BRNO UNIVERSITY OF TECHNOLOGY
VYSOKÉ UČENÍ TECHNICKÉ V BRNĚ

FACULTY OF ELECTRICAL ENGINEERING AND COMMUNICATION
FAKULTA ELEKTROTECHNIKY
A KOMUNIKAČNÍCH TECHNOLOGIÍ

DEPARTMENT OF FOREIGN LANGUAGES
ÚSTAV JAZYKŮ

TYPICAL FEATURES AND GENRES IN ENGLISH FOR SPECIFIC PURPOSES.
TYPICKÉ PRVKY A ŽÁNRY TEXTŮ ODBORNÉHO STYLU V ANGLICKÉM JAZYCE.

BACHELOR'S THESIS
BAKALÁŘSKÁ PRÁCE

AUTHOR — **Katarína Behancová**
AUTOR PRÁCE

SUPERVISOR — **PaedDr. Alena Baumgartnerová**
VEDOUCÍ PRÁCE

BRNO 2018

VYSOKÉ UČENÍ TECHNICKÉ V BRNĚ
FAKULTA ELEKTROTECHNIKY A KOMUNIKAČNÍCH TECHNOLOGIÍ

Bakalářská práce

bakalářský studijní obor **Angličtina v elektrotechnice a informatice**
Ústav jazyků

Studentka: Katarína Behancová ***ID:*** 189080
Ročník: 3 ***Akademický rok:*** 2017/18

NÁZEV TÉMATU:

Typické prvky a žánry textů odborného stylu v anglickém jazyce.

POKYNY PRO VYPRACOVÁNÍ:

Popište typické prvky a žánry textů v odborném stylu užívané v anglickém jazyce.

DOPORUČENÁ LITERATURA:

[1]Krhutová M.:The Language of Electrical Engineering as a Special Province.Brno,Akademické nakladatelství CERM,2007.

[2]Shortis T.The Language of Information and Communication Technology.London,New York,Routledge,2001.

[3]Stevens M.: Scientific Style.Thornleigh, N.S.W. ScienceScape Editing,2005.

Termín zadání: 9.2.2018 ***Termín odevzdání:*** 25.5.2018

Vedoucí práce: PaedDr. Alena Baumgartnerová
Konzultant:

doc. PhDr. Milena Krhutová, Ph.D.
předseda oborové rady

ABSTRACT

In the 21 century, it is possible to speak about enormous growth of people using English daily in their lives. English has become a language used in the global sphere and it is used in all fields of interests including science, technology, economics, law or medicine. Each of this field has developed its own “branch” of English language with its specific features and genres. Although each of these fields of scientific style is completely different, the aim of this bachelor thesis is to investigate them and identify their typical genres, specific features and diversities among them, using texts from specialised books and journals.

ABSTRAKT

V 21. storočí môžeme hovoriť o obrovskom náraste ľudí používajúcich anglický jazyk v ich každodennom živote. Angličtina sa stala jazykom používaným v globálnej sfére a je používaná vo všetkých odborných oblastiach ako veda, technika, ekonómia, zákon alebo medicína. Každá z týchto oblastí si vytvorila svoju vlastnú “odnož“ anglického jazyka, ktorá má svoje špecifické vlastnosti a žánre. Napriek tomu, že je každá z týchto oblastí odborného štýlu úplne odlišná, cieľom tejto bakalárskej je preskúmať ich a identifikovať ich typické žánre, špecifické vlastnosti a odlišnosti medzi nimi na základe textov pochádzajúcich z odborných kníh a časopisov.

KEYWORDS

scientific style, style of science and technology, English in electrical engineering and information technology, scientific style genres, scientific style disciplines, professional language, popular science writing

KĽÚČOVÉ SLOVÁ

odborný štýl, štýl vedy a techniky, angličtina v elektrotechnike a informatike, žánre odborného štýlu, vedné odbory odborného štýlu, odborný jazyk, populárno-vedecký štýl

BEHANCOVÁ, K. *Typické prvky a žánry textů odborného stylu v anglickém jazyce.* Brno: Vysoké učení technické v Brně, Fakulta elektrotechniky a komunikačních technologií, 2018. 43 s. Vedoucí bakalářské práce PaedDr. Alena Baumgartnerová.

DECLARATION

I hereby declare that I have worked on this bachelor thesis independently, using the resources listed in the bibliography.

PREHLÁSENIE

Prehlasujem, že svoju bakalársku prácu na tému *Typické prvky a žánry textů odborného stylu v anglickém jazyce* som vypracovala samostatne pod vedením vedúceho bakalárskej práce a s použitím odbornej literatúry a ďalších informačných zdrojov, ktoré sú všetky citované v práci a uvedené v zozname použitej literatúry na konci práce.

Ako autorka uvedenej bakalárskej práce ďalej prehlasujem, že v súvislosti s vytvorením tejto bakalárskej práce som neporušila autorské práve tretích osôb, najmä som nezasiahla nedovoleným spôsobom do cudzích autorských práv osobnostných a/alebo majetkových a som si plne vedomá následku porušenia ustanovení § 11 a nasledujúcich zákona č. 121/2000 Sb., o práve autorskom, o právach súvisiacich s právom autorským a o zmene niektorých zákonov (autorský zákon), v znení neskorších predpisov, vrátane možných trestnoprávnych dôsledkov vyplývajúcich z ustanovení časti druhej, hlavy VI. Diel 4 Trestného zákonníka č. 40/2009 Sb.

V Brne dňa ……. …….…….

Katarína Behancová

ACKNOWLEDGEMENT

I would like to sincerely thank PaedDr. Alena Baumgartnerová, for supervising my bachelor thesis and for her wise advice, which helped me in creating it.

POĎAKOVANIE

Chcela by som poďakovať PaedDr. Alene Baumgartnerovej, za odborné vedenie a predané rady k mojej bakalárskej práci, ktoré mi pomohli pri samostatnom spracovaní.

CONTENTS

1 INTRODUCTION 7
2 COMMON GENRES OF SCIENTIFIC STYLE IN ENGLISH 9
2.1 Research article 9
2.2 Textbook 10
2.3 Abstract 11
2.4 Review 11
2.5 PhD thesis 12
2.7 Popular science writing 12
3 COMMON DISCIPLINES OF SCIENTIFIC STYLE IN ENGLISH 14
3.1 Medicine 14
3.2 Economics 15
3.3 The law 16
4 ENGLISH IN ELECTRICAL ENGINEERING AND INFORMATION TECHNOLOGY 17
5 ANALYSIS 19
5.1 Medicine 19
5.1.1 Analysis of the text 20
5.2 Economics 22
5.2.1 Analysis of the text 23
5.3 The law 25
5.3.1 Analysis of the text 26
5.4 Electrical engineering and information technology 28
5.4.1 Analysis of the first text 29
5.4.2 Analysis of the second text 31
6 CONCLUSION 34
7 LIST OF REFERENCES 36
8 ATTACHMENTS 38

1 INTRODUCTION

Language can be divided from many points of view. One of them is the division of language between spoken language and written language. Written language is permanent while the spoken language is temporal. The written language has an advantage of the time space given to the writer to precisely choose the words and phrases. On the contrary, the spoken language enables the speaker to use his or her facial expression and mimics for better explanation of his or her ideas. Thus the writer must be as explicit as possible, as far as the written medium is concerned, because he or she does not have this opportunity of using extra linguistic means of communication. Both of them have their pluses and minuses and one must be aware of them to use the language, either spoken or written, properly (Krhutová, 2007).

Taking the written medium as the base, the possible further division is in formal and informal part. Informal part of the written language is widely used every day. It is seen in instant messaging, and practically in every written communication on a common-day level. On the contrary, formal form of the written language is used only in communication of individual persons or groups lead on either professional level or the principle of politeness.

The narrower part of formal written language which was indicated in the previous paragraph is used in scientific area and is called scientific style of writing. It is used by professionals in their fields of interests and knowledge and these individuals must be aware of the context and the professional language itself to understand and share ideas. This is not vital for informal written medium as it uses common phrases and words which are widely known and understandable.

The scientific style, and specifically its written form, has some genres which are typically used in it. The ones commonly used in this particular style are for example: research articles, textbooks, abstracts, reviews, PhD theses or popular science writing. Every text written in the scientific style fits into the format of some of these genres with respect to its typical features and shape. Genres as such are usually easily recognizable as there are strict rules and templates for each of them.

The scientific style of written language can be further divided into disciplines which commonly use this type of written communication. It is hardly possible to tell where the division of the language ends. Disciplines of scientific style are, for example medicine,

economics, the law, all branches of technical engineering like electrical engineering, for example, or informatics too.

The style of science and technology was given a detailed characteristic by Knittlová (paraphrased in Krhutová, 2007). According to her, the style of science and technology has prevailingly a form of monologue, syntax is monotonous and it uses connectors and conjunctions for expressing relations plainly without ambiguity.

In this bachelor thesis, there are chosen five texts from several fields of interest which are used for detailed analysis of these particular disciplines of scientific style. The first one comes from the book of Sergey N. Makarov with the name Antenna and EM Modeling with MATLAB, the second one is from the book Statistics for Management and Economics written by Gerald Keller, the third one is from the book edited by Schabas William with title The Universal Declaration of Human Rights: the travaux préparatoires and the last two are articles taken from the weekly journal New Scientist with headings “Go fly a cyborg moth” and “Nerve damage heeled in weeks”.

2 COMMON GENRES OF SCIENTIFIC STYLE IN ENGLISH

In this chapter, the term genre is here used as a means of "grouping texts together, representing how writers typically use language to respond to recurring situations (cited in "Writing in Academic Genres", 2016)

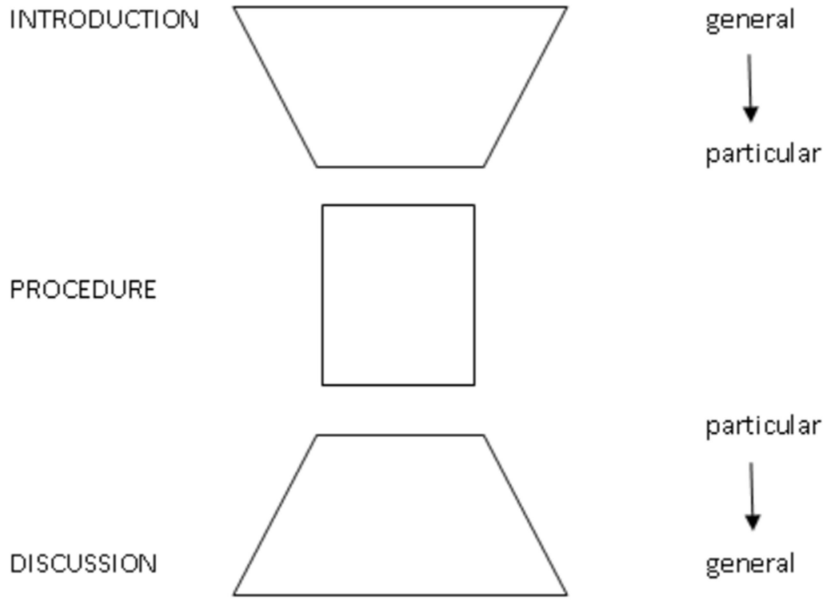
The genres mentioned in this chapter are ones commonly used in the academic community. For some of them, a broad consensus may exist as to how texts and text types within these genres are structured and used. For others, a large variation can be observed across disciplines ("Writing in Academic Genres", 2016).

2.1 Research article

The genre of research article belongs to the group of texts which are quite challenging for creation, because certain academic conventions and generalities which must be followed exist there. The writer must think about the target audience carefully. The research article or research paper in other words, is not intended for specialist in the field of linguistics but rather for aspiring authors (Swales, 1990).

The key features which should be taken into consideration when writing the research article are article length, which has in the previous century increased up to 10 000 words and it does not fit a common belief that the research articles are supposed to be compact; references, which are distributed throughout the research article and have direct relevance to the research being reported; syntactic and lexical features as there is no importance of sentence length for example; non-verbal material like graphs, tables and equations, which are common part of the research paper; and organization of the whole texts which is divided into seven parts: the title, the abstract, the introduction, methods, results, the discussion section and conclusion (Swales, 1990).

There exists a general concept for the shape of research article which has a shape of "hour-glass" that can be seen below.



Article structure (taken from Hill et al. 1982 (appearing in Swales 1990: 134))

2.2 Textbook

When the discipline of the text is not taken into consideration, the genre of textbook serves a common purpose in academic context, which is reflected in some typical features of this genre. The textbook in general spreads some discipline-based knowledge and at the same time, it displays some unequal writer-reader relationship, where the writer is a transmitter and the reader is a recipient of established knowledge (Bhatia, c2004).

Textbooks in general are seen as some collections of codified knowledge and they are made accessible to large audiences by the frequent use of a variety of rhetorical devices such as description, definition, classification, etc. These devices also include rhetorical questions, as section for leading readers through the intricacies of discipline-based understanding, non-linear rhetorical devices like charts, diagrams, figures, pictures, etc. to express general material, metadiscourse to explain difficult concepts, and many others such as boy items, summaries, end-of-the-chapter exercises, suggestions for further reading and so on. The devices listed above and many more are often used across a range of different disciplines to make a content of textbook accessible to non-initiated student populations (Bhatia, c2004).

2.3 Abstract

The genre of abstract is the type of text which usually accompanies a text of another genre. This particular piece of writing is supposed to be written in English language, although the whole text, whose part of the abstract is, is written in another language. The idea of this is simple – to generalise the aim and idea of the written medium and thanks to the usage of lingua franca, make it available and understandable for all readers (Swales, 1990).

The importance of the content of abstract can by compared to the importance of an appropriate title of the text as its main function is to convince the reader to attract the reader to such an extant that he or she wants to read the rest of the text as well (Swales, 1990).

The main characteristic features of the abstract are the use of past tense, third person passive and non-use of negatives. It avoids the usage of subordinate clauses and predominantly uses phrases instead of clauses. It misses abbreviations, jargon, symbols and other language shortcuts which may lead to incomprehension. The abstract is written in tightly worded sentences and it avoids repetition, meaningless expressions, superlatives, adjectives, illustrations, descriptive details and footnotes. In general, it eliminates the redundancy and facilitates comprehension (cited in Swales, 1990).

2.4 Review

In the general, the genre of review is a potentially threating genre for both – the author of the reviewed text and the target community. However, it plays an important role in disciplinary communication as the public evaluation of any kind of work (Hyland, c2004).

Reviewers and their reviews are shaped by the expectations and part of reviewer's competence lies in the appropriate expression of both positive and negative criticism. The key feature is also the consideration of communities where the reviews are written and also the discourse of their members. There is seen a difference in the length of the text of the review depending on the discipline it is written for. The extent of the review is quite higher in case of social sciences while it is lower as it refers to natural sciences like biology for example (Hyland, c2004).

When comparing the review with the research article for example, it does not simply

respond to the general body of impersonal literature, but offer a direct and very often critical encounter with a particular text and its author (Hyland, c2009).

2.5 PhD thesis

The PhD thesis has a special function in the academic community. It has quite extended format, from 150 to 300 pages, and its main purpose is to admit the author of the thesis into the society of academics. It proves that the author shares some common ground with professionals from a particular field of interest and that he or she has a particular expert knowledge, skills, critical thinking, and scientific values (Swales, 2004).

There are two main types of PhD thesis which differ in their formats. The first one is a monograph format and its main characteristic feature is that it is written as a coherent, clear and tidy text. It is the most common type of PhD thesis and it is predominantly used in the connection with social sciences. The second one is an article-compilation format and it features a series of published or publishable papers compiled into a coherent whole. On the contrary, it is predominantly adopted by natural sciences and engineering (Swales, 2004).

Generally, there is a lot of variation of PhD thesis when the preferred format is taken into consideration as it depends mainly on the discipline of the scientific style it is written in. However, the traditional structure of the thesis consists of introduction, literature review or survey, methods including materials and procedures, results, discussion and conclusion where implications and recommendations can be found (Swales, 2004).

2.7 Popular science writing

The next genre which belongs to the style of scientific writing is the popular science writing. It is quite different from other types mentioned above as its target audience is quite different too. It is dedicated to laymen, who are people without special professional knowledge or interest (Krhutová, 2007).

Although it does not include any special vocabulary and the background, it is quite hard for the author to write the popular science writing of a good quality. The main aim is to catch

the reader's attention although he has no evidence of the written subject and he even may not be interested in it at all. There are known some special stylistic devices to reach this goal. Some of them are: usage of concrete example, which is pointed out to illustrate some facts which are quite hard to understand themselves; metaphor, which enables better grasping of a new concept; narration and fictitious conversation that also help to find an evocative way of explaining complicated matter; personification that makes the writing more interesting and vivid; allusion, which means the usage of the phrase or sentence that makes a direct reference to a common cultural background, for example a passage from the Bible or another literary work that is familiar to most of readers; question that is the next effective stylistic device as it makes the reader to think about the answer or arouse the reader's curiosity and therefore to indirectly interact with the written text; and many more. The end of the scientific writing is supposed to be clear and without any unanswered questions left. It usually contains the summary of learned knowledge and gained experience (Pelger, 2007).

Even though that the usage of technical terms is not forbidden in case of the popular science writing they should not be overused. The exaggerated occurrence of words that are unfamiliar to the reader can lead to the loss of his interest in reading. That is why the popular science writing contains only a few words from specialized vocabulary of a particular discipline and all of them are properly explained and illustrated within the text. In general, the popular science writing can be described like unambiguous, self-explanatory, adapted to the language used, precise, not misleading and preferably short as the length of the text is also one of the factor considered by a potential reader (Pelger, 2007).

3 COMMON DISCIPLINES OF SCIENTIFIC STYLE IN ENGLISH

Scientific style is the style which primary functions are providing information, presenting exact knowledge and addressing particular group of people who are well acknowledged with the subject concerned. Most common form of scientific style is the written form which includes essays, articles and textbooks, for example (see chapter 2). The spoken form of scientific style is seen on presentations and conferences concerning particular field of interest. It is possible to divide the scientific style between the style of exact science, which is more impersonal, and the style of humanities, which is closer to public style. In general, the scientific style is supposed to be clear, explicit, unambiguous and precise. It is stereotypical in both lexicology and syntax aspect. As far as the personality is concerned, it is rather impersonal, objective and it suppresses the personality of the author. There is logical hierarchy in these types of texts or speeches, it follows logical sequence of introduction followed by argument, then it continues with conclusion and ends with résumé. In the written mediums of scientific style there are seen references to other texts and quotations and it often includes some diagrams, charts or sketches, depending on the scientific area (Knittlová & Rochovanská, 1977).

3.1 Medicine

This discipline of scientific style is known by its usage of words from other languages.

There are prevailingly seen words originated in Greek and Latin or also words of Germanic (Anglo-Saxon) origin. One of the characteristics of this language is its "monoreferentiality", which means that each word has just one specific meaning and it cannot be understood differently. The next typical feature of the vocabulary of this discipline of scientific English is high occurrence of nouns created by addition of prefixes or suffixes. Another feature worth mentioning is the shortness of the language, acronyms and abbreviations are common for this type of texts (Maglie, 2009).

The syntactic features of this discipline are similar to those seen in other disciplines of scientific style. There are seen elements like passive form of verbs, nominalization, which is

the substitution of verb phrases with noun equivalents, passive voice usage, already mentioned depersonalization of the text and also the occurrence of long sentences is higher than in common language. What is unique for the discipline of medicine is common absence of relative clauses and sometimes even conjunction and also the omission of phrasal elements appears there. These features often make impossible for common person to understand the text from this field of interest (Maglie, 2009).

Examples of texts from the field of medicine are, for example, manuscripts which are written or typewritten forms of books; journal articles, which are written in scientific journals on specific topic; or some reports, which are formal and detailed accounts of proceedings (Maglie, 2009).

3.2 Economics

Economics texts use fixed terminology and phrases, which are common for all types of these mediums. Apart from medicine, words are not so complicated and borrowed from other language but they definitely do not belong to common language and they are not familiar to average population. The next difference is in syntactic features of those disciplines. However economics also uses long sentences, these are not so complicated and hard to understand. This may be because of the entirety of the sentences occurred in the discipline of economics of scientific style, which is not so common in medicine text (Wang & Fan, 2014).

As the economy itself is mainly about figures and numbers, the typical feature of this discipline is the occurrence of diagrams, graphs and tables of any kind. They are crucial, because they are used for better understanding of what is being written in the text (Wang & Fan, 2014).

A few examples of texts from the field of economics are, for example, articles published in journals devoted to this specific area of interests; textbooks used as learning material for students of universities of economics; or some annual reports of effectiveness and success of particular company.

3.3 The law

The language of the law or in other words the legal language, as well as other disciplines, uses characteristic vocabulary, which is, in this case, very formal, unusual even archaic. The reason for this is that the origin of this discipline is very old (Tiersma, 2010).

Impersonal constructions, nominalization, passive constructions and long sentences are the same features as for other scientific style disciplines, but the one which is worth mentioning is multiple negations in sentences of legal language. There is also a difference in sentences, when the length comes into consideration. In previous disciplines, the length of sentences was higher too, but it was caused by density of important information which is needed to be mentioned. In this discipline of scientific style, the higher length of sentences is caused by wordiness and redundancy (Tiersma, 2010).

Some examples of texts from the field of legal language are, for example, contracts made between two parties, which are enforceable by law; wills, or in other words testaments, written by a person to ensure that his or her property will be given to the right persons after his or her death; or some constitutions, which set the fundamental principles of existence of particular state or organization.

4 ENGLISH IN ELECTRICAL ENGINEERING AND INFORMATION TECHNOLOGY

The English of electrical engineering and information technology, shorty just the English of technical engineering, is the discipline of scientific style that is used by engineers from wide range of technical areas.

The style of science and technology in general has a function of informing and the information is specific. When the specific discipline of electrical engineering and information technology is taken into consideration, it is crucial to keep in mind the speed of development in this field of interests as it is quite higher than in others and the style used for texts in the field of electrical engineering and information technology often undergoes quick changes. The ideas presented in the text must be formulated precisely, fully and realistically. When it comes to the form of this discipline of scientific style, it is usually a written discourse and prevailingly a monologue (Krhutová, 2007).

The lexicon used in those types of texts is highly specific and often stereotyped, the impersonality is one of the main features and the passive voice constructions are frequently used as well. The next main feature of texts from the field of electrical engineering and information technology is its logical order of facts which ensures that the information is understood without ambiguity, however, it has been mentioned before, as it is the main feature of scientific style in general. Other similarities, which have been already mentioned, are infinitive constructions and too long sentences which make it more difficult to understand the text properly and at the first attempt (Krhutová, 2007).

The next feature of texts of this discipline is the higher level of certainty involved, phrases like “to seem”, “should” or “might” are hardly ever seen in these texts, although they are quite common in the scientific style in the disciplines from the group of humanities. It also uses less bookish words and prefers more frequent and common expressions than the scientific style of humanities. For the style of electrical engineering and information technology, it is not typical to observe some words borrowed from Greek or Latin, for example. This is the next difference between this discipline and the disciplines of humanities like the language of medicine or legal language and it is caused by its origin, which is not situated so far in past like the one of the disciplines mentioned. On the contrary, in the texts of the field of electrical engineering and information technology, there are often seen new terms

which were invented along with the inventions in this technical area (Krhutová, 2007).

When the overall content and the appearance of the text from the field of electrical engineering and information technology are taken into consideration, it is possible to see that it has some typical features which are similar with those of the text from the field of economics. There are graphs and tables used for better understanding of written information and also some formulas and figures which actually cannot be expressed in another way.

To point out some examples, it is also possible to mention an article in a specific scientific journal, which is determined for the professionals rather than the laymen; some review of a device written in a highly professional discourse and intended for a person or group of people directly involved in manufacturing; or some progress reports written in the area of software development, for example.

5 ANALYSIS

5.1 Medicine

"Medical language cannot simply be defined as the medium through which physicians, nurses and doctors communicate among themselves within the specialized medical community. Since health care is a fundamental aspect of everybody's life, we need to be aware of the fact that knowledge of various medical concepts and terms is quite common even among ordinary people. Medical language is used in a variety of contexts in which participants are non-expert health professionals. By watching, for instance, television programmes which talk about particular diseases, advertisements of pharmaceutical products, information leaflets for patients, and promotions of prevention campaigns against particular diseases, we can see that this specialized information are addressed to a non-specialized audience. Therefore, even though people do not come into direct contact with an expert in the field, the doctor, they may collect a number of specific concepts and specialist medical notions in various alternative ways." (Sartori, 2013, p. 46-47)

The text analysed in this discipline (Attachments 8.1 and 8.2) is an article "Nerve damage healed in weeks" taken from the journal called New Scientist, from the section "this week". It was published in February 2012, in the eleventh edition of this weekly, and written by an author Andy Coghlan. This article is written in the style of science and technology, but it could be also denoted as the popular science writing. This means that the text is aimed not only at people trained in this field of interest, but mainly at laymen. The vocabulary is chosen by the author very carefully, which means that the text does not contain a lot of specialized words and phrases and if so, all of them properly explained or pictured. The level of English is rather advanced.

This research article is about the research of nerve damage, specifically about the way in which it is possible to heal it. Wesley Thayer of Vanderbilt University in Nashville, Tennessee, George Bittner of the University of Texas at Austin and their team have used a new technique to treat rats after severing their sciatic nerve. This new surgical procedure for nerve repair provides faster and better results in animals than techniques which have been used so far. There is also mentioned their plan to begin clinical trials and work to see if the procedure can be used to heal spinal cord injuries in rats as well. The article also contains the

opinion of other nerve specialists, who are fascinated by the result, but they also express their opinion that the outcome might not be as impressive in humans. The reason I chose this written medium is that I considered this article very interesting and what is more, I also learnt some new information about nerves and the way they naturally heal themselves. The article was absorbing to such an extent that it made me curious where the research progressed so far.

5.1.1 Analysis of the text

The genre of the chosen text is the research article with formal discourse. Despite its formality, the text can be easily readable and understandable because as mentioned before, it can be also classed as popular scientific article. This means that although the topic is related to medicine, specifically to nerve surgery, the author does not use a lot of unknown specialized terminology and the one which occurs in the text is properly explained or pictured so the reader is able to understand the text even though he or she is not interested or trained in this field of interest.

The first analysis is the analysis based on the graphological level of the chosen text, the layout of the article is divided into three columns ensuring the clarity of the text. The article also contains an illustrative image of the human nervous system, which is rather big (filling almost half of the whole article) and whose role is to grab reader's attention and convince him to read the article as it is rather colourful and with black background that makes it even more eye-catching. The next feature which makes the article special is the figure placed at the bottom of the page, whose function is figurative explanation of the matter mentioned in the text. It helps the reader to understand the given information easier. It is also a little bit colourful and therefore it can attract the attention of the potential reader as well. As far as font is taken into consideration, there are two different fonts used in the article. The first one is the font of the heading which corresponds with the font of the subheading and also the heading and text of the figure already mentioned. There is a difference in the size of each of these. The biggest one is the heading of the article, then the subheading of the article and the heading of the figure is smaller and the smallest size is used in case of the text of the figure. The next difference is that there is used the bold font in case of the heading of the article. The rest of the page is written in the second type of font. The attention is also attracted by the highlighted part of the text which is actually cut and repeated part of the article. This part is in the same font as the rest of the article, but it is in bigger size, red colour and bold. It is very likely that

the reader will also read this part of the text, except the heading and subheading, in order to predict what the article is about and if he or she is interested in reading.

The second part of the analysis is the analysis based on the lexical level of the text. The vocabulary of the article is divided into two layers. The first one is the layer of specialized terminology, specifically the vocabulary from the field of nerve surgery and anatomy. As an example, this layer involves the words and collocations like: *sciatic nerve, vesicle, polyethylene glycol (PEG), calcium-free salty solution, methylene blue* and so on. However they are all included in the group of specialized vocabulary, there is no need to find them in a dictionary. These words can be understood even by laymen, because there are lots of explanations and links so he or she is able to understand the meaning properly, for example: *"...methylene blue, a chemical that blocks oxidation reactions."* The second layer is created by everyday vocabulary, which is created by words that are in the core of the language and we use it basically every day. Considering the ratio between these two layers, the specialized terminology is less frequent, which is one of the typical features of the popular science prose. The author must be aware of the density of specialized vocabulary and he or she should try to reduce it as much as possible, because the high density of these words could discourage the reader from reading. As far as the density of the whole text is taken into consideration, the text is rather lexically dense, which is caused by its genre. In general, the research articles are supposed to be informative and the lexically density is the feature that supports that to the greatest extent.

The third analysis is analysis of the grammatical level of the chosen text. Considering the usage of particular word classes, there are used all of word classes, but their occurrence is rather uneven. The word classes of nouns and adjectives prevail in the text, which is typical for specialized texts in general. There is increased need of words that are able to carry and describe all the information and this is possible exactly by the high occurrence of these two word classes. The length of sentences is rather long and there prevail compound sentences over simple structure sentences in the text. The occurrence of passive voice is rather higher, which supports the formality of this written medium.

The fourth level of the analysis is the discourse level of the analysed text. Despite the fact that cohesive devices are not seen in this text, the text is coherent and easily readable for the reader. Description of the research is easy to follow and it is divided into several paragraphs, which makes the text clear and well-arranged. The textuality of the text is also supported by occasional occurrence of direct speech (exactly the direct speech is used six times in the text),

which engages the reader into the matter of interest even more. As mentioned above, the genre of the text is the research article and thus it is following particular form of written discourse.

To sum up, the chosen text does not deviate from the norm of the genre of research article. As far as it is written in the popular scientific style, it fulfils its specific features. These include the writer's effort to avoid misunderstanding of the facts or losing the readers interest in reading the article, which is ensured for example by rather refreshing overall appearance of the text or usage of the direct speech .

5.2 Economics

"Economics pertains to the field of social sciences, also known as "soft" sciences, as it deals with the variables which characterize human behaviour. Musacchio (1995: 6-7) considers economics as being part of the 'hybrid' disciplines, which, differently from the 'pure' disciplines such as mathematics, employ means that are typical of other scientific fields of study to conduct their research. Economics, as a matter of fact, applies methods which belong to mathematics, statistics, psychology and sociology, and, in addition, often draws upon the language of these disciplines. Similarly, Scarpa (2001: 4-5) has observed that the distinctive feature of special languages is their so-called "infrasettorialità", i.e. the fact that they combine more than one academic discipline. As the author explains, although each special language is internally homogeneous, there is a continuous exchange between technical terms of the different specialized fields, such as political, legal, statistical, and mathematical terminology which merge into the language of economics." (Brugnano, 2015, p.16-17)

In this field of interest, I have chosen a page from the specialised book (Attachment 8.3). This book deals with statistics, which is actually a branch of mathematics. In general, not only statistics, but many more branches of mathematics, create an integral part of economics and are rather substantial for this field of interest. The whole book is written in the scientific style and because of the advanced English with rather frequent usage of specialized terminology, it is devoted to the group of people having adequate background knowledge and vocabulary.

The book of Gerald Keller, with the title Statistics for Management and Economics, deals with statistical procedures and all of them are sequentially applied to different kinds of

information and data to which the students of applied statistics can be exposed to. I chose this book because it was recommended to me by my friend who studies economics and uses it during the study as supplementary material.

5.2.1 Analysis of the text

Considering that the book is used as learning material for students, as I mentioned above, it is possible to assign it the genre of textbook. The formality of the book is rather high and the text is difficult to follow due to the advanced scientific style. Not only in the chosen page but throughout the whole book, there is a high occurrence of "branch-specific" words and it is essential that the reader is familiar with the subject and he or she knows the terminology used there.

Although the book is an advanced writing, it is still rather interesting from the graphological point of view. It definitely does not belong to the group of boring textbooks in which the pages are full of words and without colours. Considering the layout, the page of chosen textbook is divided into three paragraphs, two of them are in the "Introduction" part and the third one is the beginning of the subchapter 8.1 with the title "Probability Density Functions". The whole "Introduction" part has colourful background. Colours of the page are picked up very carefully and they evoke a pleasant impression on the reader. The page also contains a figure, which is placed at the bottom of the page. The background of the figure is also coloured (light blue) and there is used brown colour for the representation of data in the graph that is rather significant at first sight. The function of the figure is not to explain or depict some information mentioned in the text above it, its function is to serve only as an example. Despite of that, it is rather refreshing part of the page. There are several types of fonts used in the text. The first one is the font of the headings "Introduction" and "Probability Density Functions". They are about the same size and in the light blue colour. The second one is the font of the text under the headings. The third and fourth type of font is used in the case of already mentioned figure. There is used different font for the title of the figure, which is in the same brown colour as the representation of the data, and different one for the axis denotation.

Considering the lexical level of the analysed text, the vocabulary in the text is divided into three layers. The first one is the specialized vocabulary. The examples of specialized

words and phrases from the text are: *continuous random variable, discrete random variable, binominal distribution, statistical inference, exponential distribution* and so on. The second one is the layer of abstract vocabulary which only completes the entirety of the text. This layer contains words like *variable, value, number* and *data*. Basically, the abstract vocabulary contains the group of word that are used for denotation of meaning. The third layer is the layer of words that belong to the core of the language and are used in everyday communication. However, some of these words can have different meanings because of the technical context and it is crucial for the reader to be familiar with that. As the text is written in the advanced scientific style, the key factor is that the reader should be trained in the field of interest for proper understanding of the information in the textbook. The reason is that the writer is not intended in the explanation of the specialized phrases at all, as he or she does not assume that the reader would be a layman who needs that. Considering the ration between three layers of vocabulary which occur in the text, the specialized vocabulary clearly prevails among the other two layers. The typical feature of the texts from the field of economics and also typical feature for the genre of textbook is the usage of references throughout the whole text. There are just a few examples as references to chapters (*"... In chapter 7, we introduce ..."*), sections (*"... In section 8.2, we focus on ..."*), examples or figures (*"... (Example 3.1), which is depicted in Figure 8.1."*). The next typical feature of the advanced papers is the lexical density, which is higher than in the popular science writing. Every sentence of the extract is highly informative and important for the whole context. There are no sentences that are possible to be omitted. In general, it is possible to stay that the advanced scientific text are informative to the maximum possible extend.

The analysis of the grammatical level of the chosen text is very similar to the analysis of previous texts of the thesis. There are used all of word classes in the extract too, and their occurrence is rather uneven. The word class of nouns prevails in the text, as there is increased need of words that are able to carry the information and this is possible exactly by the high occurrence of this word class. The next most common word class are adjectives, whose function is to specify. The length of sentences is predominantly medium and the text contains some simple but mainly compound sentences. The passive voice increases the formality of the text and therefore it has a high occurrence there, for example: *"... discrete probability distributions that are employed to calculate ..."*, *"... the population represented by the probability distribution ..."*, *"... which are used to calculate ..."*, and so on.

Discourse or textual level of the extract chosen from the textbook suggests that the text is

rather coherent for the reader. The coherence is supported by usage of linking words and except for conjunctions, there are also some transition words like: *first*, *second* and *consequently* for example. The lexical cohesion created by the usage of synonyms, antonyms and others is not seen in the text. The main reason is that there often exist no synonyms and antonyms for specialized terminology in general. The cohesive device of substitution cannot be seen in the text. The writer tries to be explicit and he or she avoids the features which possibly could cause misunderstanding. However, there is rather frequent usage of cohesive device of reference, as mentioned in the analysis of lexical level. The text of the textbook is well-arranged, which also supports the textuality of the extract, but because of the high lexical density, it is harder to follow it. The extract is written in the genre of the textbook and it follows the typical form of this register.

To sum up, the chosen text does not deviate from the norm of the genre of textbook. As far as it is written in the advanced scientific style, it fulfils some specific features. These include for example the explicitness, high occurrence of the specialized terminology and the usage of reference. The key factor for the reader is to be trained in the field of interest for proper understanding of delivered information.

5.3 The law

"There is no doubt that the vocabulary of the law is extensive. To some critics most legal terms are worthless jargon whose main purpose is to befuddle the public. More moderate voices might reject the conspiracy theory, but nonetheless suggest the legal vocabulary is full of hoary words and phrases, many survivors from Anglo-Saxon, Latin and Law French days, that should long ago have been relegated to the history books. Lawyers, of course, tend to defend their technical vocabulary as essential to communication within the profession, even if it may be difficult for the lay public to understand." (Tiersma, 1999, p.87)

The text analysed in this chapter (Attachment 8.4) is an extract from the book The Universal Declaration of Human Rights: the travaux préparatoires that was edited by Schabas William. The book is written in advanced English and in the style of science and technology and it is aimed at a group of readers who are professionals in this field of interest. The vocabulary of the book is rather extensive and demanding for comprehension.

To approximate the content of the book, it is a collection of United Nations documents

connected to the drafting of the Universal Declaration of Human Rights. I chose this book because I considered it as a proper legal text which would be suitable for the analysis.

5.3.1 Analysis of the text

The chosen book is written in the scientific style and it belongs to the group of advanced scientific writing. As mentioned above, the book is the collection of legal documents which means that it similar to the genre of anthology, the genre that is prevailingly used in the field of literature or philosophy. The formality of the whole book is on the highest level and it contains a lot of "branch-specific" words. The target recipients are professionals from the field of interest. The text of the book is possibly comprehensible for a layman too, but it would be rather a challenging task and there would be need for additional study of words which are specific for this discipline.

From the graphological point of view, the extract from the textbook is not very interesting. The page is divided into three parts which actually forms three separate articles. Every article is then divided into several paragraphs, whereas the number of paragraphs is not equal for all of the articles. Each of the articles has its own number followed by its title and text. As far as the font of the chosen text is concerned, there is used just one font type for the whole page with no variations in size. The only one variation used there is the italic with combination of bold, which is used for the articles' numbers and titles. Although the text is rather dense, it is well-arranged through the properly indented parts.

The analysis of the lexical level of the text deals with the layers of vocabulary used there. There are two layers. The first one is the layer of words that belong to the core of the language and are used in everyday communication. This layer contains words like: *person*, *health*, *unemployment*, *children*, *education* and so on. The second layer is the layer of "branch-specific" or specialized words and phrases like: *to attain*, *contingencies*, *paramount*, *fundamental rights*, *jurisdiction* and others. There is a difference between the specialized vocabulary of the legal texts and the texts from other disciplines analysed in this thesis. The vocabulary of the legal texts is not unique technical vocabulary that has no synonyms and which has to be learnt to be understood. In this case, it is the vocabulary which contains mostly archaic or very formal words that have their synonyms whereas many of them can be found in the common everyday communication. For example the word *paramount* used in the

text means can be replaced by phrase “the most important”. Considering the ratio between these two layers, the layer containing words from the core of the language prevails. Despite of that, the text is rather hard to follow not only because of special words, but the whole construction of the sentences is rather unusual. Although it does not occur in the chosen extract, there are also used lots of references throughout the whole book, which is one of the typical features of legal texts. The lexical density of the text is rather low – wordiness and redundancy are seen rather often there, which is the typical feature of legal texts in general. There are some expressions and sometimes the whole sentences that could be omitted without changing or losing the meaning. For example: *“There shall be no privileged classes of any kind whatsoever.”*

The grammatical level of the chosen text is considering for example the usage of particular word classes. There are used all of word classes in the extract, but their occurrence is rather uneven. The word class of nouns prevails in the text. In general the nouns are supposed to carry the information. What is more interesting though, the next most common word class is the word class of verbs which are supposed to “carry the story”. Their high occurrence is typical for novels and other genres which are telling some kind of story. This suggests the vagueness and ambiguity and also already mentioned wordiness and redundancy contained in the text. There prevails rather long and compound sentences in the chosen extract, which is the next feature that makes it difficult to follow the text and understand it properly. The formality of the text is supported by passive voice, but it is not seen as often as in case of advanced texts from other disciplines analysed in the thesis.

The analysis of discourse or textual level of the extract chosen from the book deals with the coherence of the text. The coherence is not supported by any usage of linking words. The lexical cohesion created by the usage of synonyms, antonyms and others is not seen in the text either. However, the cohesive device of reference can be seen in the text, as mentioned in the analysis of lexical level. The text of the textbook is well-arranged, as mentioned in the part dealing with graphological level, which also supports the textuality of the extract. Although, the text is rather dense, along with lexical sparseness of the text, it is not so hard to follow. Basically, it only takes time to understand it properly.

To sum up, the chosen text has all the main typical features of the legal texts. These include for example the vagueness, occurrence of formal, even archaic vocabulary and the frequent usage of reference. The key factor for the reader is to be familiar with specialized vocabulary and unusual construction of sentences for proper understanding of the particular

text.

5.4 Electrical engineering and information technology

“Electrical engineering is not a compact science, but its theoretical basis is divided into various disciplines having their specific spheres of interests as, for example, microelectronics, telecommunications, radioelectronics, biomedical engineering, automation,... The high specification of individual disciplines is also reflected in the specific vocabulary of each of them. Besides such a branch-specific vocabulary, the language of all the disciplines displays a lexis common to all electrotechnical fields of interest and may be considered to create a general electrotechnical vocabulary.” (Krhutová, 2007, p.39)

The first text analysed in this particular discipline (Attachment 8.5) is chosen from specialised book, from the field of radioelectronics. It is written in the style of science and technology and it is aimed at a group of recipients who have a particular level of English and primarily they are assumed to be trained in this field of interests. The key factor is the knowledge of already mentioned “branch-specific vocabulary”, which appears in this technical text. This requirement on reader makes this text quite specialised and it refers to the group of advanced technical texts.

To approximate the matter of interest, the book of Sergey N. Makarov with the title Antenna and EM Modeling with MATLAB is concerning with usage of MATLAB software for a solution of basic radiation/scattering antenna problems in some structures which differ in range from simple dipoles to patch antennas and even patch antenna arrays. I chose this book because it helped me in the study for the course of Electromagnetic waves and antennas (HEVA), which I was attending in the fourth semester of my bachelor degree’s study.

The second text (Attachment 8.6) is an article “Go fly a cyborg moth” taken from the journal called New Scientist, from the section “technology”. It was published in February 2012, in the eleventh edition of this weekly, and written by an author Anil Ananthaswamy. This article is also written in the style of science and technology, but it could be also classed as the popular science writing. Therefore, the text is aimed not only at people trained in this field of interest, but mainly at laymen in this field. Thus, the vocabulary is chosen by the author very carefully. The text does not contain a lot of specialized words and phrases and if so, all of them properly explained or pictured. The level of English is also lower in comparison with the first analysed text.

This article which is about to be analysed is about design of a unique and flexible neural probe that can be attached to the insect and therefore it enables to remotely control its move. The probe was designed by Joel Voldman of the Massachusetts Institute of Technology and his colleagues and it was tested on a tobacco hawkmoth. The article describes an outstanding progress which was reached in both fields of technology and biology. I chose this article because it is rather interesting reading even for the laymen. The technology is still proceeding and it is absorbing what was already possible six years ago, not mentioning that the research of the machine-insect interface is even further nowadays.

5.4.1 Analysis of the first text

The genre of the first analysed text is the textbook. The formality of the text is rather high and the text is harder to follow because it is written in advanced academic style. The page of the textbook contains a lot of specialized terminology and it requires the reader to be trained in the particular branch of the discipline. What is more, it is essential for the reader to know the terminology as the priority of the author is not concentrated on the explanation of used vocabulary.

Analysis of the graphological level of the text is concerning among other features the layout of the text. The extract form the textbook is a whole text divided only into two paragraphs, which is interrupted by one table and two equations. The density of the text is one of the features which make it rather intricate and heavy. This particular page picked from the textbook contains the name of the chapter which is placed in the right upper corner of the page. There are three fonts used in the text. The first one is the font which is used for the title of the table and it corresponds also with the font of the name of the chapter in the upper part of page. The second one is the one which prevails in the text and it is the font used for the whole text. The last one is the font used for indication of the names of MATLAB scripts, which can be seen at the first sign even in the case of whole and rather dense text. Because it is the advanced technical text, the author has no intention to make this text interesting or grabbing the attention of the reader. The arrangement of the text is slightly supported by the indentation of the equations, which are rather highlighted thanks to that.

Proceeding to the lexical level of the analysed text, the vocabulary in the text is divided into three layers. The first one is the specialized vocabulary, particularly from the field of

radiation. The examples of specialized vocabulary are these words and collocations: *antenna feed*, *radiation resistance*, *current*, *half-wavelength dipole*, and so on. The second one is the layer of abstract vocabulary which only completes the entirety of the text. The words like *methods*, *results*, *value* and so on. Basically, the abstract vocabulary contains the group of word that are used for denotation of meaning. The third layer is the layer of words that belong to the core of the language and are used in everyday communication. However, some of these words can have different meanings because of the technical context and it is crucial for the reader to be familiar with that. As the text is written in the advanced scientific style, the key factor is that the reader should be trained in the field of interest for proper understanding of the information in the textbook. The reason is that the writer is not intended in the explanation of the specialized phrases at all, because the text is intended for professionals with the needed background knowledge. Considering the ration between three layers of used vocabulary, the specialized vocabulary clearly prevails among the other two layers mentioned above. The typical feature, which can be seen in the text, is the usage of references. There occur references to equations (*"Equation (4.15) gives …"*) and figures (*"… (see Fig. 4.10)."*). Also the occurrence of abbreviations is present – abbreviation *"Eq."* used for the word *equation* and abbreviation *"Fig."* used instead the word *figure*. The next typical feature of the advanced papers is the lexical density, which is higher than in the popular science writing. Every sentence of the extract is highly informative and important for the whole context. There are no sentences that are possible to be omitted. The last but not least feature of the advanced technical text is that they are informative to the maximum possible extent.

The grammatical level of the chosen text is among others considering the usage of particular word classes. There are used all of word classes in the extract, but their occurrence is rather uneven. The word class of nouns prevails in the text, which is typical for advanced technical texts. There is increased need of words that are able to carry the information and this is possible exactly by the high occurrence of this word class. The length of sentences is predominantly medium and the text contains some simple but mainly compound sentences. The passive voice, which increases the formality of the text, has a high occurrence there. The examples of passive voice used in the extract are: *"…resistance is calculated…"*, *"…two examples are considered…"*, *"…it can be seen…"*, *"…power is delivered to antenna…"*, and so on.

Considering the discourse or textual level of the extract chosen from the textbook, the text is rather coherent for the reader. The coherence is supported by usage of linking words

and except for conjunctions, there are also some transition words like: *then*, *thus* and *again* for example. The lexical cohesion created by the usage of synonyms, antonyms and others is not seen in the text. The main reason is that there often exist no synonyms and antonyms for specialized terminology in general. However, the cohesive device of substitution can be seen in the text, specifically there is the usage of abbreviations and it is also possible to see the usage of reference, as mentioned in the analysis of lexical level. The text of the textbook is well-arranged, as mentioned in the part dealing with graphological level, which also supports the textuality of the extract. However, the text is rather dense and along with high lexical density of the text, it is harder to follow it. The extract is written in the genre of the textbook, which is providing an exact from of the text.

To sum up, the chosen text does not deviate from the norm of the genre of textbook. As far as it is written in the advanced scientific style, it fulfils its specific features. These include for example the explicitness, precise expressions and high occurrence of the specialized terminology. Moreover, it is crucial for the reader to be trained in the field of interest for proper understanding of information delivered not only in the analysed extract but also in the whole textbook.

5.4.2 Analysis of the second text

As the chosen text is written and not spoken one, it is possible to assign it as genre of research article with formal discourse. Despite its formality, the text can be easily readable and understandable because it is rather popular scientific article. This means that although the theme is a technological topic, the author does not use a lot of unknown specialized terminology and the one which occurs in the text is properly explained or pictured so the reader is able to understand the text even though he or she is not interested or trained in this field of interest.

Starting with the analysis of the graphological level of the chosen text, the layout of the article is divided into four columns ensuring the clarity of the text. The article also contains an illustrative image of the moth, which is rather big (filling about one third of the page) and whose role is to grab reader's attention and convince him to read the article. The next feature which makes the article attractive for the reader is the coloured table placed at the bottom of the page. There are two different fonts used in the article. The first one is the font of the

heading which corresponds with the font of the subheading and also the heading of the coloured table already mentioned. The only one difference is that the size of each of these is different. The biggest one is the heading of the article, then the heading of the table is smaller and the smallest size is used in case of the subheading of the article. The rest of the page is written in the different font which is used in bold in the coloured table too. The attention is also attracted by the highlighted part of the text which is actually cut and repeated part of the article. This part is in the same font as the rest of the article, but it is in the blue colour and bold. It is very likely that the reader will also read this part of the text, except the heading and subheading, in order to predict what the article is about and if he or she is interested in such a text.

The second part of the analysis is the analysis based on the lexical level of the text. The vocabulary of the article is divided into two layers. The first one is the layer of specialized terminology which is narrow to the vocabulary of two disciplines – biology and microelectronics. As an example, this layer involves the words and collocations like: *cyborg, interface, electrodes, ventral nerve, polyimide polymer, impedance* and so on. However they are all included in the group of specialized vocabulary, there is no need to find them in a dictionary. These words can be understood even by laymen in the field, because there are lots of explanations and links so the reader is able to understand the meaning properly, for example: *"... an insect's ventral nerve cord (VNC), which, along with the brain, makes up the central nervous system in insects.*" The second layer is created by everyday vocabulary, which is created by words that are in the core of the language and we use it basically every day. Considering the ratio between these two layers, the specialized terminology is less frequent, which corresponds with typical features of the popular science prose. The writer must be aware of the density of specialized vocabulary and he or she should try to reduce it as much as possible, because the high density of these words could discourage the reader from reading. As far as the density of the whole text is taken into consideration, the text is rather lexically dense, which is caused by its genre. In general, the research articles are supposed to be informative and therefore the lexically density is a key factor.

The third analysis is analysis of the grammatical level of the chosen text. Considering the usage of particular word classes, there are used all of word classes, but their occurrence is rather uneven. The word classes of nouns and adjectives prevail in the text, which is typical for specialized texts in general. There is increased need of words that are able to denote and describe all the information and this is possible exactly by the high occurrence of these two

word classes. The sentences are of medium size and the ratio between the usage of simple structure sentences and compound sentences is approximately equal. The occurrence of passive voice is rather higher, which signifies the formality of this written medium.

The last level of the analysis is the discourse level or the textual level in other words. Despite the fact that cohesive devices are not seen in this text, the text is coherent and easily readable for the reader. Description of the research is easy to follow and it is divided into several paragraphs, which makes the text clear and well-arranged. The textuality of the text is also supported by the occurrence of direct speech, which engages the reader into the matter of interest even more. As mentioned above, the genre of the text is the research article and thus it is following particular form of written discourse.

To sum up, the chosen text does not deviate from the norm of the genre of research article. As far as it is written in the popular scientific style, it fulfils its specific features. These include the writer's effort to avoid misunderstanding of the facts or losing the readers interest in reading the article, which is ensured by rather refreshing overall appearance of the text or usage of the direct speech for example.

6 CONCLUSION

In this bachelor thesis, there was approximated the scientific style, some of its genres like research articles, textbooks, abstracts, reviews, PhD theses or popular science writing, and its disciplines, specifically the discipline of medicine, economics and the law. There were presented the main differences and the typical features of all of them. An extra chapter was devoted to the discipline of electrical engineering and information technology. The analysis of five texts from all fields of interests mentioned above was made and the aim was to indicate the key features of such a discipline of scientific style.

The analyses of particular texts were done from the point of view of four levels. The first level of analysis was the graphological level of the text, which dealt with the overall appearance of the text, its layout, use of fonts and the possible occurrence of pictures and figures. The second level was the lexical level, which was devoted to the analysis of vocabulary, its layers and the lexical density of the text. As third was analysed the grammatical level of the extracts. This one was about the word classes, which one was the most frequent for particular text, and the complexity of sentence, their length and structure. The last one was the analysis of the discourse or textual level of the texts, which dealt with coherence and cohesion of the texts and whether they include transposed features of other language varieties like genres or registers.

Throughout the analyses, the presence of typical features of the texts and genres from different disciplines which were listed in the second, third and fourth chapter was verified. To briefly repeat them, there are analysed two popular science writings, which have the genre of research article and their typical features are explicitness, effort to attract the reader, minimum usage of specialized vocabulary and lexical density of the text. The next analysed texts are the extracts from two different textbooks. They are unique because of the layouts of the pages and the way the information is delivered in them. The usage of specialized vocabulary is rather frequent and they are rather hard to follow because they are aimed at students with some background knowledge of the discipline. The last analysed text is from the field of law and it is even more distinct from the others. The wordiness, ambiguity, very formal, even archaic vocabulary and lexical sparseness are the typical features that can be seen throughout the whole extract. The target group of recipients of this text are professionals in this field of interest.

Despite the fact that each of the texts had different genre and it was from different discipline of scientific style of writing, they had some common features. The formality of the text, the specific vocabulary and at least small background knowledge needed for proper understanding of delivered information were the main features which united the extracts and proved that they are written in the style of science and technology. Simultaneously, these features are the ones which made them rather distinct from non-specialized written mediums.

7 LIST OF REFERENCES

ANANTHASWAMY, Anil. Go fly a cyborg moth. *New Scientist*. 2012, (11), 1.

BHATIA, V. K. *Worlds of written discourse*. New York: Continuum, c2004. ISBN 0-8264-5446-1.

BRUGNANO, Maria Teresa. *Investigating the Language of Economics: A Linguistic Analysis and Translation of "Basic Economics" by T. Sowell (Chapters 20 and 21)*. Padova, 2015. Thesis. University of Padova. Supervisor Prof. Maria Teresa Musacchio.

COGHLAN, Andy. Nerve damage healed in weeks. *New Scientist*. 2012, (11), 2.

HYLAND, Ken. *Academic discourse: English in a global context*. New York: Continuum, c2009. Continuum discourse series. ISBN 978-0-8264-9803-8.

HYLAND, Ken. *Disciplinary discourses: social interactions in academic writing*. Michigan classics ed. Ann Arbor: University of Michigan Press, c2004. ISBN 0-472-03024-8.

KELLER, Gerald. *Statistics for management and economics, abbreviated*. 9th ed. [abbreviated]. Mason, OH: South-Western Cengage Learning, 2012. ISBN 9781111527327.

KNITTLOVÁ, Dagmar, ROCHOVANSKÁ, Ida. *Funkční styly v angličtině a češtině. I. díl.* Olomouc: Palacký University Olomouc, 1977.

KRHUTOVÁ, Milena. *The language of electrical engineering as a special province*. Brno: Academic publishing CERM, 2007. ISBN 978-80-7204-562-4.

MAGLIE, Rosita. *Understanding the language of medicine*. Roma: Aracne, 2009. ISBN 978-88-548-2774-5.

MAKAROV, Sergey N. *Antenna and EM modeling with Matlab*. New York: Wiley-Interscience, c2002. ISBN 0-471-21876-6.

PELGER, Susanne. *Kommunikation för naturvetare*. Lund: Studentlitteratur, 2007. ISBN 9789144044477.

SARTORI, Monica. *"Excuse me, what does it mean?": A socio-linguistic analysis of patient information leaflets in doctor-patient interactions*. Padova, 2013. Thesis. University of Padova. Supervisor Prof. Maria Teresa Musacchio.

SCHABAS, William (Ed.). *The Universal Declaration of Human Rights: the travaux*

préparatoires. New York: Cambridge University Press, 2013. ISBN 978-1-107-01550-0.

SIEGWART, Roland. a Illah Reza NOURBAKHSH. *Introduction to autonomous mobile robots*. Cambridge, Mass.: MIT Press, 2004. ISBN 0-262-19502-x.

SWALES, John M. *Genre analysis: English in academic and research settings*. New York: Cambridge University Press, 1990. ISBN 978-0-521-32869-2.

SWALES, John M. *Research genres: explorations and applications*. New York: Cambridge University Press, 2004. ISBN 978-0-521-53334-8.

TIERSMA, Peter Meijes. *Legal language*. Chicago: University of Chicago Press, 1999. ISBN 0-226-80302-3.

TIERSMA, Peter Meijes. *Parchment, paper, pixels: law and the technologies of communication*. London: The University of Chicago Press, c2010. ISBN 0226803066.

WANG, Jianjun a Yize FAN. Characteristics of Economic Literature and Its Translation. *Theory and Practice in Language Studies* [online]. 2014, **4**(4), - [cit. 2018-05-22]. DOI: 10.4304/tpls.4.4.786-791. ISSN 1799-2591. Available from: http://www.academypublication.com/issues/past/tpls/vol04/04/18.pdf

Writing in Academic Genres [Online]. (2016). Retrieved May 13, 2018, from http://awelu.srv.lu.se/genres-and-text-types/writing-in-academic-genres/

8 ATTACHMENTS

THIS WEEK

Nerve damage healed in weeks

A potential breakthrough in lab rats offers hope of more effective nerve-repair surgery

Andy Coghlan

THE once paralysed limb began to twitch just minutes after the operation. It was an early sign that the rat was on a fast track to recovery that would see it up and running within weeks.

The rodent is one of more than 200 to have undergone a new surgical procedure for nerve repair that provides faster – and better – results in animals than existing techniques. The crucial question is: can it work as well in humans with the sorts of injuries that the real world inflicts upon us?

"In animal models, the results are better than any current techniques used for nerve repair," says Wesley Thayer of Vanderbilt University in Nashville, Tennessee, a member of the team behind the new procedure.

So far, Thayer and team leader George Bittner of the University of Texas at Austin have used the new technique to treat rats after severing their sciatic nerve, which mediates leg movement and feeling. With plans afoot to begin clinical trials and work also under way to see if the procedure can heal spinal cord injuries in rats, nerve specialists are cautiously optimistic that Bittner and Thayer are on to something.

When a nerve is severed through injury, surgeons must suture the two stumps together as quickly as possible. Yet even under controlled lab conditions, Bittner's tests in rats suggest that these conventional sutures restore little more than 30 per cent of previous mobility, even three months after surgery. His new technique helps to restore twice that, in as little as two weeks. The secret, he says, is to prevent the body lending a helping hand.

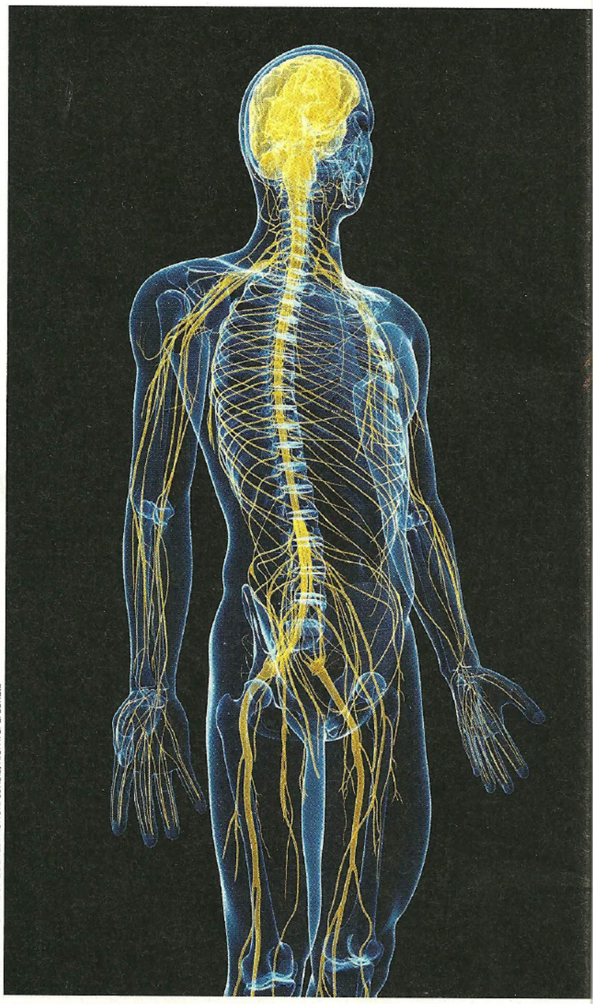
Put bluntly, the body botches nerve repair. It forms seals over the two severed stumps of a broken nerve within an hour, says Bittner, but it doesn't reconnect them first. Even if surgeons then suture the two ends, the seals will prevent nerve signals from passing easily across the join (see "Bound together", below right).

"It would be a major breakthrough if severed pieces of a nerve could just be glued together"

Bittner realised that we need a system that blocks the body's repair process. The way to do that, he discovered, is to immediately flush the injury site with a calcium-free salty solution that also contains methylene blue, a chemical that blocks oxidation reactions. Calcium and oxidation drive the formation of tiny spheres called vesicles, which in turn seal the nerve stumps.

The two still-unsealed stumps can then be glued together using polyethylene glycol, or PEG, which Bittner says allows the outer insulating layers of the nerve to join up more efficiently than they would through suturing.

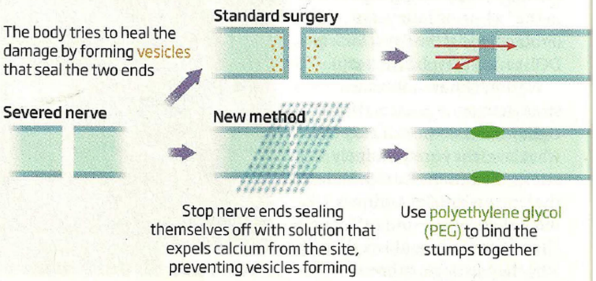
Only when the nerve has been glued together does Bittner restart the body's natural local repair mechanism – by injecting a calcium-rich salty solution. Vesicles quickly consolidate the



LEFT: SCIENCE PICTURE CO/SCIENCE FACTION/CORBIS; RIGHT: SPL/CORBIS

Bound together

A new procedure promises better and faster recovery from nerve damage

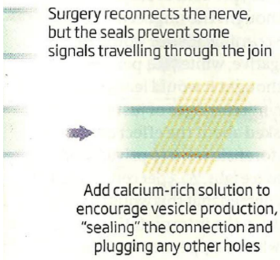


8 | NewScientist | 11 February 2012

Attachment 8.1 Nerve damage healed in weeks (1.) (Coghlan, 2012, p.8)

In this section
- Ultimate chemistry set, page 14
- Clint Eastwood on brain evolution, page 18
- Fly a cyborg moth, page 21

You've got a lot of nerve



join (*Journal of Neuroscience Research*, DOI: 10.1002/jnr.23022 and 10.1002/jnr.23023).

All the substances for the procedure are already in medical use. "We are planning a small clinical trial once we have more safety data," says Thayer.

Work is also under way to see if the technique could help heal the spinal cord as well as the nerves that branch from it. Bittner says he's already shown that the new procedure works on spinal cords "in a dish", and evaluations in animals have been done too, but he is keeping these results under wraps until the work is published in a peer-reviewed journal.

Other nerve specialists are fascinated by the results, but all warn that the outcome might not be as impressive in injured humans because real-world wounds are often much more complex than those produced in the lab rats. "Clinical injuries are normally messy, not carefully controlled microlesions," says John Priestley of Queen Mary, University of London.

Giorgio Terenghi at the University of Manchester, UK, says that the technique won't work in people with injuries that are more than a few days old. Not only will the nerve stumps have sealed, but the chunk of nerve cut adrift from the rest of the nervous system begins to decay. Bittner and Thayer say they are working on ways to improve the survival time of the isolated section.

The caution greeting the new work is understandable, given that researchers are keen to avoid raising hopes prematurely. But it was also mixed with optimism. "As a beginning it's very encouraging," says Terenghi.

"It would be a major breakthrough if the severed pieces of a nerve could be just glued together – although most research indicates that this is not possible," says Priestley. "The two new papers describe something truly startling and exciting." ■

Most fish in the sea evolved on land

FAMILY histories don't come much more bizarre. Three-quarters of the fish in the sea can trace their origins back to a freshwater ancestor. The finding highlights how important rivers and lakes are as a source of new species, just as that supply is under threat from disappearing freshwater habitats.

Fish first evolved in the sea. The oceans have been teeming with them for almost half a billion years, so there is no reason to doubt that the fish living there today did all their evolving in salt water – until you take a closer look at their family tree.

Greta Vega and John Wiens at Stony Brook University in New York noticed something peculiar while studying the evolutionary tree of ray-finned fish, a mega-group comprising 96 per cent of all freshwater and marine fish species on the planet. All the fossils belonging to the ancestral group that gave rise to ray-fins some 300 million years ago came from freshwater deposits. According to Vega and Wiens's tree, the ray-fins didn't take to the sea until about 170 million years ago (*Proceedings of the Royal Society B*, DOI: 10.1098/rspb.2012.0075). Their descendants now make up three-quarters of all marine fish.

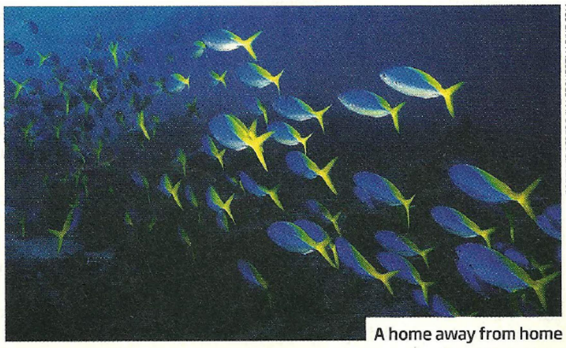
We've seen this kind of topsy-turvy evolution before. Most whales, dolphins and porpoises live in the sea, but like the ray-finned fish, they all evolved in rivers.

Michael Benton of the University of Bristol, UK, says that combined with what we know about whales and dolphins, the new study may point to a more general pattern: that most major groups of vertebrates came from land-based ecosystems. But we'll need many more studies to confirm that, he says.

What could be driving such a pattern? Wiens speculates that seas may be more prone to extinctions than land, rivers or lakes, and that rivers and lakes form an "arc of survival" that can reseed the oceans when marine species are lost.

"I don't think our results show that seas are strongly inhospitable, but they may become so at certain points in time," he says. Unfortunately, the strong ocean acidification that is predicted for the near future means we may be heading for one of those times now, he adds.

Today, however, rivers and lakes may not be healthy enough to help resupply the oceans. "Freshwater ecosystems suffer from a higher rate of species loss than any other major ecosystem," says Peter Bosshard, policy director at International vRivers, a non-profit NGO based in Berkeley, California. "This study shows that by damming, diverting and polluting the world's rivers, we may deplete the seed bank of future generations." Colin Barras ■



SOREN EDGEBERG/IMAGEQUESTMARINE.COM

A home away from home

Attachment 8.2 Nerve damage healed in weeks (2.) (Coghlan, 2012, p.9)

INTRODUCTION

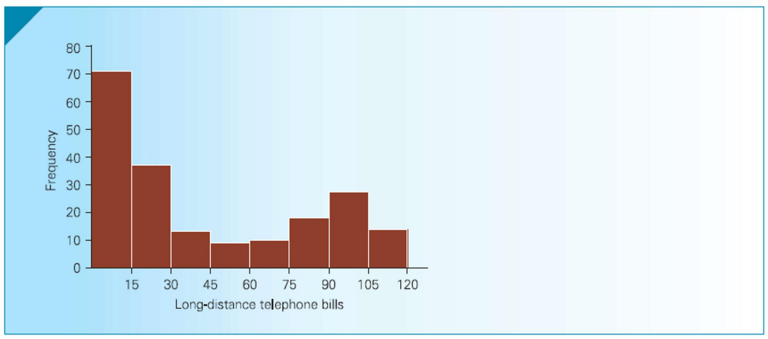
This chapter completes our presentation of probability by introducing continuous random variables and their distributions. In Chapter 7, we introduced discrete probability distributions that are employed to calculate the probability associated with discrete random variables. In Section 7.4, we introduced the binomial distribution, which allows us to determine the probability that the random variable equals a particular value (the number of successes). In this way we connected the population represented by the probability distribution with a sample of nominal data. In this chapter, we introduce continuous probability distributions, which are used to calculate the probability associated with an interval variable. By doing so, we develop the link between a population and a sample of interval data.

Section 8.1 introduces probability density functions and uses the uniform density function to demonstrate how probability is calculated. In Section 8.2, we focus on the normal distribution, one of the most important distributions because of its role in the development of statistical inference. Section 8.3 introduces the exponential distribution, a distribution that has proven to be useful in various management-science applications. Finally, in Section 8.4 we introduce three additional continuous distributions. They will be used in statistical inference throughout the book.

8.1 PROBABILITY DENSITY FUNCTIONS

A continuous random variable is one that can assume an uncountable number of values. Because this type of random variable is so different from a discrete variable, we need to treat it completely differently. First, we cannot list the possible values because there is an infinite number of them. Second, because there is an infinite number of values, the probability of each individual value is virtually 0. Consequently, we can determine the probability of only a range of values. To illustrate how this is done, consider the histogram we created for the long-distance telephone bills (Example 3.1), which is depicted in Figure 8.1.

FIGURE **8.1** Histogram for Example 3.1



We found, for example, that the relative frequency of the interval 15 to 30 was 37/200. Using the relative frequency approach, we estimate that the probability that a

Attachment 8.3 Statistics for management and economics, abbreviated (Keller, 2012, p.264)

Article 16
Right to Social Security

Every person has the right to social security.

The state has the duty to assist all persons to attain social security. To this end the state must promote measures of public health and safety and must establish systems of social insurance and agencies of social cooperation in accordance with which all persons may be assured an adequate standard of living and may be protected against the contingencies of unemployment, accident, disability and ill-health and the eventuality of old age.

Every person has the duty to cooperate with the state according to his powers in the maintenance and administration of the measures taken to promote his own social security.

Article 17
Right to Education

Every person has the right to education.

The right of children to education is paramount.

The state has the duty to assist the individual in the exercise of [10] the right to education, in accordance with the resources of the state. The opportunities of education must be open to all upon equal terms in accordance with their natural capacities and their desires to take advantage of the facilities available.

The state has the right to fix general standards to which educational institutions must conform, provided that these standards are in accord with other fundamental rights and are the same for public and for private schools.

The right to education involves the right to teach, subject to the restrictions which accompany the right to education.

Article 18
Right to Equality before the Law

All persons shall be equal before the law in respect to the enjoyment of their fundamental rights. There shall be no privileged classes of any kind whatsoever.

It is the duty of the state to respect the fundamental rights of all persons within its jurisdiction and to protect them in the enjoyment of their rights against interference by other persons.

In all proceedings in relation to fundamental rights the state must act in accordance with due process of law and must assure to every person the equal protection of the law.

Attachment 8.4 The Universal Declaration of Human Rights: the travaux préparatoires (Schabas, 2013, p.104)

Table 4.4. Numerically Found Values of Radiation Resistance versus Real Part of the Input Impedance; Numerically Found Values of Radiated and Delivered Power

Model	Real Part of the Input Impedance, Ω	Radiation Resistance, Ω	Radiated Power, W (P_{rad})	Feed Power, W (P_{feed})
Half-wavelength dipole at 75 MHz (`strip2.mat`)	87.6	88.2	0.0045	0.0044
Quarter-wavelength monopole at 75 MHz (`monopole.m`)	28.4	28.6	0.0109	0.0108

the total power, P_{rad}, radiated by the antenna has exactly the form of Eq. (4.14) where I is the current through the antenna feed. Simultaneously the resistance R is replaced by the "antenna" resistance, R_r, as follows:

$$P_{rad} = \frac{1}{2} R_r |I|^2 \tag{4.15}$$

Equation (4.15) gives the radiation resistance, R_r, of the antenna in the form of Joule's law, Eq. (4.14). To find the radiation resistance, we must first calculate the total radiated power, P_{rad}. Then, using Eq. (4.15) together with the known value of the feed current, we solve for the radiation resistance. The radiation resistance is calculated in the script `efield2.m`. Table 4.4 compares the radiation resistance and the real part of the input impedance. Again, two examples considered are the half-wavelength dipole and a quarter-wavelength monopole (see Fig. 4.10).

From the table it can be seen that these values agree well with each other, to within a numerical round-off error. The reason is simple. The total power radiated by the antenna is also the total electric power delivered to the antenna in the feed:

$$P_{feed} = \frac{1}{2}\mathrm{Re}(IV^*) = \frac{1}{2}\mathrm{Re}(Z_A)|I|^2 = P_{rad} = \frac{1}{2} R_r |I|^2 \tag{4.16}$$

Thus $R_r = \mathrm{Re}(Z_A)$. Equation (4.16) provides another, and simpler, way to calculate the total power radiated by the antenna without the need of surface integration in the far field. The corresponding variable is `FeedPower` (`script rwg4.m`). It is not to be mixed with the variable `TotalPower` (script `efield2.m`). Calculation of the radiation resistance and the total power using two independent methods is the best way to test the correctness of the far-field results.

Attachment 8.5 Antenna and EM Modeling with MATLAB (Makarov, c2002, p.75)

ROBERT PICKETT/CORBIS

It could be watching you

Go fly a cyborg moth

Half moth, half machine, remote-controlled insects could one day be used as tiny spies

Anil Ananthaswamy

GOVERNMENT spooks want cyborg insects to snoop on their enemies. Biologists want to tap into the nervous systems of insects to understand how they fly. A probe that can be implanted into moths to control their flight could help satisfy both parties. One day, it could even help rehabilitate people who have had strokes.

The US Defense Advanced Research Projects Agency (DARPA) has been running a programme to develop machine-insect interfaces for years but electrodes implanted to stimulate the brains or wing muscles of insects were not precise enough. Now Joel Voldman of the Massachusetts Institute of Technology and colleagues have designed a unique, flexible neural probe that can be attached directly to an insect's ventral nerve cord (VNC), which, along with the brain, makes up the central nervous system in insects.

Another reason previous attempts have not been entirely successful was because the impedance of the electrodes did not match that of the insect's tissue. This probe is made of a polyimide polymer coated with gold and carbon nanotubes, and its impedance is much closer to that of nerve tissue. One end of the probe is a ring that clamps around the VNC. The inside of the ring has five electrodes which stimulate distinct nerve bundles within the VNC.

Attached to the probe is a wireless stimulator, which contains a radio receiver, as well as a battery and a device to generate electrical pulses. The team implanted the device in the abdomen of a tobacco hawkmoth (*Manduca sexta*). As it weighs less than half a gram, it is easy for the moth to carry. "Their wingspan is the width of your hand," says Voldman. "These are big guys."

Testing on tethered moths revealed that stimulating one side of the VNC made the moth's abdomen turn one way, and vice versa (*Journal of Neuroscience Methods*, DOI: 10.1016/j.jneumeth.2011.11.026). The amount the abdomen turned depended on the strength of the current, which ranged from about 1 to 10 microamperes. The team then implanted the device in untethered moths and sent commands remotely. The moths turned left or right whenever the appropriate signal was delivered (see video at newscientist.com/article/dn21431).

"Once the probe had been implanted in the abdomen, the moth turned left or right on command"

"This is a major advance," says insect neurobiologist Roy Ritzmann at Case Western Reserve University in Cleveland, Ohio. DARPA hopes this kind of control will one day allow intelligence agencies to use insects to carry surveillance equipment and spy on unsuspecting enemies.

The researchers also found that the relatively low current required to control the moth meant they were able to pick up nerve signals. This should allow them to gain an insight into the impulses that make a moth fly, something that has not been possible with previous electrode designs. The low current was also less damaging to the moth.

Voldman's team is now talking to neurobiologists to see if the probe could be used in humans. "It turns out there are a bunch of cylindrical nerves in humans that are about the same size," says Voldman. Electrodes that stimulate nerve bundles could help rehabilitate people who have lost mobility after a stroke.

So will insect cyborgs soon become a reality? "It is a step toward that goal, but we are still a long way away," says Ritzmann. "To really get to a cyborg, we would need to tap where behavioural commands come from and often that is the brain. We are just starting to understand these brain circuits." ■

Cy-bugs make their own power

A true cyborg insect needs more than neural circuits. It also needs a power source, and batteries won't cut it over long periods.

Daniel Scherson at Case Western Reserve University in Cleveland, Ohio, and colleagues built a fuel cell that taps into an insect's chemical energy. The fuel cell's anode was coated with two enzymes: the first converts a sugar called trehalose in an insect's blood into glucose; the second oxidised the glucose and extracted electrons.

When implanted into the abdomen of a female cockroach, the fuel cell delivered about 55 microwatts per square centimetre of electrode (*Journal of the American Chemical Society*, DOI: 10.1021/ja210794c).

Attachment 8.6 Go fly a cyborg moth (Ananthaswamy, 2012, p.21)