions of academic writing are followed: Lithuanian scholars tend to use a more conservative and traditional approach to depersonalize academic discourse, while the expression of a personal stance, both by using hedges and boosters, is more appropriate in popular scientific discourse.

The author of a popular scientific article in Lithuanian seems a more active participant than in English. S/he tries to direct the reader more or simply attempts to achieve a convincing effect in popular scientific articles in Lithuanian by mitigating certain propositions and emphasizing others. A more personalized discourse creates the effect of collegiality and shared knowledge between the reader and the writer, as, for instance:

- (5) Man nepriimtina Zenono Norkaus, **tikrai fantastiško** Lietuvos akademiko, taip mėgstama weberiška (o iš tikrųjų nietzscheiška) racionalumo samprata (*Filosofija Lietuvoje*)<sup>39</sup>
- (6) Šios kultūros yra **neabejotinai** megalitiškos<sup>40</sup> (*Naujasis Židinys – Aidai*).

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<sup>39</sup> Zenonas Norkus's, a **really fantastic** Lithuanian academic's, Weber-like concept of rationality is unacceptable to me as actually being Nietzsche-like.

<sup>40</sup> These cultures are **undoubtedly** megalithic.

The examples above reveal that, on the one hand, the authors express their personal opinion and strengthen it by boosters; on the other hand, this information is not restricted to a particular discourse community, but is shared among wider circles of readers.

### 6.1.3 Attitude markers

Attitude markers are words which express the author's opinion or attitude towards the propositions (Hyland 2005: 180). The present analysis has revealed that this category has the largest number of different items, but their frequencies are not high; furthermore, most typically adjectives, adverbs, nouns, and verbs function as attitude markers in English and Lithuanian. The main genre and cross-cultural features of attitude markers are discussed in this sub-section.

The tendency of using attitude markers in English is similar to the use of hedges and boosters: in academic writing the use of attitude markers is slightly more frequent than in popular scientific discourse. As can be seen in Table 22 (see Appendix F), more attitude markers are used in academic discourse (1,271.3 instances) than in popular scientific discourse (1,093.6 instances). Adjectives are the most typical category to express the author's attitude (660.4), followed by adverbs (228.2 instances). The frequencies of attitude markers are not high (mainly they range from 2 to 5 words in COPSA); however, this category has the largest number of different instances, comprising in total 69 attitudinal adverbs and 108 adjectives.

In Lithuanian, attitude markers are the most frequent category expressing the author's stance (see Appendix G). In Lithuanian, the difference between popular scientific discourse and academic discourse is very large: in total, 1,278.1 attitude markers are used in popular scientific discourse, while in academic discourse this figure reaches only 587.7 instances. Interestingly, the frequency of attitude markers is almost the same in Lithuanian popular scientific and English academic discourse. Adjectives function as attitude markers the most frequently, i.e., the frequency of attitudinal adjectives reaches as much as 923.3 in COPSA, while nouns are the least likely to appear as attitude markers (only 25.4 instances in COPSA). Similar to English, the frequency of individual instances is not high, especially of adverbs, which mainly range from 1 to 3 occurrences. However, some adjectives (e.g., *geras* or *svarbus*) tend to be used especially frequently, i.e., 199.6 or 141.4 times.

As the present investigation shows, semantically, attitude markers in popular scientific discourse may be categorized according to the following categories:

- (a) positive (e.g., *fascinating*, *exclusively*, *sėkmingai*, *puikiausiai*, or *idealus*);
- (b) more neutral (e.g., *obvious*, *normally*, *rimtai*, *tiksliai*, or *nuoširdžiai*);
- (c) negative (e.g., *frustrating*, *furious*, *blogas*, *agresyviai*, or *grėsmingai*).

Negative attitude markers form only a small part of all attitude markers in English; more neutral ones are used with the same frequency in academic and popular scientific discourse or the difference is very small (e.g., *convincing*, *reasonably*, *appropriately*). Positive attitude markers express an author's positive evaluation towards the ideas or research described textually.

From the point of view of register, most attitude markers are more common in other registers than in academic discourse in English and Lithuanian, as COCA results reveal. For instance, the adjective *fantastic* is most frequently used in spoken discourse and *dull* in fiction, while the adverbs *amazingly* appear in magazines and *incredibly* in spoken discourse. These words carry an emotional load so that their use diverges from the traditional understanding of objective academic language.

In order to check the register to see which attitude markers are most common in Lithuanian, the Corpus of the Contemporary Lithuanian Language<sup>41</sup> was used, as CorALit represents only academic language. The results demonstrate that attitude markers are usually more common in other registers, especially literary texts (e.g., *puikiai*, *ironiškai*, or *gražus*) and publicistic writing (e.g., *patriotiškai* or *subtiliai*), as exemplified in the following cases:

- (7) Mus pasiekia tikrai labai **talentingai** parašytų kūrinių, net kartais **nuostabu**, kad galėjo susiformuoti tokie, sakyčiau, talentai<sup>42</sup> (*Kultūropolis*; August 23, 2010);
- (8) Autorius kuo **puikiausiai** supranta, kad personažų jausmų, subtiliausių psichologinių niuansų išryškėjimas įtaigesnis už sausą faktų kalbą<sup>43</sup> (*Nemunas*, October 16, 2008).

The adverbs *talentingai* and *puikiausiai* in Examples (8) and (9), as well as the adjective *nuostabu*, describe the manner of doing an action or a personal attitude. As the Corpus of the Contemporary Lithuanian Language indicates, the adverb *talentingai* is the most common in publicistic, while the adverb *puikiausiai* and the adjective *nuostabu* are most common in literary texts. These and other examples (e.g., *savotiškai*, *grėsmingai*, etc.) demonstrate that popular scientific discourse in Lithuanian combines various ways of speaking by incorporating a more neutral and objective tone with one that is more expressive and personalized. This feature supports Bhatia's (2008) idea of the non-existence of unified genres and their mixing in contemporary discourse.

Because of the use of non-academic vocabulary in both languages, the informality of popular scientific discourse is increased and may function as a persuasive element, especially for lay people. The use of various registers in popular scientific discourse implies that it is

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<sup>41</sup> <http://tekstynas.vdu.lt/tekstynas/>

<sup>42</sup> We receive really very **talented** works; sometimes it is even **amazing** that such, I would say, talents, could develop.

<sup>43</sup> The author understands **perfectly well** that emphasis on characters' feelings and subtle psychological nuances is more appealing than pure facts.

composed of the elements typical of other registers; thus, the genre is mosaic rather than homogeneous.

The comparison of academic and popular scientific discourse in English demonstrates that attitude markers are used more frequently in academic English. The tendency that the author's stance is more common in academic English in the humanities than popular scientific discourse can be viewed as a distinctive feature of popular scientific discourse in English. The extensive use of attitude markers in academic discourse in English suggests the presence of the author rather than an objective and 'faceless' information, even though the analysis of different subject fields provides different results as indicated by Hyland (1996, 2005, 2011). In popular scientific discourse, on the other hand, English authors tend to be more reserved when compared to academic discourse, possibly leaving the interpretation for the readers themselves.

In Lithuanian, the author's attitude is more clearly and explicitly expressed in popular scientific than in academic discourse (as discussed in Sections 6.1.1 and 6.1.2, the same tendency is typical of the use of hedges and boosters in Lithuanian popular scientific and academic discourse). As can be seen in Table 22 (see Appendix G), attitude markers in Lithuanian are mainly expressed by adjectives and adverbs, which provide the author's attitude towards the proposition. As the data indicate, most attitude markers expressed by adjectives and all attitude markers expressed by adverbs are more common in popular scientific discourse than in academic discourse in Lithuanian. The data suggest that the authors of popular scientific articles feel more freedom in expressing their own point of view and thus contribute to a more personalized popular scientific discourse, while writing academically requires the author's detachment and objectivity.

The comparison of English and Lithuanian popular scientific discourse reveals that, in Lithuanian, more attitude markers are used (in total 1,093.6 and 1,278.1 attitude markers, respectively). An apparent difference is the usage of adjectives: in English the frequency of attitudinal adjectives is 660.4, while in Lithuanian the number reaches 923.3 words. Clearly, the authors of popular scientific articles in both languages tend to express their opinion on the ideas described. In English the difference between popular scientific and academic discourse is not very large, while in Lithuanian the use of attitude markers is a clear feature of popular scientific discourse, as in academic discourse the authors are reserved in expressing their attitude. As previously mentioned, a substantial number of attitudinal markers are more typical of literary texts or magazines. This feature contributes to the interdiscursivity of popular scientific discourse and a heterogeneous genre.

#### 6.1.4 Self-mention

In academic writing, the relationship between the reader and the writer is clearly delineated: both participants belong to the academic community; thus, their relationship may be described as a colleague-to-colleague relationship. Self-mention has not been analysed in popular scientific discourse where the scholar attempts to represent himself/herself to an ordinary reader or establish his/her identity. The lack of research in this area poses several questions: What is the relationship between the author and the reader in popular scientific discourse? How does the author establish his/her identity? What are the major differences between self-mention in popular scientific discourse and academic discourse? What are the cultural differences between the author's stance in popular scientific discourse in English and in Lithuanian?

The major problem faced in the present research is grammatical differences between English and Lithuanian. Lithuanian, as a synthetic language, typically omits pronouns as the person is expressed by the ending of the verb; however, technically, it is impossible to extract the verbs used in the first-person singular and plural in CorALit. For this reason, the research is limited to the analysis of personal pronouns, including various cases of personal pronouns in Lithuanian (e.g., *aš*, *mano*, *man*).

The analysis has revealed several important differences between academic and popular scientific discourse, as well as cultural differences between popular scientific discourse in English and Lithuanian. The results of the research are provided in Table 24:

**Table 24.** Self-mention in popular scientific discourse in English and Lithuanian (per 100,000 words)

<b>Self-mention in English</b>	<b>COPSA-EN</b>	<b>COCA</b>	<b>Self-mention in Lithuanian</b>	<b>COPSA-LT</b>	<b>CorALit</b>
1 <sup>st</sup> person singular pronouns	435	351.1	1 <sup>st</sup> person singular pronouns	358.6	29.5
1 <sup>st</sup> person plural pronouns	514.8	332	1 <sup>st</sup> person plural pronouns	365.4	82.6
<b>Total</b>	<b>949.8</b>	<b>683.1</b>		<b>724</b>	<b>112.1</b>

The most apparent difference between academic discourse and popular scientific discourse is that self-mention is more typical of popular scientific discourse both in English and Lithuanian. As indicated in Table 24, first-person pronouns occur 949.8 times in popular scientific discourse in English and 724 times in Lithuanian, while in academic discourse the frequency is 683.1 and 112.1 times, respectively. Thus, apparently, the focus on personal contribution (using both first-person singular and plural) is higher in popular scientific discourse in both languages. In addition to a 'more visible' author in popular scientific discourse, the purpose of self-mention serves the aim of increasing the interactivity of discourse, i.e., it maintains a closer contact

between the reader and the author and creates an in-group relationship (cf. Cutting 2000). Thus, in popular scientific discourse, the dividing line between the author, as the authoritative provider of information, and the reader, who acquires this information, is blurred.

The most significant cultural difference is that the distinction between academic discourse and popular scientific discourse is much more clearly noticeable in Lithuanian (e.g., first-person singular pronouns repeat 358.6 in popular scientific discourse, while in academic discourse this figure reaches only 29.5); in English this distinction is not so clear-cut. Thus, in Lithuanian the distinction between academic discourse and its subgenre is more clearly noticeable, and self-mention serves as a distinctive feature of popular scientific discourse.

As the present research shows, the use of personal pronouns is not unified. Personal pronouns may refer to (a) the author(s) of the article; (b) other researchers in the field or colleagues; or (c) the author and the readers. Clear references to the author(s) create a more personalized discourse, as in Examples (9) and (10):

- (9) Sometimes a local slang was being used but in general I had to readjust my perception of Black English that I have been introduced to (*Word.*; June 15, 2010)
- (10) Mano manymu, Algio Mickūno tekstas „Filosofijos pradžia“ knygoje „Filosofijos likimas“ yra iki šiol sistemiškiausias jo filosofijos išdėstymas<sup>44</sup> (*Filosofija Lietuvoje*; 2010-12-16)

In the examples above, the author's presence is signalled by the pronoun *I* in English and *mano* in Lithuanian. The pronouns clearly emphasize the author's involvement (Example (9)) and attitude (Example (10)). Here a relationship with the visual representation of the authors might be drawn: in English the author's presence is both verbal and non-verbal while in Lithuanian it is atypical to represent the authors of the articles visually (as discussed in Section 5.2.2). Thus, the substantial use of personal pronouns in Lithuanian popular scientific discourse (if compared to academic discourse) is a clear attempt to personalize the discourse.

Collegiality or interpersonal relationship is highlighted by the use of the first-person plural pronoun in both languages (consider Examples (11) and (12)):

- (11) Within a hot spot, we would prioritize the languages that are smallest, that are most endangered, perhaps, that are most unusual (*National Geographic*, October 6, 2010)
- (12) Vis dėlto į Karaliaučiaus universiteto profesorių Rėzą mes, regis, linkę žvelgti siaurai, jo veiklą supaprastiname, matome jį tik kaip Donelaičio metų leidėją<sup>45</sup> (*Literatūra ir menas*; February 18, 2011)

This use of personal pronouns functions as a dialogic feature of popular scientific discourse, as it involves not only the author himself/herself, but also his/her colleagues or other scholars. The

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<sup>44</sup> In my opinion, the text “The Beginning of Philosophy” by Algis Mickūnas in the book *The Destiny of Philosophy* is so far the most systematic presentation of his philosophy.

<sup>45</sup> Anyway, we tend to view Rėza, Karaliaučius University professor, from a narrow perspective; we simplify his activities and consider him as only the publisher of Donelaitis's *Metai*.

dialogicality of popular scientific discourse is also emphasized by the reader-inclusive use of the pronoun *we*, as in Example (13):

(13) If we look at Britain in the 16<sup>th</sup> and 17<sup>th</sup> centuries we can see antipathy towards angels coupled with an imaginative appetite for them (*History Today*, Vol 60, issue 12).

(14) Mes, Vakarų pasaulio žmonės, lyg ir turėtume laisvės turėti į valias.<sup>46</sup> (*Filosofija Lietuvoje*).

By using the pronoun *we*, the author identifies with the readers of the article and involves them into the discussion.

The comparison of self-mention in popular scientific articles in English and Lithuanian has revealed the existing differences across genres and cultures. Hyland's extensive interdisciplinary research of self-mention in research articles emphasises that the use of personal pronouns depends on the field. As indicated by Hyland (2004, 2005), who analysed research articles in 8 different disciplines, the use of self-mention reaches 5.7 occurrences per 1000 words in philosophy and 4.4 occurrences per 1000 words in applied linguistics (or 570 and 440 occurrences per 100,000 words). The present research demonstrates a higher usage of personal pronouns in English academic discourse, which might be influenced by the genre, as Hyland analyses research articles, while COCA comprises a whole variety of genres. As for popular scientific discourse, the numbers are higher in both English and Lithuanian (949,8 and 724 instances, respectively).

Recent research on engagement features including personal pronouns was carried out by Khoutyz (2013), who compares engagement features in English and Russian. Due to their similar geographical positions and close cultural relations, one might expect a similar use of self-mention in Russian and Lithuanian. The main similarity which can be observed between Russian and English is that self-mention is more typical of English, as is the case between English and Lithuanian. Additionally, as noted by Khoutyz, the personal pronoun *we* is more typical in Russian than *I*, which is the case in Lithuanian popular scientific articles as well; however, in Lithuanian the difference between the use of the pronoun *I* and *we* is minimal. Furthermore, in popular scientific discourse, more occurrences of personal pronouns can be found in Lithuanian than in English.

In general, the research shows the existing cross-cultural differences between popular scientific discourse in English and Lithuanian and the differences between academic and popular scientific discourse. The analysis has not revealed a noticeable difference between academic discourse and popular scientific discourse in English; however, this distinction is obvious in Lithuanian. In addition, cross-cultural differences between English and Lithuanian

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<sup>46</sup> We, the people of the Western world, should have as much freedom as we want.

popular scientific discourse can be observed, as personal pronouns are more frequently used in Lithuanian. In both languages extensive personalization is a distinctive feature of popular scientific discourse.

## 6.2 Intertextuality in Popular Scientific Discourse in English and Lithuanian

As has been discussed in Sub-section 3.2.1, intertextuality is an important feature of academic discourse. Scholars distinguish between implicit and explicit intertextuality (see Sub-section 3.2.1). The present research focuses on explicit intertextuality and attempts to discuss citation and referencing conventions in popular scientific discourse in English and Lithuanian.

For the analysis of intertextuality in English and Lithuanian popular scientific articles, quotations, paraphrases, and references were selected manually and grouped into categories. This analysis indicates that popular scientific discourse is highly intertextual, and that authors rely heavily on researchers' ideas by using direct or indirect quotations to support their claims or basing their article on an authority (almost 50% of direct quotations and paraphrases are based on other scholars' ideas). The results are provided in Table 25:

**Table 25.** Intertextuality in popular scientific articles in English and Lithuanian

Direct quotations		Paraphrases		Mixed		In-text references		Total	
EN	LT	EN	LT	EN	LT	EN	LT	EN	LT
1550	971	773	789	112	4	234	361	2669	2125
58.3%	45.6%	28.7%	37.2%	4.3%	0.2%	8.7%	16.9%	100%	100%

As indicated in Table 25, popular science in English and Lithuanian relies on direct quotations more than paraphrases. Direct quotations create the impression of immediacy and reliability as there is no danger of misinterpreting or distorting the idea. Still, some scholars' ideas and the main aspects of the research are paraphrased, which is more typical of Lithuanian (37.2% of instances to 28.7% of instances in English). Paraphrases and mixing direct quotations with paraphrases create the major difference between English and Lithuanian popular science. Mixed quotations in Lithuanian make up only 0.2% of explicit intertextuality, while in English this type is much more common (4.3%).

Mixing paraphrases and direct quotations in the same sentence provides wider possibilities for the author (i.e., what to quote directly and what to paraphrase); in addition, the author can also express his/her attitude. In-text references (where the scholar's/researcher's surname and date of publication are indicated in brackets) are not very typical of popular scientific discourse. Their omission can be viewed as one of the distinctive features of the genre.

Precise documentation of the sources is essential in academic discourse. Typically a quotation or a paraphrase is followed by a reference to the source (i.e., the author's surname, year, and page). However, this convention is not obeyed in popular scientific discourse. Only in nearly 9% of the cases analysed in English and nearly 17% in Lithuanian are in-text references indicated; thus, precise documentation is not considered essential in popular scientific discourse in English. In Lithuanian, this convention of academic writing is used more extensively.

The effect of excluding in-text references is double. On the one hand, the readers are more interested in the facts rather than in-text referencing, and including them could disturb reading; on the other hand, in some cases the scholars remain invisible, as neither their surnames nor publications, are mentioned only their institutions. Thus, questions of authorship and, accordingly, of the reliability of the research might be raised.

Another formal requirement of academic writing is to register all sources in the list of references. Such lists are included in only 14 articles out of 376 in English and 12 articles out of 294 in Lithuanian, which makes up only 3.7% and 4% of all articles, respectively. In addition, 4 articles contain a section, 'For further reading,' where related articles or books with precise documentation are provided so that the reader can find them easily. In general, the convention of precise referencing and documenting sources is not obeyed in popular scientific articles, thereby creating a difference between popular science and academic writing.

Direct quotations and paraphrases in English and Lithuanian can be categorized into several types (see Table 26 in Appendix H). Four different categories of direct quotations in popular scientific discourse may be distinguished: quotations by scholars (31.9% in English and 6.2% in Lithuanian), participants of research or historical events (9.6% in English and 6% in Lithuanian), examples (especially in articles on linguistics to give real-life examples) (4.9% in English and 2.5% in Lithuanian), and quotations from written sources, such as documents, books, or newspapers (11.9% in English and 28.9% in Lithuanian). The most noticeable cultural difference between direct quotations in English and Lithuanian is the reliance on authority in English (quotations of scholars) and on written sources in Lithuanian.

Quotations of scholars and researchers provide authentic and reliable explanations of their research, methods or interpretations, as in Example (15):

(15) Vajda also showed how these cognates have sound correspondences. "I systematically connect these structures in Yeniseic with the structures in modern Na-Dene," Vajda said. "My comparisons aren't just lists of some look-alike words ... I show there is a system behind it."

Johanna Nichols is a linguist at the University of California in Berkeley who attended the Alaska meeting where Vajda presented his research.

With the exception of the Eskimo-Aleut family that straddles the Bering Strait and Aleutian Islands, this is "the first successful demonstration of any connection between

a New World language and an Old World language," Nichols said. (*National Geographic*; March 27, 2008)

In the example above, direct quotations introduce the reader to the analysis and research on extinct languages. The researcher herself explains her method of working, which is a livelier and more personalized description when compared to the methodology sections of academic papers, yet a less precise one (e.g., it is not clear what system is being discussed). Thus, research is reported as a current and lively event, adding immediacy by direct speech.

The degree of researcher centeredness is one more difference between academic and popular scientific discourse, as in academic discourse the main focus is on the ideas, concepts, or results, while the process or personal researcher's opinion are of primary value in popular scientific discourse in English. The reader receives the information which is more personalized compared to academic discourse, and has access to authentic scholars' comments.

Direct quotations and paraphrases of scholars also function as a principle of creating popular scientific discourse as the scholars' voice is combined with more objective paraphrases. This principle is illustrated in Example (16) below:

(16) The foreign adopted children, who struggle with language, master everyday skills and have a perfect pronunciation. This is why we are fooled, Wagner says, and continues: "The everyday language is learnt very fast. Children adopted at the age of three to four experience their biological age as different from their linguistic age. Some of these children become very adept at using words and concepts they do not understand. They use language like a parrot and make grown-ups believe they are more advanced in language development than they really are. The children know the words, but do not understand the deeper concepts," says Wagner (*Science Daily*, December 19, 2008).

The pattern when a paraphrase is followed by a quotation or vice versa is typically repeated several times in an article. Again, this pattern could be referred to as a different principle of discourse creation, as a synthesis of several sources and their discussion is more typical of academic discourse. The principle of constructing popular scientific discourse is more similar to newspaper language where the author's voice is intermingled with other voices of participants.

Participants in a research, projects, or events are also important in popular scientific writing as their voice is also frequently quoted or in some cases paraphrased. Participants, who can also be unprofessional, provide their own impressions, opinions, or comments, as can be seen in Example (17):

(17) "The original plan was to fully support it, but we just didn't have the resources," said Peter Constable, a senior program manager at Microsoft. For Windows 8, which is still being tested, Microsoft has fixed the problem. (*New York Times*; December 9, 2011)

In the example above, the opinion and explanation of a programme manager are provided. It can be claimed that features of journalistic writing to interview various personalities are obeyed in popular scientific discourse, as academic writing is usually limited to the discussion of the topic.

Similar to English, Lithuanian articles feature quoted or paraphrased participants of events or research. Furthermore, some articles mix scholarly information with descriptions of events to commemorate famous Lithuanian people or scholars, as in Example (18):

- (18) Kartą tarp jų sutikau ir iš Joniškio įmonės „Sidabra“ atvykusį giminaitį, pavaišinusį ir mus su žmona karštomis dešrelėmis. „Vaišinkitės, dešrelių užteks – direktorius liepė tiek ir tiek nuvežti, o aš dar nuo savęs pridėjau“, - su šypsena pridūrė Stasiukas ir toliau vaišino kitus. Atrodė, kokie mes, lietuviai, vieningi esame - net žūti nebaisu.<sup>47</sup> (*Lietuvos aidas*, January 11, 2011)

The tone of speaking and the situation described in the example above are closer to publicistic writing; however, the article is an associate professor doctor's reflection and comment on the events of January 13, 1991, combined with quotations of dialogues which occurred while participating in these events. The quoted ideas modify the academic tone to a more informal one and make academic discourse both intertextual and interdiscursive.

The use of intertextual elements is also dependent on the subject field. In the articles on literature or linguistics, not only are the researchers' but also the participants' opinions expressed. For instance, the participants in historical events are quoted (especially politicians); however, even more frequently, written sources (such as documents, books, letters, or myths) are quoted or paraphrased in popular scientific articles on history. These intertextual elements dominate in the magazines *History Today* or *American Heritage*.

Direct quotations provide the reader with access to historically significant documents, memoirs, or personal impressions, as can be seen in Example (19):

- (19) William Strachey, who arrived in 1610, soon wrote an account of the already Lost Colony in which he stated that the “men women, and Children of the first plantation at Roanoak” lived with the Indians for 20 years but were then exterminated by the Powhatan, a powerful people who were expanding their rule over Tidewater Virginia. (*American Heritage*; Vol 60, issue 2)

In Example (19), the author incorporates the quotation from 1610 into a broader description, thereby increasing the authenticity of the discourse and grounding his claims on the existing memoirs. In addition, some of the historical articles are highly intertextual, so that it is complicated to distinguish between the author's voice and paraphrases of historical sources. This could be viewed as a typical feature of historical popular scientific articles, which are

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<sup>47</sup> Once I met a relative among them who came from the ‘Sidabra’ company in Joniškis; he treated me and my wife with hot sausages. “Enjoy, we’ve got plenty of them – the director said to bring that much, and I also added from myself,” Stasiukas added, smiling and treating others. It seemed that we, Lithuanians, are so united – it’s not dreadful even to die.

unavoidably based on earlier texts. As has been mentioned, popular scientific discourse in Lithuanian relies on written sources more than on scholars' works. As in English, written sources refer to historical documents or letters; however, in Lithuanian, extracts from books or poems are incorporated into articles. This is not a very common tendency, but an attempt is made to represent historical facts not only from a scholarly point of view, but also from a subjective perspective.

The authenticity of popular scientific discourse is also increased by providing authentic real-life examples, dialectal words, or grammatical constructions. This is especially typical of the magazine *Word.*, the aim of which is to discuss the features of African American English and introduce them to broader audiences. Mainly authentic uses or examples from songs are chosen as illustrations, as in Example (20):

(20) AAE lyric: "I wanna celebrate and live my life/ sayin' "Ayo, baby let's go"/ 'cause we gon' rock this club." (*Word.* September 27, 2009)

In this case, a verse from a song is taken as an example to illustrate grammatical and lexical features of African-American English, which are discussed and commented upon below. In articles on endangered languages, the readers are provided with examples of words written in a Latin alphabet so that the reader can try and pronounce them as well.

In Lithuanian popular scientific discourse, the voice of cultural actors may be distinguished, i.e., the voice of writers, poets, or creators, as for instance:

(21) Apie šią garbingo amžiaus išėivijos rašytojų vadovę žinojau mažai. Bene daugiausia būsiu girdėjęs iš Bernardo Brazdžionio. Įsiminė jos kuklus prisipažinimas, 1994 m. išsprūdęs „Egzodo rašytojuose“: „Parašiau nedaug. Tebūnie mano kūryba kaip tas nedidelis žilvičių krūmelis prie didžiųjų ąžuolų.“<sup>48</sup> (*Literatūra ir menas*; July 16, 2010)

The quotation above is an idea expressed by the writer Stasė Petersonienė, while in the article her and other exodus writers' works are analysed. Thus, the reader obtains both a more objective and critical discussion of her works as well as her own attitude towards writing. In general, the category of cultural actors is different from popular scientific discourse in English, where only the participants of events or research are quoted. This suggests that, in Lithuanian, more cultural topics are touched upon and incorporated with the academic discussion of literary texts.

The analysis leads to several generalizations about intertextuality in popular scientific discourse in English and Lithuanian. First, intertextuality is a common feature of

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<sup>48</sup> I knew little about this elderly chairwoman of exodus writers. Probably I heard most from Bernardas Brazdžionis. I memorized her modest statement in *Exodus Writers* (1994): "I wrote little. Let my creation be like that small osier bush by the big oaks."

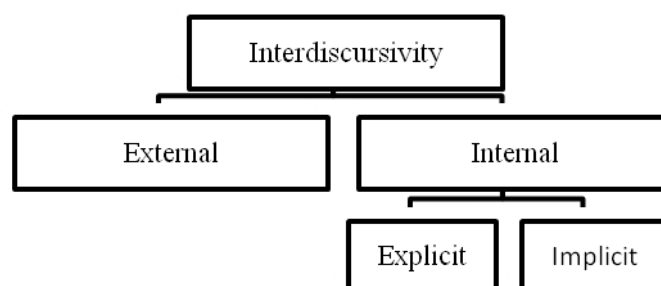
popular scientific discourse in both languages: scholars' ideas, research or other voices (e.g., participants of events or research) are used as direct quotations or paraphrases. Direct quotations are more typical than paraphrasing; direct quotes create the effect of immediacy and authenticity. Second, in-text referencing is used in some of the popular scientific articles; however, it is common not to include in-text references or references at the end of the article, which creates a major difference between popular scientific and academic discourses. Third, quotations by participants contribute to the dialogic nature of popular scientific discourse and modify it to a more publicistic one.

In addition, cultural differences between English and Lithuanian popular science are observed. In English, scholars' quotes and their research are provided as a contextual basis for the article, while in Lithuanian authentic written sources dominate, including literary works. Thus, in English, popular scientific discourse is centered on research and the ideas of scholars as authoritative figures, while in Lithuanian it is less common to provide a broader scholarly context. Rather, cultural implications or ideas of culture actors are provided, which combine a scholarly point of view with Lithuanian culture or commemoration of certain events.

### 6.3 Interdiscursivity in popular scientific discourse in English and Lithuanian

Despite the increasing interest in interdiscursivity of genres, the research on popular scientific discourse from this perspective is minimal. Thus, this research attempts to describe interdiscursivity in popular scientific discourse in English and Lithuanian and compare its uses in the two languages. Even though conventionally it is agreed to refer to implicit and explicit intertextuality, the same concepts may also be applied to interdiscursivity.

Implicit interdiscursivity elements refer to stylistic changes, which are not immediately visible and require more detailed analysis. Explicit interdiscursivity is signalled very clearly by visible elements of other discourses, such as pictures, graphs, and bold or underlined phrases which are hypertextual, i.e., they link two different discourses. In general, interdiscursivity may be analysed according to the following model based on works by Bhatia (2007), Jones (2012), and Bazerman (2004):



**Figure 10.** Types of interdiscursivity (based on Bhatia, Jones, and Bazerman)

In the present research, the focus is on explicit interdiscursivity, which contributes to the complexity and dynamics of the genre, as well as promotes the interpersonal metafunction of the texts. The analysis of implicit interdiscursivity can be very complicated due to the large scope of texts under the present investigation and is therefore excluded.

A general observation about popular scientific articles in English is that this genre is highly complex, dynamic, and interactive, while interdiscursive elements contribute not only to the informative but also to the interpersonal content. First, a distinction can be made between text external and text internal interdiscursivity. The former refers to the elements directly incorporated in the text but appear as contextual elements, while the latter is concerned with the elements inside the article.

In English popular scientific discourse, two main text external interdiscursive elements may be traced: advertisements and article commentaries. Advertisements (to buy or order the magazine, to buy books, etc.) are an inseparable part of online popular scientific discourse in English and contribute to the commercial aspect. Thus, the reader of popular scientific articles is also a potential buyer or user of the advertised services; on the contrary, traditional academic discourse is devoid of commercialization.

Text internal interdiscursive elements include non-linguistic constructs (Wu 2011: 96) and hypertexts. Non-linguistic constructs are a variety of visuals which are also analysed as interdiscursive elements by other scholars, but in different genres: for instance, advertisements (Cruz and Mendonça 2012). In popular scientific articles the most common non-linguistic elements are photos, pictures, graphs, and maps, which are analysed from the multimodal perspective in the present thesis. These visual elements (or modes) serve not only informative but also affective or interpersonal metafunctions (as discussed in Section 5.4).

The use of a hypertext, which is signalled by a bold type, blue colour, or underlined, depends on the magazine: it is more typical of some popular scientific magazines than others. The analysis of English popular scientific articles reveals that hypertexts may be categorized according to the following categories:

- (a) links to biographies of the scholars or other famous people;
- (b) links to dictionary entries or terms, which might be unknown for the reader;
- (c) links to interviews, scholarly articles or parts of books;
- (d) links to pictures, photos, video or audio material;
- (e) links to institutions.

The analysis has revealed that the use of hypertexts and, accordingly, interdiscursivity, is dependent on the magazine. Some (e.g., *Word.* or *National Geographic*) use hyperlinks

extensively, i.e., 3-4 links per article; however, in other magazines (e.g., *HowStuffWorks*, *Language Magazine* and *Scienc Daily*) hypertexting is not typical.

Despite different fields and different magazines, hypertexts fall into restricted categories; thus, it may be claimed that these categories, as well as discourses or genres accessed by using hypertexts, are typical of popular scientific discourse in English. For instance, it is common to provide links to the author's biographies or lists of their publications. By clicking on the author's surname, the reader can access the main professional information about the author, i.e., his/her interests, work place, or main publications (in some cases the information may be more extensive and contain more biographical details). In this way, the author receives additional attention, while the readers may also access articles written by the same author. In addition, they can also access additional information about other people mentioned in the article (e.g., politicians, writers, or celebrities).

A hypertext may also link to dictionary or encyclopedia entries. In such a case, a clear focus on a non-specialist is placed as the terms or concepts, which might be unknown for a non-specialist, are explained (e.g., the terms *speech community* or *'r' vocalization*). The terms are explained by giving links to *Wikipedia*, which is criticised from the scholarly point of view as being unreliable. In the case of dictionaries, *The Free Online Dictionary* or *The Urban Dictionary* are chosen, i.e., the sources which are not prestigious or the most reliable.

The readers may also access other academic genres, such as academic articles, parts of books, or interviews with scholars. These genres serve as supports for the claims made in the articles. Finally, links to the websites of institutions such as museums, universities, or their libraries may provide necessary information, such as working hours, services, or admission conditions. This shows that institutional discourse is often combined with the informative content of the article.

Interdiscursivity in Lithuanian is treated differently when compared to English popular scientific articles. The examples of external interdiscursivity are advertisements and article commentaries, which are beyond the scope of the present research. Even though photos and graphs or maps are used as modes to contribute to the meaning of the article in Lithuanian, other affordances of the internet are not used. For instance, hypertextuality and, accordingly, other genres or discourses are rarely used to complement popular scientific articles. Only two popular scientific magazines, namely, *Filosofija Lietuvoje* and *Istorija.net* use hypertext; however, its use is not systematic and consistent.

In the magazine *Filosofija Lietuvoje*, hypertext is used to refer to biographies of the scholars, lists of publications, and institutions, such as universities, institutes, or centres (mainly the institutions where the scholar works), as can be seen in Picture 73:

I svetainės "[Filosofija Lietuvoje](#)" lankytojų klausimus atsako filosofas Dalius Jonkus



Dalius Jonkus – humanitarinių mokslų daktaras, Vytauto Didžiojo universiteto Humanitarinių mokslų fakulteto [Filosofijos katedros](#) docentas bei vedėjas, Vilniaus pedagoginio universiteto [Filosofijos katedros](#) docentas, Lietuvos fenomenologų draugijos prezidentas, Lietuvos filosofų draugijos narys. Taip pat Vilniaus Pedagoginio universiteto mokslo darbų „[Žmogus ir žodis](#)“ redkolegijos narys, atsakingas už filosofinio numerio parengimą.

1998 metais apgynė disertaciją tema „Būties problema Martyno Smigleckio logikoje“.

Interesų sritys: fenomenologija, filosofinė antropologija, kultūros filosofija.

Detalų akademinio gyvenimo aprašymą galite rasti [čia](#).

**Picture 73.** Example of hypertext used in Lithuanian popular scientific articles

As the example demonstrates, more attention is given to the scholar's personality, research interests, and his work place; however, most information is inaccessible or cannot be found because of technical problems, which also shows that online popular scientific magazines are not constantly administered, and online publishing popular scientific magazines do not have a strong tradition (or are not viewed seriously) in Lithuania.

The features discussed above show that popular scientific discourse in Lithuanian is more conservative, as the possibilities provided by the internet are practically not used at all. The impression is created that the article is copied from a paper version (in most cases, the magazines are printed as well) to the website. A clear lack of personal involvement may be observed, while, on the contrary, in English various technological affordances are employed, which are reader-oriented and attract more readers as active participants.

Concerning genre, popular scientific articles in Lithuanian exhibit more generic integrity, to use Bhatia's term (1997: 360); i.e., they follow more conventional structural, linguistic, and extra-linguistic features. On the contrary, popular scientific articles in English demonstrate more mixing and embedding, which modifies the genre according to the needs of society; for instance, the rise of social communication websites, such as *Twitter*, has encouraged including their links in articles.

From a scholarly point of view, it might be questionable to use *Wikipedia* or *The Free Dictionary* as sources to explain unknown terms and concepts, as other, more reliable encyclopedias or dictionaries could be used; however, possibly, this shows an orientation towards the reader and the discourse, so that it would not be too complex. In Lithuanian, on the contrary, no explanations or other guidance are provided.

The analysis has revealed that, from the perspective of interdiscursivity, English and Lithuanian popular scientific discourse differs considerably. Both in English and Lithuanian

advertisements and article commentaries are used; however, in Lithuanian the tradition to contribute and express a personal opinion on scholarly matters is only developing, while in English this possibility is frequently used. Other explicit features of interdiscursivity are the use of visuals and hypertexts, which links different genres and discourses to popular scientific discourse, in this way either providing additional information which might be necessary for the perception of the article, or entertaining the reader. In English the use of hypertexts is still dependent on the magazine; however, in most cases hypertextual links are used extensively. The result is culturally distinct variants of the same subgenre: in English it is more complex, dynamic, and corresponds to the needs of contemporary society, while in Lithuanian it is more conservative and restricted, even though the medium is the same, i.e., the internet.

#### **6.4 Summary**

This chapter focused on linguistic features of popular scientific discourse in English and Lithuanian; namely, on the author's stance, which expresses the relationship between the author of a popular scientific article and the reader, intertextuality, and interdiscursivity. The analysis has revealed certain features typical of popular scientific discourse, as well as cultural variation.

The most distinctive difference is between academic discourse in English and Lithuanian. In English more features of author's stance are used in academic discourse, while in Lithuanian, considerably more features of author's stance are used in popular scientific discourse. Thus, the authors of popular scientific discourse employ different strategies of approaching the reader. Furthermore, the comparison of popular scientific discourse in English and Lithuanian has revealed that the frequency of the features of author's stance is slightly higher in Lithuanian.

Intertextuality is a feature common to popular scientific discourse in English and Lithuanian. Even though academic texts are naturally intertextual, i.e., they are grounded on the ideas and research of other scholars, popular scientific discourse is not restricted to quotations and paraphrases from other pieces of research by scholars (i.e., a variety of other sources are quoted or paraphrased). Additionally, in-text referencing is not commonly used in popular scientific discourse, while references after the articles are even less typical. Despite some obvious features of interdiscursivity in popular scientific discourse in Lithuanian (advertisements or quoted literary texts), it might be claimed that in English popular scientific discourse employs a variety of interdiscursive features, at least at the explicit level, which was the object of the present research.

## 7 Conclusions

The aim of the final chapter is to provide a generalization about the features of popular scientific discourse as a genre and to draw a distinction between the conventions of popular scientific discourse in English and Lithuanian. In addition, this chapter emphasizes the practical applications of the present thesis and provides suggestions for further research.

### 7.1 Popular Scientific Article as a Genre in English and Lithuanian

The present thesis has analysed popular scientific articles in English and Lithuanian from the multimodal perspective, which is a comparatively new approach. The aim of this section is to discuss the dominant verbal and non-verbal features of the genre in English and Lithuanian.

The present thesis has demonstrated that popular science has distinctive features as a genre; in addition, culture-dependent features can also be observed. The main features of popular scientific discourse in English and Lithuanian are presented in Table 27 (coinciding features are emphasized by italics):

**Table 27.** Features of popular scientific discourse in English and Lithuanian from the multimodal perspective

Feature	English popular scientific discourse	Lithuanian popular scientific discourse
Usage of modes	Various modes and their combinations; <i>photos and pictures dominate</i>	<i>Photos and pictures dominate</i> ; the use of other modes is minimal
Visual representation	<i>Stereotypes</i>	<i>Stereotypes</i>
Metafunctions of images	<i>Ideational metafunction dominates</i> ; entertaining and interpersonal metafunctions are also common	<i>Ideational metafunction dominates</i> ; the focus on representation
Relationship between text and images	<i>Multiple relationship</i> ; the modes tend to be more directly interrelated	<i>Multiple relationship</i> ; the images add additional information
Author's stance	Slightly higher frequency of author's stance features in academic discourse	Twice or more higher frequencies of author's stance features in popular scientific discourse
Intertextuality and interdiscursivity	<i>Highly intertextual</i> and interdiscursive genre	<i>Highly intertextual</i> ; explicit interdiscursivity is hardly used

The present thesis has focused on the main tendencies concerning **the usage of modes** in popular scientific articles in English and Lithuanian and has revealed a number of differences, which indicate that the discourse communities view the genre differently and explore different possibilities in creating it. In English, non-verbal elements are used more frequently than in Lithuanian (731 non-verbal elements in English and 520 in Lithuanian) and their combinations are more varied (e.g., in English, photos, maps, videos, and other modes are used in combination with text), while in Lithuanian only photos and pictures are the dominant modes.

The different frequency of non-verbal elements and their combinations shows that the attitude of the discourse community towards the genre is different in English and Lithuanian. In English, various affordances of the internet are used in order to attract the reader. In contemporary society, visuals dominate (Kress and van Leeuwen 2006); thus, it is essentially important for the readers to obtain information from various non-verbal modes. This need of the readers is satisfied by the authors of popular scientific articles in English, who attempt to attract the readers' attention by large photos, slideshows of pictures, audios, or video recordings. A different strategy is adopted by the Lithuanian authors of popular scientific articles who tend to create a salient and homogeneous genre with text as the dominant mode; non-verbal elements are mainly photos and pictures, which is also the case in printed articles. Thus, the affordances of the internet domain are not used in Lithuanian; furthermore, clear strategies to attract the audience and popularise the genre cannot be observed.

For a long time, **visual representation of social participants** was mainly the object of art; traditionally, discourse analysis was limited to the analysis of various verbal or structural elements, while the visuals remained unanalysed. The theory of multimodality has provided the methodology of analysing social participants in various discourses. Kress and van Leeuwen correctly observe that repetitive variables lead to stereotyping; other scholars (e.g., Mitchell 2005; Olson et al. 2008) support this idea by analysing the visuals of African-Americans or other social participants in advertisement. However, these are small-scale studies, which might be true for individual instances, but may not necessarily be applicable for genres.

The present thesis has revealed that popular science encompasses not only informative content, but also cultural and social features typical of a particular society. Contrary to expectations about academic discourse, the analysis shows that certain stereotypes typical of Anglo-Saxon and Lithuanian culture are perpetuated in popular scientific discourse. One of the dominant stereotypes is the stereotype of a scholar in English and Lithuanian. Repetitive variables (such as formal clothes, a kind facial expression, and direct eye-contact) suggest that in English a scholar is represented as an official person, while in Lithuanian the typical scholar is a male; his clothing is more casual, the facial expression serious, and the eye-contact with the reader is not direct.

These results support Christidou's observation (2011: 147) that popular science promotes intense, outdated, controversial, or stereotypic and gender-biased images of scholars. The scholar also notes that female scholars are hardly present in public representations of science, which is especially true for the representations of scholars in Lithuanian articles (i.e., almost all visually represented scholars are males). The present thesis also supports Christidou's idea (2011: 148) that scholars are represented as 'someone not like us;' this stereotype of a

scholar is especially reinforced in English, as scholars are depicted recording distinct languages or doing archaeological excavations.

Other representations of people are also stereotypical; for instance, English popular scientific articles tend to represent individuals (73% of the represented people), while in Lithuanian articles individuals comprise 50% of all represented people. Furthermore, the representation of other professions (e.g., soldiers or pop stars) or non-Western cultures is also stereotypical and expresses the attitude of the society rather than representing the objective truth. Stereotypes thus can be referred to as a feature of popular science typical of both English and Lithuanian and distinctive from academic discourse.

From a methodological perspective, only the analysis of a large number of examples can reveal the existing stereotypes. The analysis could have been facilitated and improved by an annotated corpus of the images. Such multimodal corpora are compiled and used in contemporary centres of multimodal analysis. In the present investigation, however, the compilation of an annotated visual corpus was beyond the scope of the research.

Contemporary studies of multimodal analysis discuss not only the features of **visuals** but also their **metafunctions** in discourse and use Halliday's distinction into ideational, interpersonal, and textual metafunction in the analysis of images. The idea that it is possible to decompose images and that their elements form a visual grammar (i.e., images have a textual metafunction) permeates all Kress's works (cf. Kress 2001, 2010).

The present thesis has analysed the metafunctions of visuals in popular scientific discourse. Contrary to Kress's idea, the textual metafunction of images is not dominant in this genre, as most visuals both in English and Lithuanian are either representative (i.e., portraits of people) or narrative with the intention of depicting reality as accurately as possible; thus, the decomposition of images can hardly be applied in popular science. The interpersonal metafunction expressed visually is typical of popular scientific articles in English, which depict couples or families expressing close relationships or affection for each other. This metafunction could be viewed as a feature typical of popular scientific discourse in English; it combines the informative content of the article with emotive visual representation.

The ideational metafunction refers to the representation of informative images (i.e., people, objects, and charts/graphs), narrative images, aesthetic, and entertaining images. Naturally, informative images dominate both in English and Lithuanian; however, cultural genre differences can also be observed. In English articles an attempt is made to attract the readers by using entertaining images (e.g., caricatures, figurative images, or beautiful landscapes), while in the Lithuanian ones the entertaining aspect is reduced to a minimum.

Different metafunctions of the visuals in English and Lithuanian reveal different aims of the discourse community in creating the genre. In English, the aim of popularizing scholarly news and presenting it in a way that is acceptable and appealing for wider audiences can be observed. Entertaining images or images which express an interpersonal metafunction serve as features of pop culture and deviate from the norms of academic discourse. In Lithuanian, on the other hand, the authors aim at creating a serious and objective genre, which meets the expectations of a professional more than of a lay person, especially with respect to non-verbal representation.

As has been observed by Kress (2001, 2010, 2011), van Leeuwen (2002, 2005), Forceville (2006, 2009), Bateman (2008, 2009), Doloughan (2011), and other scholars working in the field of multimodal analysis, the **relationship between the text and images** is not homogeneous: some genres are dominated by the visual mode (e.g., advertisements), while other genres are inextricably associated with text (e.g., legal documents).

The present analysis aimed at analysing the relationship between the textual and the visual mode in popular scientific articles in English and Lithuanian. The analysis has revealed that there are several types of relationships between the textual and the visual mode, which can be conceptualized as a continuum; i.e., the indicated types may be different depending on the genre, subject-field, or cross-cultural differences.

The types of relationship between the textual and the visual mode vary from a very close one, when the visuals are described textually (usually tables or graphs) to a loose one when no direct relationship between the modes can be observed, and the reader has to interpret it himself/herself. A close relationship between the two modes conforms to the convention of academic discourse that the tables, graphs, or charts have to be described and interpreted textually. A looser relationship between the textual and the visual, when the images present additional information, or there is a very close relationship between the title and the image, are more typical of other genres, such as publicistic writing or literary works. Thus, with respect to the relationship between text and images, popular scientific discourse combines the features typical of both academic writing and other genres.

Cross-cultural differences in the genre concerning the relationship between the textual and the visual were also observed. In English articles, the modes tend to be more directly interrelated, while in Lithuanian articles, on the other hand, the visuals either add additional information or serve as a decoration used for aesthetic rather than informative purposes. In such a case, the reader is expected to analyse, associate, and interpret, which is more common to other genres (e.g., literary genres) rather than academic discourse. As many authors claim, the features of academic discourse are accuracy, precision, and directness (i.e., interpretation or

associations should be avoided) (cf. Murray 2005, Purves 1988, Rienecker and Jorgensen 2003, Swales 1990). Thus, the results of the present investigation suggest that Lithuanian popular scientific discourse tends to deviate from this norm; in contrast, in English popular scientific discourse, the relationship between the textual and the visual mode is more straightforward.

As the present analysis shows, corpus linguistics as a research method has some limitations in research on the relationship between the textual and the visual. It is a convenient research method when the relationship between the textual and the visual mode is close; however, it is not effective in identifying other types of relationships, as neither word lists nor collocations are revealing enough. Therefore, for an analysis of the relationship between the modes, software programmes are not an optimal option.

Linguistic analysis of popular scientific articles in English and Lithuanian focused on the expression of the **author's stance** (i.e., hedges, boosters, attitude markers, and self-mention), which contributes to the interpersonal metafunction of discourse and demonstrates different culture-dependent genre conventions. As the present thesis has revealed, in English, more features of the author's stance are used in academic than in popular scientific discourse, except for self-mention. For instance, the frequency of hedges is 997.8 and 1,076 in popular scientific and academic discourse, respectively; the difference in frequency between popular scientific and academic discourse is even greater with respect to attitude markers (1,093.6 and 1,271.1, respectively). However, the frequency of self-mention is 947.8 in popular scientific discourse, while it reaches only 683.1 in academic discourse.

In Lithuanian, an opposite strategy may be observed, i.e., the frequency of features of the author's stance is approximately twice or even more times higher in popular scientific than in academic discourse. For instance, the frequency of hedges is 947 in popular scientific and 448.3 in academic discourse; the frequency of attitude markers reaches even 1,278.1 in popular science, while in academic discourse the frequency is only 857.7. The broadest difference is with respect to self-mention: 724 and 112.1 occurrences in popular scientific and academic discourse, respectively.

It can be generalized that the authors of popular scientific discourse employ different strategies of approaching the reader in English and Lithuanian in comparison to academic discourse. In English, popular scientific discourse is more direct and concrete than academic discourse; consequently, the reader receives less guidance from the author and reacts to the information by writing commentaries on the articles and sharing these opinions on social communication websites. On the contrary, in Lithuanian the authors feel more freedom in expressing their own attitude in popular scientific discourse, which is a distinctive predominant feature of Lithuanian popular science.

Furthermore, the results of the author's stance may be related to the visual representation of the authors. As the present investigation shows, a photo of the author is a typical feature of a popular scientific article in English, while this convention is not observed in Lithuanian. The higher frequency of features of the author's stance in Lithuanian suggests that in Lithuanian popular scientific discourse the author's presence is textual rather than visual. In this way, the focus is placed on the author's opinion and attitude rather than his/her appearance; in English popular science both the visual and verbal presence of the author can be observed.

A comparison of the features of the author's stance in English and Lithuanian popular science demonstrates that, in total, their frequency is slightly higher in Lithuanian than in English (4,038.9 and 3,857.6, respectively). Concerning different features, hedges and self-mention are more frequent in English (997.8 and 947 occurrences of hedges in English and Lithuanian, respectively; 949.8 and 724 occurrences of self-mention in English and Lithuanian, respectively), while boosters and attitude markers are more frequent in Lithuanian (816.4 and 1,089.8 occurrences of boosters in English and Lithuanian, respectively; and 1,093.6 and 1,278.1 occurrences of self-mention in English and Lithuanian, respectively). The findings suggest that the authors of popular scientific articles in English attempt to mitigate their propositions similar to academic discourse, while in Lithuanian the authors tend to emphasize their point of view or express their opinion more explicitly and directly, thereby increasing subjectivity and personalization of the discourse.

High frequencies of features of the author's stance in the humanities have been observed by Hyland (2005, 2009, 2010, to name a few studies), Dontcheva-Navratilova (2009), and Khoutyz (2013). Their research demonstrates that from an interdisciplinary perspective, the humanities show the highest frequencies of features of the author's stance as interpretative and suggestive rather than exact and precise. The present research supports their findings concerning the humanities in academic discourse. However, no research has been done on features of the author's stance in popular scientific discourse. Thus, it can only be hypothesized that other subjects of popular scientific discourse (e.g., geography or technology) would demonstrate considerable differences concerning the author's stance.

**Intertextuality** is a common feature of popular scientific discourse in both English and Lithuanian, which suggests that the genre is shaped by various voices. Direct quotations (scholars' ideas, quotations from printed research, or other sources) are preferred to paraphrases, in this way adding immediacy and authenticity to the discourse. In addition, in-text referencing, as well as references after the text are typical neither of English nor of Lithuanian popular scientific discourse, which creates a difference from academic discourse where precise and accurate referencing is essential.

Even though academic texts are naturally intertextual, i.e., they are grounded on the ideas and research of other scholars, popular scientific discourse is not restricted to quotations and paraphrases from other pieces of research of scholars. They also include a variety of written sources, including literary texts, impressions by participants of research, or events described in the article, which modify the discourse to a more informal and publicistic one.

Despite some obvious features of **interdiscursivity** in popular scientific discourse in Lithuanian (advertisements or quoted literary texts), in English popular scientific discourse, a variety of interdiscursivity features are employed (e.g., advertisements, slide-shows, or videos), of which the hypertext is dominant. Thus, a typical feature of popular scientific discourse in English is the combination of various other discourses or genres, at least at the explicit level, which was the object of the present research. The affordances of the internet are employed in order to attract wider audiences and contribute to the dissemination of popular scientific discourse or address a lay person. In Lithuanian explicit interdiscursivity and affordances of the internet are used minimally, which shape the genre as more conservative and homogeneous.

## **7.2 Practical Application of the Thesis**

As has been mentioned initially, the application of the theory of multimodality in discourse analysis is still limited. However, the results obtained may also be applied for practical purposes by writers, translators, readers of popular scientific articles, and language learners.

The present thesis supports Kress and van Leeuwen's idea that images in discourse are not chosen accidentally; they are an inseparable part of discourse and, together with other modes, create meaning. Thus, the writers of popular scientific articles have to be aware not only of the linguistic differences between academic and popular scientific discourse but also of the use of other modes. The analysis has revealed that non-verbal elements are treated differently in English and Lithuanian popular scientific discourse, and that in English a variety of modes and their combinations provided by internet affordances are employed in order to attract readers. Similar strategies on popularizing the discourse and attracting lay people could be adopted by the writers of Lithuanian popular scientific discourse in order to reach wider audiences.

Some popular scientific magazines are read world-wide (e.g., *National Geographic* or *Discovery*). The articles are usually translated from English into a variety of languages; therefore, translators have to know genre differences and conventions in order to produce a translation which not only reveals the informative content but is also acceptable stylistically and obeys genre requirements. In the present thesis, a considerable difference in the use of the

author's stance has been observed, which might be one of the problematic cases while translating popular scientific articles.

Knowledge of the genre, its features, and conventions is useful not only for its writers but also its readers. By having more knowledge about the genre, the readers can read more effectively and obtain information from various modes more easily, as the combination of various modes is especially important in popular scientific discourse. Furthermore, the readers have to form certain genre expectations and be aware of the existing cross-cultural differences.

Finally, language learners have to acquire knowledge about genres and their conventions. This improves their linguistic repertoire and extends their knowledge about the appropriate features of the genre. The distinction between academic and popular scientific discourse is especially important for learners of EFL in order to choose appropriate means of expression both while writing and analysing academic and popular scientific genres.

### **7.3 Suggestions for Further Research**

The present thesis opens up wide research possibilities in the future. First, the present investigation is limited to the analysis of non-moving images; future studies could analyse the use and functions of audio and videos in popular scientific discourse, especially in English. Furthermore, the theory of multimodality could be applied by analysing other fields of popular science such as geography or the hard sciences, as interdisciplinary differences can be expected in the use of various modes. In addition, the comparison between popular scientific and academic discourse could be interesting, as well as the analysis of printed and online articles.

From a linguistic perspective, the present thesis focused only on the author's stance, intertextuality, and interdiscursivity. Future research could focus on other features, such as the use of figurative or informal language, lexical bundles, sentence structure, and other lexical, syntactic, semantic, and pragmatic features of popular scientific discourse. Cross-disciplinary research is also a potential area where linguistic differences of popular scientific discourse can be expected to be found.

With respect to genre, the research applying the theory of multimodality is still limited. Therefore, other academic or non-academic genres or subgenres could be analysed. For instance, it would be interesting to analyse the differences in the use of different modes by novice and non-novice writers of academic discourse; spoken discourse in academic settings is one more domain where the theory of multimodality could be applied. As for non-academic genres, travel brochures, advertisements, or blogs are only some of the possibilities where the application of the theory of multimodality could be applied.

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## Appendices

### APPENDIX A

The main information about the popular scientific magazines used in the present research

Magazine	Main information
<i>National Geographic</i>	The official magazine of the National Geographic Society. It has been published continuously since its first issue in 1888, nine months after the Society itself was founded. It primarily contains articles about geography, history, and world culture.
<i>History Today</i>	The original history magazine, <i>History Today</i> has been published monthly in London since January 1951. The founder of the magazine was Brendan Bracken, Minister of Information during the Second World War, publisher of the <i>Financial Times</i> and faithful lieutenant of Winston Churchill. <i>History Today</i> created the concept of popular history, mixing styles, genres, and periods to achieve a fusion of intellectual excitement and readability.
<i>HowStuffWorks</i>	A commercial educational website launched in 1998. It was created by Marshall Brain; now the website is owned by Discovery Communications. The site uses various media in its effort to explain complex concepts, terminology, and mechanisms, including photographs, diagrams, videos and animations, and articles.
<i>Language Magazine</i>	First published in 1997, <i>Language Magazine</i> (formerly <i>American Language Review</i> ) is the popular periodical of language, education, and communication. In 2001, <i>Language Magazine</i> increased its publication schedule from 6 to 12 issues a year to answer the demand of readers
<i>American Heritage</i>	A quarterly magazine dedicated to covering the history of the United States for a mainstream readership. Until 2007, the magazine was published by Forbes. Since that time, Edwin S. Grosvenor has been its publisher.
<i>Word.</i>	Created in 2009 by Niki Hossack. The aim of the website is to share knowledge about African American English with the larger community.
<i>Scientific American</i>	<i>Scientific American</i> was founded by inventor and publisher Rufus M. Porter in 1845 as a four page weekly newspaper. It is notable for its long history of presenting scientific information on a monthly basis to the general educated public. In March 1996, <i>Scientific American</i> launched its own website that includes articles from current and past issues, online-only features, daily news, weird science, and special reports.
<i>Science Daily</i>	An American news website for topical science articles. It features articles on a wide variety of science topics including: astronomy, archeology, paleontology, and others. The website was founded in 1995 by science writer Dan Hogan. The articles are selected from news releases submitted by universities and other research institutions. Some articles are written by <i>Science Daily</i> staff.
<i>Popular Linguistics Online</i>	A monthly online magazine with articles on linguistics- and language-based theory, news, application, findings, and field reports. It is aimed at a general, educated, and scientifically-inclined audience. During the process of writing the thesis, this popular scientific magazine terminated its activity.
<i>Popsci</i>	An American monthly magazine carrying popular science content, that is, articles for the general reader on science and technology subjects. With roots beginning in 1872, <i>PopSci</i> has been translated into over 30 languages and goes out to at least 45 countries
<i>NY Times</i>	An American daily newspaper, founded and continuously published in New York City since September 18, 1851. It has won 112 Pulitzer Prizes. It contains a section on popularized science.
<i>DNews</i>	One more product of Discovery Communications LLC, which is probably the best known for the Discovery channel. <i>DNews</i> presents popular scientific articles on history, anthropology, psychology, medicine, and many other issues.

<i>Nature.com</i>	International weekly journal of science published by Nature Publishing Group. The journal was founded in 1869. nature.com provides over 6 million visitors per month with access to NPG publications and online databases and services, including news and comments.
<i>Mokslo Lietuva</i>	Published since 1998. The newspaper of Lithuanian scholars. Explores a variety of topics with the major focus on the humanities.
<i>Literatūra ir menas</i>	Published since 1946. Now published as a weekly magazine of Lithuanian Writers' Association. The magazine focuses on such topics as cultural life, art, literature, architecture, and translation.
<i>Kultūropolis</i>	Mainly explores cultural topics in Klaipėda region
<i>Istorikas.lt</i>	Contains a variety of sources which can help learn history. The texts are written by professor and archaeologist Eugenijus Jovaiša.
<i>Istorija.net</i>	The texts are mainly written by historian Tomas Baranauskas. He explores historical topics of his personal interest or commemorates important dates.
<i>Filosofija Lietuvoje</i>	Published since 2004 by Vilnius University. Focuses on philosophy in Lithuania (people, publications, conferences, or news)
<i>Alkas</i>	The aim of the magazine is to introduce with Lithuanian ethnography, culture, language, history, religion, and customs. The online magazine is a part of a non-commercial project.
<i>Lietuvos aidas</i>	A newspaper published since 1917. The first editor was Antanas Smetona, the future President. It was not published during the Soviet period and revived only in 1990. The newspaper deals not only with current events but also explores a variety of cultural and scholarly issues, especially in history and literature.
<i>Viduramžių Lietuva</i>	The website focuses on the history of Medieval Lithuania. The articles are written by historian Tomas Baranauskas
<i>Rubinaitis</i>	The website which explores the topics related to children's literature: the authors, topics, books, events, and translations
<i>Post Scriptum</i>	A website launched in 2002 by Vilnius University, the Institute of International Relations and Political Science. The magazine is published twice a year and addresses Lithuanian social and cultural phenomena and their interrelationship.
<i>Nemunas</i>	A weekly newspaper published since 1967. Discusses cultural and literary topics.
<i>Naujasis židinys - Aidai</i>	Published since 1991. Publishes original and translated articles. The most important topics are philosophy, theology, religion, history, and literature.

## APPENDIX B

**Table 18.** Hedging devices in English popular scientific discourse

Category	COPSA raw freq.	COPSA per 100,000	COCA per 100,000	Category	COPSA raw freq.	COPSA per 100,000	COCA per 100,000
<b>Verbs</b>	<b>3,167</b>	<b>633.4</b>	<b>697.8</b>	<b>Adverbs</b>	<b>1,677</b>	<b>335.4</b>	<b>335.4</b>
Assume	56	11.2	14.4	Approximately	20	4	4.7
Could	580	116	100.5	Arguably	17	3.4	1.6
Believe	195	39	16.6	Barely	11	2.2	2
Consider	129	25.8	60.8	Fairly	21	4.2	3.3
Imply	16	3.2	3.4	Frequently	54	10.8	10.3
May	447	89.4	118.8	Hardly	13	2.6	5.8
Might	291	58.2	55.4	Maybe	25	5	2.8
Seem	232	46.4	61.4	Nearly	106	21.2	10.7
Suggest	197	39.4	55.6	Occasionally	17	3.4	3.4
Suppose	19	3.8	8.5	Often	305	61	59.6
Tend	74	14.8	24.4	Perhaps	109	21.8	30.7

Would	931	186.2	178	Possibly	54	10.8	5
				Presumably	14	2.8	3.3
<b>Adjectives</b>	<b>145</b>	<b>29</b>	<b>42.8</b>	Probably	114	22.8	15.5
Considerable	15	3	7.3	Quite	93	18.6	15.5
Plausible	5	1	1.5	Rarely	20	4	4.9
Possible	118	23.6	32.9	Rather	158	31.6	57.2
Probable	7	1.4	1.1	Relatively	38	7.6	11.3
				Roughly	16	3.2	3.2
				Seemingly	17	3.4	3.2
				Seldom	11	2.2	1.6
				Several	210	42	38.9
				Slightly	26	5.2	3.6
				Somehow	14	2.8	2.9
				Sometimes	84	16.8	17.8
				Supposedly	19	3.8	2.3
				Usually	91	18.2	14.3
<b>TOTAL</b>	<b>4,989</b>	<b>997.8</b>	<b>1,076</b>				

## APPENDIX C

**Table 19.** Hedging devices in Lithuanian popular scientific discourse

Category	COPSA raw freq.	COPSA per 100,000	CORALIT per 100,000	Category	COPSA raw freq.	COPSA per 100,000	CORALIT per 100,000
<b>Verbs</b>	<b>1,353</b>	<b>270.4</b>	<b>114.3</b>	<b>Other</b>	<b>1,905</b>	<b>400.2</b>	<b>200</b>
Atrodo	247	49.4	9.4	Daugelis	335	67	31.3
Galėti	1066	213	100.5	Dažnas	31	6.2	2.8
Sakyčiau	7	1.4	0.3	Gal	359	71.8	8.4
Tėra	33	6.6	4.1	Galbūt	89	17.8	8.4
				Galima	679	135.8	74.6
<b>Adverbs</b>	<b>1,382</b>	<b>276.4</b>	<b>134</b>	Galimybė	240	48	40.1
Beveik	263	52.6	22.2	Keletas	38	26.8	20.2
Dažnai	253	50.6	27.3	Kone	39	7.8	2.4
Gana	202	40.4	22	Matyt	68	13.6	8.7
Ganėtinai	8	1.6	0.6	Tikėtina	27	5.4	3.1
Gerokai	99	19.8	8.6				
Greičiausiai	28	5.6	4.8				
Kartais	212	42.4	13.1				
Maždaug	60	12	4.7				
Nedaug	50	10	6.4				
Nemažai	100	20	11				
Neretai	66	13.2	8				
Retai	22	4.4	4.1				
Veikiausiai	19	3.8	1.2				
<b>TOTAL</b>	<b>4,640</b>	<b>947</b>	<b>448.3</b>				

## APPENDIX D

**Table 20.** Boosters in English popular scientific discourse

Category	COPSA raw freq.	COPSA per 100,000	COCA per 100,000	Category	COPSA raw freq.	COPSA per 100,000	COCA per 100,000
<b>Verbs</b>	<b>2,344</b>	<b>468.8</b>	<b>597.4</b>	<b>Adjectives</b>	<b>209</b>	<b>41.8</b>	<b>47.1</b>
Approve	14	2.8	3.8	Certain	113	22.6	26.4
Argue	74	14.8	9.6	Consistent	24	4.8	6.2
Can	857	171.4	206.2	Evident	18	3.6	6.6
Claim	150	30	35.5	Sure	54	10.8	7.9
Conclude	41	8.2	11.1				
Confirm	43	8.6	8.8	<b>Adverbs</b>	<b>1,415</b>	<b>283</b>	<b>274.7</b>
Debate	61	12.2	17.7	Absolutely	9	1.8	1.9
Demonstrate	42	8.4	18.7	Always	93	18.6	28.1
Determine	102	20.4	16.5	Apparently	40	8	7.3
Estimate	55	11	1.5	Certainly	51	10.2	13.8
Focus	125	25	40.4	Clearly	56	11.2	20.2
Maintain	58	11.6	23.7	Completely	51	10.2	7
Prove	88	17.6	16.8	Definitely	6	1.2	10.9
Reveal	110	22	20.8	Entirely	47	9.4	7.9
Will	524	104.8	166.3	Exactly	68	13.6	5.3
				Extremely	36	7.2	5.4
<b>Nouns</b>	<b>114</b>	<b>22.8</b>	<b>37.1</b>	Fundamentally	7	1.4	2.8
Accuracy	16	3.2	2.1	Highly	62	12.4	13.8
Approval	12	2.4	3.2	Indeed	94	18.8	26.4
Certainty	4	0.8	1.2	Never	185	37	33.5
Dominance	8	1.6	3	Notably	14	2.8	3.9
Importance	37	7.4	18.1	Obviously	19	3.8	5
Statement	37	7.4	9.5	Really	213	42.6	11.3
				Substantially	4	0.8	2.3
				Surely	19	3.8	4.2
				Undoubtedly	11	2.2	2.8
				Very	330	66	60.9
<b>TOTAL</b>	<b>4,082</b>	<b>816.4</b>	<b>959.3</b>				

## APPENDIX E

**Table 21.** Boosters in Lithuanian popular scientific discourse

Category	COPSA raw freq.	COPSA per 100,000	CORALIT per 100,000	Category	COPSA raw freq.	COPSA per 100,000	CORALIT per 100,000
<b>Verbs</b>	<b>2,273</b>	<b>452.6</b>	<b>328.5</b>	<b>Adverbs</b>	<b>2,437</b>	<b>487.4</b>	<b>173.4</b>
Akcentuoti	25	5	11.9	Akivaizdžiai	27	5.4	3.5
Nurodyti	133	26.6	25.8	Apskritai	158	31.6	12
Pabrėžti	126	25.2	18.5	Būtent	172	34.4	19.6
Pagrįsti	38	7.6	15.9	Labai	1053	210.6	47.4
Pareikšti	23	4.6	4.6	Neabejotinai	35	7	4.3
Pateikti	224	44.8	62	Nuolat	102	20.4	26.2
Pripažinti	166	31.2	8.3	Pernelyg	54	10.8	3
Privalėti	30	6	7.6	Stipriai	27	5.4	1.2
Reikėti	499	99.8	38.6	Tikrai	219	43.8	7.7

Teigti	178	35.6	29.1	Tiksliai	48	9.6	5.1
Turėti	788	157.6	101.3	Vienareikšmiškai	5	1	1
Tvirtinti	43	8.6	4.9	Visada	180	36	12.9
				Visiškai	170	34	15.8
<b>Adjectives</b>	<b>171</b>	<b>34.2</b>	<b>24.8</b>	Žymiai	22	4.4	0.8
Akivaizdus	93	18.6	9.8				
Esminis	78	15.6	15	<b>Other</b>	<b>578</b>	<b>115.6</b>	<b>81.3</b>
				Būtent	64	12.8	19.6
				Būtinybė	10	2	1.2
				Ypač	295	59	41.7
				Visuomet	61	12.2	4.9
				Žinoma	148	29.6	13.9
<b>TOTAL</b>	<b>5,459</b>	<b>1,089.8</b>	<b>608</b>				

## APPENDIX F

**Table 22.** Attitude markers in English popular scientific discourse

Category	COPSA raw freq.	COPSA per 100,000	COCA per 100,000	Category	COPSA raw freq.	COPSA per 100,000	COCA per 100,000
<b>Verbs</b>	<b>823</b>	<b>173</b>	<b>250.8</b>	<b>Adjectives</b>	<b>3,291</b>	<b>660.4</b>	<b>706.7</b>
Admire	13	2.6	2.6	Acceptable	11	2.2	3.5
Agree	80	24.4	34.9	Advanced	63	12.6	7.1
Appreciate	18	3.6	4.5	Advantageous	4	0.8	0.4
Exaggerate	7	1.4	2.1	Amazing	25	5	0.7
Must	115	23	67.7	Ambitious	9	1.8	2.5
Need	305	61	45	Appropriate	21	4.2	12.7
Should	213	42.6	86	Astonishing	8	1.6	0.7
Succeed	72	14.4	8	Astounding	4	0.8	0.2
				Attractive	7	1.4	2.8
<b>Nouns</b>	<b>160</b>	<b>32</b>	<b>50</b>	Awful	4	0.8	0.4
Absurdity	7	1.4	0.4	Barbarous	4	0.8	0.2
Accomplishment	7	1.4	0.9	Beautiful	24	4.8	5
Beauty	23	4.6	5.8	Better	146	29.2	24.9
Complexity	18	3.6	3.8	Best	121	24.2	26.4
Difficulty	21	4.2	5.3	Charming	4	0.8	0.4
Effectiveness	6	1.2	3	Complex	94	18.8	16.2
Flexibility	4	0.8	2.1	Clear	75	15	24.5
Popularity	18	3.6	3.2	Comprehensive	14	2.8	6.7
Quality	28	5.6	14.7	Comfortable	10	2	2.7
Significance	21	4.2	10	Controversial	23	4.6	3
Simplicity	7	1.4	0.8	Convincing	11	2.2	1.9
				Critical	36	7.2	24.9
<b>Adverbs</b>	<b>1,146</b>	<b>228.2</b>	<b>263.8</b>	Crucial	26	5.2	9.1
Accurately	14	2.8	2.3	Curious	8	1.6	1.9
Actively	7	1.4	4.3	Difficult	72	14.4	20.4
Adequately	3	0.6	1.6	Disappointing	5	1	0.4
Amazingly	4	0.8	0.1	Distinct	35	7	6.6
Appropriately	7	1.4	1.5	Distinctive	14	2.8	3.6
Arguably	4	0.8	1.6	Dull	4	0.8	0.6

Bitterly	6	1.2	0.4	Eccentric	8	1.6	0.5
Carefully	28	5.6	5.9	Eloquent	4	0.8	0.6
Clearly	56	11.2	20.2	Elusive	4	0.8	1.1
Comfortably	8	1.6	0.5	Enjoyable	4	0.8	0.4
Confidently	4	0.8	0.4	Enormous	18	3.6	4
Creatively	4	0.8	0.6	Excellent	20	4	4.1
Desperately	4	0.8	0.9	Exceptional	6	1.2	1.8
Differently	20	4	2.8	Exclusive	11	2.2	2.8
Dramatically	9	1.8	3.4	Extensive	29	5.8	5.9
Easily	54	10.8	9.8	Extraordinary	19	3.8	3.5
Effectively	25	5	7.8	Faithful	11	2.2	1.4
Efficiently	4	0.8	0.8	Famous	82	16.4	6.4
Elaborately	4	0.8	0.3	Fantastic	4	0.8	1.6
Elegantly	4	0.8	0.2	Fascinating	13	2.6	1.4
Enormously	8	1.6	0.7	Friendly	18	3.6	2.2
Enthusiastically	4	0.8	0.7	Frustrating	4	0.8	0.6
Especially	104	20.8	33.7	Fundamental	18	3.6	10.2
Exclusively	10	2	4.1	Genuine	14	2.8	3.1
Explicitly	11	2.2	5.2	Good	190	38	37.2
Extensively	11	2.2	1.3	Great	262	52.4	37.9
Extraordinarily	3	0.6	0.7	Groundbreaking	4	0.8	0.2
Extremely	36	7.2	5.4	Huge	53	10.6	4.2
Eventually	90	18	10.7	Hopeless	4	0.8	0.3
Famously	10	2	0.7	Horrible	6	1.2	0.6
Firmly	11	2.2	2.6	Immense	15	3	1.5
Fluently	5	1	0.1	Important	226	45.2	62.5
Furiously	4	0.8	0.1	Impossible	34	6.8	8.4
Gradually	28	5.6	4.9	Inauthentic	4	0.8	0.1
Greatly	25	5	4.4	Ineffective	4	0.8	1.1
Heavily	23	4.6	4.4	Incredible	13	2.6	0.6
Importantly	14	2.8	2.9	Influential	17	3.4	4.5
Incredibly	7	1.4	0.3	Inspiring	5	1	0.5
Ironically	4	0.8	3.9	Interesting	56	11.2	8.7
Naturally	22	4.4	3.4	Intriguing	11	2.2	1.2
Necessarily	36	7.2	8	Irresistible	3	0.6	-
Normally	10	2	2.4	Magnificent	14	2.8	0.7
Paradoxically	3	0.6	1.6	Major	150	30	35.6
Particularly	70	14	24.9	Meaningful	21	4.2	5.5
Peacefully	6	1.2	0.6	Monstrous	3	0.6	0.5
Persuasively	3	0.6	0.3	Obvious	27	5.4	8.1
Poorly	21	4.2	1.8	Ordinary	21	4.2	4.8
Positively	5	1	1.3	Original	67	13.4	15.6
Perfectly	13	2.6	2.1	Particular	100	20	32
Precisely	20	4	8.9	Powerful	94	18.8	14.4
Properly	21	4.2	2.8	Precious	22	4.4	1.4
Reasonably	5	1	1.2	Precise	18	3.6	2.9
Regularly	21	4.2	3.7	Profound	20	4	3.9
Remarkably	12	2.4	1.7	Prominent	25	5	7.1
Routinely	5	1	1.3	Prosperous	14	2.8	1.1
Secretly	11	2.2	0.9	Reasonable	7	1.4	3.2
Significantly	16	3.2	8.7	Rebellious	5	1	0.5
Successfully	19	3.8	5	Relevant	15	3	7.5
Suddenly	21	4.2	3.8	Remarkable	38	7.6	4.2
Surprisingly	14	2.8	2.8	Respected	5	1	2.3

Thoroughly	13	2.6	2	Ridiculous	5	1	0.5
Traditionally	5	1	4.7	Scandalous	4	0.8	0.2
Tremendously	5	1	0.3	Sensitive	14	2.8	4
Truly	23	4.6	5.6	Significant	55	11	26.5
Typically	34	6.8	5.8	Sophisticated	34	6.8	3.5
Unexpectedly	5	1	0.7	Special	62	12.4	22
Unfortunately	19	3.8	4.6	Striking	20	4	4.5
Vividly	3	0.6	0.6	Stunning	14	2.8	0.6
				Successful	72	14.4	14.7
				Tantalizing	5	1	0.1
				Terrible	12	2.4	1.7
				Terrifying	6	1.2	0.4
				Tremendous	10	2	2.1
				Uncertain	11	2.2	2.2
				Unhappy	7	1.4	0.8
				Unexpected	17	3.4	2
				Unintelligible	3	0.6	0.3
				Unique	76	15.2	10.1
				Unsuccessful	13	2.6	1
				Unusual	28	5.6	3.7
				Valuable	33	6.6	5.2
				Vital	15	3	5.8
				Vulnerable	14	2.8	2.9
				Wonderful	11	2.2	1.8
				Worse/worst	22	4.4	7.3
<b>TOTAL</b>	<b>5,420</b>	<b>1,093.6</b>	<b>1,271.3</b>				

## APPENDIX G

**Table 23.** Attitude markers in Lithuanian popular scientific discourse

Category	COPSA raw freq.	COPSA per 100,000	CORALIT per 100,000	Category	COPSA raw freq.	COPSA per 100,000	CORALIT per 100,000
<b>Verbs</b>	<b>253</b>	<b>50.6</b>	<b>19.3</b>	<b>Adverbs</b>	<b>1,401</b>	<b>278.8</b>	<b>101.1</b>
Pasisekti	16	3.2	0.7	Agresyviai	6	1.2	0.1
Pripažinti	155	31	10.3	Aiškiai	73	14.6	9.2
Privalėti	82	16.4	8.3	Aktyviai	53	10.6	6.7
				Atidžiai	9	1.8	0.4
<b>Nouns</b>	<b>127</b>	<b>25.4</b>	<b>16.3</b>	Blogai	26	5.2	0.2
Gerumas/ gėris	22	4.4	1.4	Būtinai	32	6.4	1.1
Genijus	8	1.6	1.2	Entuziastingai	6	1.2	0.6
Grožis	31	6.2	2.9	Gerai	283	56.6	13.1
Privalumas	20	4	1.7	Greitai	62	12.4	4.9
Sunkumas	30	6	2.4	Grėsmingai	6	1.2	0.4
Trūkumas	16	3.2	6.7	Griežtai	35	7	3.5
				Intensyviai	10	2	2.4
<b>Adjectives</b>	<b>4,651</b>	<b>923.3</b>	<b>449</b>	Ironiška	58	11.6	0.1
Aiškus	47	9.4	8.8	Iškilingai	15	3	0.1
Aktualus	67	13.4	12.8	Išsamiai	24	4.8	4.4
Blogas	161	32.2	3.1	Ypatingai	22	4.4	0.6

Brangus	53	10.6	1.7	Jautriai	10	2	0.1
Didelis	418	83.6	27.9	Kategoriškai	8	1.6	0.3
Garsus	125	25	5.9	Keistai	13	2.6	0.1
Geras	998	199.6	56.2	Kokybiškai	9	1.8	0.5
Gražus	64	12.8	6.5	Kritiškai	14	2.8	2.6
Idealus	12	2.4	1.3	Kruopščiai	18	3.6	1.3
Idomus	173	34.6	13.7	Kūrybiškai	13	2.6	1.6
Įprastas	46	9.2	8.9	Laisvai	29	5.8	2.1
Išskirtinis	36	7.2	6.1	Lengvai	40	8	2.4
Ypatingas	111	22.2	12.1	Nesunkiai	16	3.2	1.5
Keistas	78	8.7	1.6	Nuoširdžiai	16	3.2	1.1
Kritiškas	20	4	3.1	Patriotiškai	7	1.4	0.1
Kūrybingas	18	3.6	0.4	Puikiai	79	15.8	3.5
Laimingas	41	8.2	0.7	Ramiai	24	4.8	0.5
Neįmanomas	48	9.6	8.2	Rimtai	33	6.6	1.1
Nuostabus	41	8.2	0.8	Rūpestingai	8	1.6	0.2
Pagrindinis	233	46.6	52.5	Savitai	7	1.4	1.3
Paslaptingas	42	8.4	1.4	Savotiškai	11	2.2	1.4
Populiarus	86	17.2	11.6	Sąžiningai	7	1.4	0.1
Prasmingas	55	11	1.9	Sėkmingai	62	12.4	5.7
Puikus	105	21	4.7	Smarkiai	34	6.8	1
Reikalingas	110	22	9.6	Sparčiai	24	4.8	4.4
Reikšmingas	88	17.6	14.9	Stebėtinai	7	1.4	0.8
Ryškus	68	13.6	12.9	Subtiliai	13	2.6	0.1
Savotiškas	59	11.8	7.4	Sunkiai	55	11	6.6
Sunkus	335	67	23.3	Talentingai	7	1.4	0.1
Svarbus	707	141.4	99.5	Teisingai	32	6.4	1.4
Talentingas	26	5.2	2.8	Tiksliai	48	9.6	5.1
Žinomas	132	26.4	18	Tinkamai	17	3.4	1.6
Žymus	48	9.6	8.7	Tradiciškai	13	2.6	3.5
				Visapusiškai	7	1.4	1.2
<b>TOTAL</b>	<b>6432</b>	<b>1278.1</b>	<b>587.7</b>				

## APPENDIX H

**Table 26.** Types of intertextuality in English and Lithuanian popular scientific discourse

Direct quotations					Paraphrases					Mixed	In-text references	Total																																			
Scholars		Participants		Examples	Written sources	Cultural	Scholars	Research	Written sources			Participants	Cultural	EN	LT																																
EN	LT	EN	LT	EN	LT	EN	LT	EN	LT			EN	LT																																		
31.9%	849	6.2%	131	9.6%	254	6%	129	4.9%	130	2.5%	52	11.9%	317	28.9%	616	2%	43	16.8%	448	14.9%	317	9.3%	248	0.8%	17	2.3%	69	15.2%	321	0.3%	8	3%	65	3.3%	69	4.3%	112	0.2%	4	8.7%	234	16.9%	361	100%	2669	100%	2125