IS SCHOLARLY COMMUNICATION POSSIBLE IN A SO-CALLED "ARTIFICIAL" LANGUAGE?

Detlev Blanke* and Wera Blanke

Gesellschaft für Interlinguistik
Berlin, Germany

ABSTRACT

Important for the status of any language is its function as a scholarly language. Are "artificial" languages, i.e. "international planned languages", available for such a function? This article demonstrates that they are. Among planned languages, language planning, and research on scholarly language there are several connections, particularly demonstrable through the example of Esperanto. This language, from as early as the beginning of the 20th century, has had available to it scholarly texts in journals and other publications, and oral scholarly discourse through individual communication among individual scholars and in the context of organizations and other communities of discourse on various subjects, today also web-based. Characteristics of the language, particularly its word-formation, tend to favor the flexible naming of notions and the creation of terms in line with the criteria of ISO/TC 37. Such stabilized scientific vocabulary is recorded in over 200 dictionaries covering some 90 fields. The Universal Esperanto Association seeks to coordinate work on terminology and collaborates with the principal international terminological institutions. Outside their own range of discourse, planned languages have served to stimulate work, for example, in decimal classification, in nomenclature, and in terminology science. There is a broad scholarly literature in the field.

KEY WORDS

CLASSIFICATION

*Corresponding author, η: detlev@blanke-info.de; ; ;

SCHOLARLY LANGUAGE

"Scholarly language", understood as the total of linguistic elements used in individual fields and branches of science, is an integral part of a given language. According to the prestigious German specialist in scientific language, Lothar Hoffmann [1; p.53], such scholarly language (variously known as specialized language, scientific language, or language for special purposes) is "The sum of all linguistic resources used in a communicative field limited to a specific scientific field of inquiry, in order to guarantee communication among people in that field."[1]

So defined, a "scholarly language" is an abstraction. In practice, there exist in various languages what we might call *sublanguages* (lects) for various kinds of scholarly discourse, for industrial and technical areas of production, and for other special activities. But there also exist certain characteristics common to all such scholarly and specialized languages.

When we speak of such "languages," we often have in mind specialized vocabulary, the "terminology" of given fields. But in reality such specialized language includes syntactic rules, specific stylistic resources, phraseologies, and mechanisms for the organization of texts to create the various types that such texts assume.

The application of specialized language is particularly significant for at least three principal functions of language:

a) *communication*: Specialized communication allows for more effective and more precise linguistic communication than would be possible through the general resources of the language,

b) *discovery of new knowledge*: The discovery of new facts and connections in nature and society, and their cognitive appropriation, is made significantly easier through application of specialized language,

c) *recording, conserving and conveying new knowledge:* By applying adequate specialized linguistic resources to various phenomena and channels of communication, we can record facts, actions and connections in nature and society, thereby conserving their existence and transferring them to current and future users.

Given the increasing growth of human knowledge, the influence of science and technology is expanding in ordinary life. Accordingly, our understanding of specialized language plays a larger and larger role in everyday communication.

PLANNED LANGUAGES, LANGUAGE PLANNING, AND RESEARCH ON SCHOLARLY LANGUAGE

Planned languages (other terms include: "artificial" or "constructed" international languages, international auxiliary languages, universal languages)[2] are the result of conscious and goal-oriented creation and can therefore be regarded as products of *language planning*. This idea is particularly emphasized by the Estonian scholar of language planning Valter Tauli. He describes language planning as "… the methodical activity of regulating and improving existing languages or creating new common regional, national or international languages" [2; p.27]. In this sense planned languages are both products of and devices for language planning. This is so at least of Esperanto [3].

For the study of specialized language, planned languages are of interest for at least the following reasons:

1) planned languages are often results of the search for rational and more precise linguistic resources than can be found in ethnic languages. In this sense, they perform a similar role

    to that of efforts to regularize and adapt ethnic languages to the needs of specialized and automated communication (see [4]),

2) planned languages have historically provided an impulse for the development of specialized languages (including nomenclatures) and the emergence of terminology science,

3) language planning plays a significant role in the creation and development of specialized vocabulary in both ethnic and planned languages,

4) planned languages have played a role as means of international scholarly communication and continue to do so,

5) ethnic languages and planned languages, if they have developed specialized languages, have a common need for quality standards for the formation and expansion of terminology, for terminological standardization and planning, and for the practical organization of these activities,

6) in addition – though to a different degree in various ethnic languages and a lesser degree in planned languages – we can observe efforts to collect and document terminology, to explore the development of theory, to examine knowledge transfer and research methods, and to exploit modern electronic resources and data-processing systems (among them, electronic terminology banks).

Because planned languages have been applied to communication needs only to a very limited extent, most of the results in the field of specialized communication in planned languages have been achieved (almost always in Esperanto) not by state-supported or institutionally supported efforts, but through private initiatives. The lack of professional grounding has led to considerable variability in the quality of individual specialized terminologies.

Given the varying extent and development of the application of given fields in planned languages, some parts of the specialized vocabulary should be regarded in the first instance as mere proposals, because they relate to a field not yet fully active in the medium of a planned language.

Description of the problems of scholarly communication in Esperanto has up to now been largely limited to the development of terminology.

LANGUAGES WITHOUT LINGUISTIC SPECIALIZATION?

ETHNIC LANGUAGES

A language that lacks specialized fields of communication faces the threat of decline and finally the withering away of its social significance. Such limited communicative functionality may lead to a kind of folkloric marginalization and the use of the language only as a family language.

Even the ethnic languages of Europe may be threatened by such a development, given the hegemonic role of English and the pressure on other languages that such hegemony produces. Robert Phillipson [5, 6] has rightly drawn attention to the phenomenon of linguistic imperialism and its negative consequences. The gradual loss of specialized function will become evident in, among other considerations, the fact that important scholarly and specialized texts will cease to be produced in a given language, and specialized terminology will not be taught. Furthermore, there is a danger that important specialized texts written in the past will be ignored. This shift is beginning to concern even speakers of "major" languages, like German and others, in which important scholarly texts have been produced for centuries. In bibliographies of current scholarly works, doctoral dissertations, and other forms of research, works in other languages are already barely mentioned, thus ignoring important discoveries (on the Anglicization of economics, for example, see [7]).

PLANNED LANGUAGES

In addressing planned languages, we must distinguish among:

a) *projects* with no practical application,

b) some *planned-language systems with limited practical application* (particularly Volapük, Ido, Latino sine flexione, Occidental-Interlingue, Basic English and Interlingua), and

c) a planned *language* – i.e. a language in the full sense of the notion, with well-developed and *various* communicative functions – a status so far achieved only by Esperanto.

Furthermore, it would be a mistake to assume that all Esperanto speakers share the ideals of the language's creator, Zamenhof, or that they see the language as first and foremost an embodiment of the ideals of peace. Adepts of Esperanto may see the language as, variously:

a) a hobby,

b) a language game,

c) a means of artistic expression (for creative literature),

d) an instrument of practical communication,

e) an idealistic or alternative means of identity, primarily, though not exclusively, in line with the ideas of Zamenhof,

f) a language policy alternative.

Among these six there are variations and commonalities. Probably all Esperantists share some common values, but such commonality varies enormously from one speaker to another.

A certain proportion of the adepts of planned languages (particularly those in categories d), e) and f) are politically engaged (see [8]). They are interested in language rights and are critical of the hegemonic position of a few major languages in international communication, particularly English. They argue for non-discriminatory communication through a politically neutral language and they draw appropriate attention to the phenomenon of linguistic imperialism and its negative consequences. Their attention is particularly focused on European language problems, which have proved especially complicated and multi-faceted within the European Union.

As for the development of Esperanto and its communicative potential, attention is often drawn to the abundant creative literature in the language, both original and translated. Such literature exists in considerable quantity and quality (on original literature, see [9, 10]). There is no doubt that creative literature is of great significance in the development and stabilization of the means of expression in a planned language and serves to prove its independent cultural function. However, it is insufficient if the language is ever to function in a given context as an *official,* even if limited, means of international communication on a par with other languages.

Accordingly, the specialized-language function is indispensable, not least because in international cooperation in official contexts (organizations, institutions, etc.), most communication is on specialized topics. Such topics also play a growing role in everyday communication.

The German Romanist Karl Vossler (1872-1949) once put it like this:

> a purely poetic literature, without scholarly works, is a written dialect, but not
> a fully rounded literature [11; p.236][3].

In sum, the modern scholarly application of a planned language is one of the basic conditions for its eventual role as a language policy alternative.

What role is played by specialized-language communication in planned languages, particularly Esperanto? We will attempt a brief summary.

THE SCHOLARLY APPLICATION OF PLANNED LANGUAGES

Outside Esperanto, the application of scholarly language in the context of planned languages has been very limited.

In *Volapük* (1879, the work of the German Catholic prelate Johann Martin Schleyer), a strictly agglutinative language with radically adapted (not to say distorted) morphemes derived from Latin and from Romance and Germanic languages, there exist only a few modest attempts at commercial correspondence (see [12; p.29, 12; p.41, 12; p.47]).

In *Latino sine flexione* (initiated in 1903 by the well-known Italian mathematician Giuseppe Peano), based on the ideas of Gottfried Wilhelm Leibniz (1646-1716) for a simplified Latin, a few scientific texts were published, primarily in the periodical *Schola et Vita* (1926-1939)[4], among them Peano's work *Formulario mathematico* (see [13] passim, especially [13; p.107, 13; p.118, 13; p.125]).

In *Ido* (1907, published by the well-known French mathematician, logician, and Leibniz specialist Louis Couturat), which is to some degree a reformed version of Esperanto, especially in word-formation and lexis, a few scientific texts appeared. They include some eight specialized terminologies, on, among other fields, biology, chemistry, business, machine building, mathematics, and radio technology, and also philological, philosophical and religious texts (see [14; pp.199-201, 15])[5].

In *Occidental* (published in 1922 by the German-Baltic mathematics teacher Edgar de Wahl and known after 1945 as *Interlingue*), a largely uninflected but Romance-based language, there appeared only a few scientific texts, in the fields of philosophy, philology, and – even more rarely – politics, economics, and pedagogy. Worthy of mention, however, is a sizable collection of specialized texts in mathematics and a mathematical dictionary (see [14; p.167, 16])[6].

In *Interlingua* (1951, initiated by IALA, the International Auxiliary Language Association and completed by the German-American Romanist Alexander Gode), a planned language deeply indebted to Romance languages with reduced inflective characteristics, abstracts appeared in the 1950s and 1960s in a few medical periodicals and between 1952 and 1955 in two abstract compilations, *Spectroscopia Molecular* and *Scientia International* (see [17; pp.7-8]). The Interlingua book catalogue[7] [18] mentions only a few specialized publications, in, among other fields, demography, art history, mathematics, philology, philosophy, plant diseases, and theology. There are also a few specialized dictionaries, in biology and botany, among others.

Also in *Basic English* (1929, by the British linguist and translator Charles Ogden), a variant of English with a lexis reduced semantically to 850 words and some systematization in word-formation, there appeared several specialized texts, for example in electrotechnology, geology, and economics [19; pp.75-82].

In these various planned languages very few specialized texts have appeared in printed form. However, we can find a number of new texts of this kind in the various versions of Wikipedia and in newly-established websites. A common element in all these linguistic systems is the fact that in principle they are structurally well-adapted for the presentation of specialized texts and terminologies. Even so, the limited number of specialized texts and dictionaries that have appeared in these languages hardly responds to the real needs of international communication, given that there are so few of them and the number of users of these languages interested in their use is so limited.

SPECIALIZED TEXTS IN ESPERANTO

A GENERAL OVERVIEW

The initiator of Esperanto, a physician well grounded in the natural sciences, Ludwig Leyzer Zamenhof (1859-1917), put no particular emphasis on the scientific role of his language, unlike, for example, the initiators of Latino sine flexione, Ido and Interlingua. However, in the first collection of model texts, *Fundamenta Krestomatio* [20], we find popular science texts, for example in medicine and astronomy.

It was primarily French intellectuals who, at the turn of the 19th and 20th centuries, first grasped the significance of Esperanto as a scholarly language and engaged themselves in its development. The language was not yet two decades old when the first such journal, *Internacia Scienca Revuo*[8], was launched. Between then and 1909 organizations were founded for *scientists, doctors, vegetarians* and *railway workers* (see [21]), all contributing to the development of their specialized languages. In 1910 a further scientific journal, *Medicina Internacia Revuo,* was launched.

It is difficult to present a complete picture of the scientific and scholarly initiatives and applications in Esperanto, since so much depends, and has depended, on individual efforts. Journals appear and, in due course, disappear[9], though the possibilities for scientific and specialized discourse have increased with the arrival of web-based opportunities.

Specialized texts exist in this planned language in considerable numbers. Today they appear in small journals and bulletins, and in web-based discussion groups and publications – of varying quality – at least in the following fields:

> Atheism, ecology, economics, ecumenism, Esperantology, railways, philately, philosophy, forestry, linguistics and interlinguistics, law, journalism, the construction industry, language policy, language minorities, medicine, music, homeopathy, ornithology, education, post and telecommunication, amateur radio, interdisciplinary science, theology and various religions, vegetarianism.

In addition to *Internacia Scienca Revuo,* a particularly important role in the publication of scientific texts has been played, or continues to be played, by the following periodicals:

- *Medicina Internacia Revuo* (1910-1911, 1923-36, 1952-),
- *Internacia Pedagogia Revuo* (1908-1922, 1927-1939, 1956-1959, 1970-),
- *Homo kaj Kosmo* (astronomy, 1963-1987),
- *Esperantologio* (1949-1955, 1959-1961, 1999-),
- *Internacia Geografia Revuo* (1956-1964),
- *Kemio Internacia* (1965-1968),
- *Internacia Komputado/Fokuso* (1983-1988),
- *Planlingvistiko* (1981-1986),
- *Scienca Mondo* (science policy, 1976-1989),
- *Sciencaj Komunikaĵoj* (1975-1986),
- *Tutmondaj Sciencoj kaj Teknikoj* (in Chinese and Esperanto, 1985-1995).

The most important journal in general science up to now is *(Internacia) Scienca Revuo*. Its genealogy is as follows:

- 1904-1911: *Internacia Scienca Revuo,*
- 1912-1914: *Scienca Gazeto,*
- 1918/19: *La Teknika Revuo* (subtitled *Sekvo de Internacia Scienca Revuo,* continuation of *Internacia Scienca Revuo*),

- 1922-1923: *Internacia Scienca Revuo*,
- 1926-1939: *Bulteno de ISAE*,
- as of 1949: *Scienca Revuo* (*Fondita en 1904 kiel Internacia Scienca Revuo*, founded in 1904 as *Internacia Scienca Revuo*).

Recently the complete run of *Scienca Revuo* from 1949 to 2014 (more than 2 000 articles in various fields) has become available in electronically scanned form[10].

A few journals in ethnic languages occasionally include contributions and summaries in Esperanto, for example the language-policy journal *Language Problems & Language Planning* (*LPLP*, as of 1977)[11], and the journal of cybernetics and education *Grundlagenstudien aus Kybernetik und Geisteswissenschaft/Humankybernetik* (as of 1977). The bibliographically and scientifically oriented bulletin *Informilo por Interlingvistoj* (IpI)[12], published by the Center for Research and Documentation on World Language Problems (CED), attempts, among other things, to register the most important facts and information about scholarly communication in Esperanto. As of 1992, the bulletin *Interlinguistische Informationen* (IntI), organ of the *Gesellschaft für Interlinguistik e.V.* (Society for Interlinguistics), has done the same, with contents similar to those of IpI[13].

In the most recently published book catalogue of the Universal Esperanto Association [22] publications on the following subjects are listed as available:

> Archeology, astronomy, bee-keeping, biology, botany, chemistry, culinary arts, cybernetics, ecology, economics, ethnography, geography, geology, historiography, hydraulic engineering, hygiene, informatics, interlinguistics and Esperantology, journalism, law, linguistics, mathematics, medicine, meteorology, pedagogy, philosophy, political science, psychology, sociology, sport, stenography, telecommunications, theology (and philosophy of religion), traffic engineering, and zoology.

Every year some twenty or thirty specialized monographs of various lengths appear[14]. The UEA catalogue, mentioned above, contains information on the following specialized publications (by topic and numbers): Philosophy 141, Geography 114, History 82, Linguistics 463, Religion 264, Science and Technology 313, in total 1377 titles.

The available literature is regularly updated in the web versions of the catalogues.

Esperanto-language material in monographs, anthologies and periodicals is collected by several specialized libraries and archives across the world. Over the past decade, efforts have intensified to coordinate such activity with a view to conserving the collections and creating a world catalogue and bibliography (see [23] on a symposium held in Vienna on this subject). Discussion on the topic continues in conferences and internet discussion groups[15]. A particularly important step is the web-based catalogue of the Planned Language Collection of the Austrian National Library[16]. In addition, for almost fifty years scholarly materials and contributions on interlinguistics and Esperantology have been systematically recorded in the web-based bibliography of the Modern Language Association of America[17], where a search for "Esperanto terminology" will yield numerous titles on problems of specialized terminology in Esperanto.

SPECIALIZED TEXTS IN THE INTERNET

We can probably not expect the emergence of many new scientific journals in printed form, given that the Internet has largely assumed the role of communication channel in the various fields. Several web-based journals have begun publication, however:

- *Teleskopo* (edited in Brazil) publishes scientific texts on various topics[18],
- Interlinguistic and Esperantological contributions have been published as of 1999 in *Esperantologio – Esperanto Studies*, which also exists in paper form[19],
- as of 2006, the Swedish linguist Bertil Wennergren has edited the web-based journal on Esperanto studies *Lingva Kritiko*[20],
- from 2010 to 2012 *Inkoj: Interlingvistikaj Kajeroj*[21] was published by scholars in Italy.

A particular role in the creation of specialized texts has been played recently by *Vikipedio* (the Esperanto-language Wikipedia)*,* and the various "wikis" linked to it. The creation of articles, often with specialized content, has accelerated in recent years, and this has had a significant influence on the development of specialized language. The speed and sometimes hasty creation of such texts allows little time for competent discussion of the terms employed.

Here is how the major planned languages appear in Wikipedia:

Esperanto (to 12 January 2015)[22]	208 299 articles[23]
Ido[24]	26 229
Interlingua[25]	14 352
Interlingue/Occidental[26]	2 640

We should also mention the *WikiTrans* project of Eckhard Bick [24], which automatically translates large numbers of English-language articles into Esperanto. As of mid-2014, more than four million articles had been translated into Esperanto[27]. These articles, being automatically translated, need to be edited for, among other things, specialized terminology.

There are several Esperanto-language branches of the Wiki family that include specialized texts:

- *Meta-Vikio*[28], website of the Vikimedio Foundation,
- *Vikilibroj*[29], a project for the construction of open-source handbooks and textbooks,
- *Vikicitaro*[30], an open-source web-based dictionary of quotations,
- *Vikispecioj*[31], a project to register all living species,
- *Vikivortaro*[32], a general dictionary,
- *Vikinovaĵoj*[33], an open source news agency.

This abundance of already existing and steadily expanding texts naturally raises the question of the consistency and quality of the specialized language used and, particularly with WikiTrans, the influence of the English language.

TYPES OF SPECIALIZED TEXTS

Many specialized texts are also available in the Esperanto Library of Science and Technology (STEB)[34]. The growing number of specialized texts in Esperanto leads us to consider the characteristics of the phenomenon of "specialized text" if we are to distinguish it from other texts, such as literary texts or general texts.

In the 1980s and 1990s the definition of *specialized text* has become the focus of linguistic attention. What , then, is a "specialized text"? Lothar Hoffmann defines it as follows:

> *specialized text* is an instrument and a result of an act of linguistic communication occurring in connection with productive activity within specialized social contexts. It consists of a limited and ordered quantity of sentence or sentence-like units that are coherent with respect to logic, semantics and syntax. These units are complex signs corresponding to complex propositions in the human mind and to complex facts in objective reality [25; pp.233-234].

Such specialized texts come in many types with varied characteristics and communicative functions. They can, for example, be either written or spoken. However, it is important to emphasize that it is not always possible to make a clear distinction between a scientific text for a colleague in the field and a popular science text for a wider audience.

We can distinguish a few major forms of specialized texts, such as:

- **scientific and scholarly texts.** *Treatise, scientific survey, conference intervention, examination material.* All four exist in Esperanto,
- **technical texts.** *Patent application, instruction manual for a machine*. Such texts do not yet exist in Esperanto,
- **institutional texts.** *Law, decree, contract, birth certificate*. Translations of laws exist (in legal publications in Esperanto), likewise decrees and regulations (for example in offices), and contracts (for example agreements for cooperation among organizations), though not birth certificates,
- **field-dependent texts.** *Weather forecast (meteorology), prescription (medicine), recipe (culinary arts), instructions to patients (medicine, pharmacology)*. There are abundant examples of recipes, and Esperanto-language radio and television programs involve weather forecasts, but the other forms are lacking.

To date, no detailed study of specialized texts in Esperanto (their typology, characteristics, and occurrence in linguistic practice) has been undertaken.

ORGANIZATIONAL STRUCTURES AND SPOKEN COMMUNICATION

Although Esperanto is in the first instance a written language, spoken use is expanding. This is so of specialized-language communication, which takes place in varying degrees of intensity, in *specialized organizations* and other fora, not least in online discussion groups. The following is a selection of specialized organizations (by year of foundation, as in [26; pp.61-75]):

Science. Internacia Scienca Asocio Esperantista (ISAE, 1906, interdisciplinary)
Medicine. Universala Medicina Esperanto-Asocio (UMEA, 1908)
Vegetarianism. Tutmonda Esperantista Vegetarana Asocio (TEVA, 1908)
Railways. Internacia Fervojista Esperanto-Federacio (IFEF, 1909)
Catholics. Internacia Katolika Unuiĝo Esperantista (IKUE, 1910)
Christians (Protestants). Kristana Esperantista Ligo Internacia (KELI, 1911)
Teachers. Internacia Ligo de Esperantistaj Instruistoj (ILEI, 1949)
Post and Telecommunication. Internacia Poŝtista kaj Telekomunikista Esperanto-Asocio (IPTEA, 1966)
Amateur radio. Internacia Ligo de Esperantistaj Radioamatoroj (ILERA, 1970)
Mathematics. Internacia Asocio de Esperantistaj Matematikistoj (IAdEM, 1974)
Ethnography. Internacia Komitato por Etnaj Liberecoj (IKEL, 1978)
Forestry. Internacia Forstista Rondo Esperantista (IFRE, 1981)
Philosophy. Filozofia Asocio Tutmonda (FAT, 1983)
Cybernetics. Tutmonda Asocio pri Kibernetiko, Informadiko kaj Sistemiko (TAKIS, 1983)
Business. Internacia Komerca kaj Ekonomia Fakgrupo (IKEF, 1985)
Homeopathy. Internacia Naturkuraca Asocio (INA, 1986)
Law. Esperanta Jura Asocio (EJA, 1989)
Spiritualism. Asocio de Studado Internacia pri Spiritaj kaj Teologiaj Instruoj (ASISTI, 1989)
Building trades. Tutmonda Asocio de Konstruistoj Esperantistaj (TAKE, 1993)
Agriculture. Internacia Agrikultura Esperanto-Asocio (IAEA, 1996)

Education. Edukado@Interreto (E@I, 2001)
Social issues. Monda Asembleo Socia (MAS, 2005)
Islam. Islama Esperanto-Asocio (2007)
Numismatics. Esperanto Numismatika Asocio (ENA, 2012)

A high proportion of these and other specialized organizations include a web presence[35].

There exist numbers of academic institutions whose goal is the promotion of interdisciplinary exchange. Among them are the *Akademio Internacia de Sciencoj San Marino* (AIS 1985: see [27; p.910]) and the *Internacia Scienca Akademio Comenius* [28; p.III]. International professional contacts are also aided by handbooks for scientists publishing in Esperanto or active as Esperantists (e.g. [29, 30]).

These and other specialized organizations, institutions and informal groupings commonly organize their meetings in the context of the annual World Congress of Esperanto, an annual event that convenes anywhere from 1000 to 3 000 (and even as many as 6 000 – in Esperanto's centennial year 1987) speakers from some 60 or 70 countries.

Some organizations have their own conferences and other events. Railway specialists hold an annual congress, doctors a biennial congress, and interlinguists and Esperantologists several annual national and international events. Specialists in information sciences, computer science, and cybernetics – and also religious groups – organize events less regularly.

Popular scientific events also contribute to the development of specialized texts and the establishment of specialized vocabulary. As of 1948, for example, sessions of the so-called International Congress University take place during the World Congress [31]. Also prominent have been various "Summer Universities" (e.g. 1963-1990 in Gyula, Hungary; 1980 and following years in Veliko Trnovo, Bulgaria), and the University Summer Courses in Liège, Belgium, from 1972 to 1980, which produced some 30 published papers, on such topics as anatomy, biology, chemistry, literary studies, mathematics, pharmacology, psychology, sociology, linguistics, and zoology [32; pp.82-87].

Particularly important was the series known as Application of Esperanto in Science and Technology (AEST) held in Czechoslovakia between 1978 and 1989. Individual conferences were devoted to selected topics (always with a secondary theme of "Esperanto as a scientific language" and "Esperanto and terminology"). The six volumes of this first series of events contains 156 separate papers. As of 1998 the series was continued by the Czech Esperanto Association under the title Conference on the Application of Esperanto in Science and Technology (KAEST). The proceedings of these conferences were also published[36]. A third series of biennial KAEST conferences has been organized since 2010 in Modra Harmónia, Slovakia, by a group of young specialists in internet applications, computers and other electronic devices, (papers in [33, 34])[37]. Similar conferences etc. have been arranged from time to time in Bulgaria, China, and Cuba.

Scholarly exchange in Esperanto has been particularly active in Japan. A series of six largely language-policy-oriented symposia have been recently organized by the Japanese Esperanto Institute [35]. Japanese scholars are particularly active in medicine, contributing frequently to *Medicina Internacia Revuo,* and have made important contributions to Esperantology. Itô Kanzi (1918-2005, under the pseudonym Ludovikito) provided a fundamental basis for the scholarly study of Esperanto and of Zamenhof by editing 58 volumes of the works of Zamenhof and of journals, dictionaries and textbooks influenced by him (see the list in [36]). In the Republic of Korea, university-based activity has included publication of the journal *Mondo de Universitato* (Seoul, Dankook University, 1987-1994) and other publications and conferences.

In several non-Esperanto specialized conferences, Esperanto is occasionally used as a conference language in parallel with other languages, for example as of 1968 by geologists (10 volumes of conference proceedings so far), and in the 1980s by specialists in cybernetics in Namur, Belgium. The international conference Interkomputo took place entirely in Esperanto in Budapest in 1982, attracting 200 computer scientists from 19 countries. The conference produced over 100 papers, published in 6 volumes. In the international informatics conference in Budapest in 1985, 17 out of 45 papers were given in Esperanto. The proceedings were subsequently published.

We should not underestimate the important role in the development of specialized communication played by informal correspondence among specialists, now much facilitated by the internet. There exist discussion groups and innumerable individual contacts. The Universal Esperanto Association's Yearbook contains 1700 addresses of variously oriented speakers of Esperanto in 100 countries, exchanging and promoting contacts on some 800 different topics [26; pp.99-259].

SPECIALIZED VOCABULARY AND SPECIALIZED DICTIONARIES

The structural characteristics of the Esperanto language make it particularly suitable for scientific communication, as the founder of terminology science Eugen Wüster (1889-1977) established long ago in his foundational work on language standardization [37; pp.294-323]. Among these characteristics are the easy linkage of morphemes (a consequence of, for example, the convenient morpho-phonological syllabic structure, the lack of morpheme changes, etc.), the fully productive affix system and the flexible application of word-formation rules[38]. This system was initially analyzed by René de Saussure [38], brother of the linguist Ferdinand de Saussure.

Such characteristics facilitate the adaptation of the language to new communicative needs and render it suitable for automatic documentation of specialized language, as has been shown for example in the planned-language research and dialogue system PREDIS [39] and in machine processing. The semiautomatic translation system Distributed Language Translation (DLT), initiated by Toon Witkam in 1983, in which a slightly modified Esperanto served as a bridge language (black-box language), was developed as far as a fully functioning prototype [40-42] before funding ran out. In recent years new initiatives have been published to develop software for machine translation into and out of Esperanto (see for example several contributions by Nosková & Baláž [33]). Also worthy of mention are the phonetic and phonological qualities of Esperanto, which favor high-quality speech recognition and speech synthesis [43].

Specialized vocabulary is recorded in specialized dictionaries[30]. Estimates of their numbers vary. Edward Ockey lists 200 specialized dictionaries of differing extent and quality up to the year 1980 [44]. Ockey's list has been updated to the year 2002 by Geoffrey Sutton, who mentions 280 dictionaries for some 70 fields[40] [45]. Some 140 specialized dictionaries are available on line[41]. Another web-based bibliography for 1980-2000 lists 188 specialized dictionaries for 88 fields[42]. Also the largest Esperanto-Esperanto dictionary, *La Nova Plena Ilustrita Vortaro de Esperanto,* includes specialized vocabulary for 73 fields [46; pp.36-37]. Krause's *Granda Vortaro Esperanto-Germana* seems even richer, with specialized vocabulary for 86 fields [47]. A similar number of fields is covered in the German-Esperanto volume [48].

Active development of specialized terminology has been particularly systematic and purposeful in the fields of forestry [49], railway terminology [50], and medicine [51]. Also the field of computer science is relatively well developed [52-54]. Many dictionaries are no longer published in printed form, but regularly updated in web-based versions, for example a list of terminology related to international organizations, particularly the United Nations[43].

FORMATION OF SPECIALIZED TERMS

For the formation of specialized terms, following responsible systematization of the field and definition of its ideas, the following procedures are available:

- creation of terms from already existing general words by modification of their definition, for example *funkcio* (function), which doubles as a part of the general vocabulary and as a mathematical term,
- borrowing from other languages: *softvaro*, *sputniko*,
- calques: *sin-mort-igo* (from the Latin *sui/cid/um,* or the German *Selbst/töt/ung*),
- use of metaphorical terms: *elektra kampo*,
- use of metonymy: the transfer of a proper name to a notion: *doplera efiko*[44], *leĝo de Ohm.*

The most common procedures in the formation of neologisms are calquing and the borrowing of compoundable morphemes from other languages. This sometimes leads to the creation of synonyms: *rul/ŝtup/ar/o* and *eskalator/o* for German "Rolltreppe" and English "escalator". For a while the terms *komput/il/o, komputer/o* and *komputor/o* competed for acceptance. The compound 'komput/il/o' emerged as the dominant term.

Given Esperanto's extremely flexible word-formation system, it is possible to form specialized terms through the use of this system, independently of the methods mentioned above. But up to now Esperanto has tended to follow ethnic-language models, particularly in the natural sciences.

The various requirements imposed on terms by their creators either reinforce or undermine their applicability[45]. Such requirements include:

- an idea as the basis of a term,
- link to a field,
- link to systems within the field,
- precision to be applied as needed,
- (reversible) disambiguation[46],
- transparency of meaning,
- concision (linguistic economy),
- internationality,
- ease of pronounciation.

Additional requirements, specific to Esperanto, include *internationality* and *conformity to system* i.e. conformity to the *Fundamento de Esperanto,* Zamenhof's description of the grammar of Esperanto, established in 1905 (see [20]). Selection of criteria for terminology formation should conform with the norms of Technical Committee 37 (ISO/TC 37)[47].

Terms in Esperanto are almost always based on individual proposals published in texts or dictionaries, discussed, tried out in practice, and finally accepted into the language and its specialized dictionaries, where they may stabilize or, in due course, be eliminated from use.

Various methods for the discussion of new proposals for specialized vocabulary have been applied. From 1968 to 1981, Rüdiger Eichholz stimulated discussion through his *Slipara Vortaro*[48]. On small slips of paper (A-7 format) he presented specialized terms in German, English and French. He also added the Decimal Classification number and, where possible, a line drawing. On the basis of the received reactions from his readers across the world, he published an Esperanto translation of the German dictionary *Bilder-Duden*, known as *Esperanta Bildvortaro* [55], based on the second edition of the *Bilder-Duden* of 1958 (Mannheim: Dudenverlag). In 2012 there appeared a much enlarged and newly edited edition of the *Bildvortaro*. One third of it was derived from the material compiled by Eichholz, while two thirds were newly edited and added by Petro De Smet and Jozefo Horvath[49]. This new

Esperanto edition was based on the sixth German edition, *Duden – das Bildwörterbuch* (Mannheim: Bibliographisches Institut & F.A. Brockhaus AG, 2005).

In the early 1990s, Eichholz went over to a new computer-based mode of discussion, publishing his extensive *Pekoteko* [56], a work that recorded the international discussion of individual terms through the exchange of diskettes. This method was later replaced by the more convenient and effective mode of web-based discussion.

EFFORTS TO COORDINATE TERMINOLOGY WORK

It was in 1911 that the first principles were developed for the creation of specialized vocabulary in Esperanto [57, 58]. In the 1950s the terminology centers of the *Internacia Scienca Asocio Esperantista* and the Esperanto Academy, the principal language-cultivation institution for Esperanto, attempted to advance and expand terminological work, but not to a degree that we could rightly call standardization of the kind undertaken by national standardization institutions.

In an effort to achieve better results, UEA founded its Esperanto Terminology Center in 1987 (TEC/UEA Rotterdam)[50]. The center collaborated with *Infoterm*[51] and *TermNet*[52], the principal worldwide terminological agencies. With the direct or indirect support of TEC, conferences and training seminars were organized and instructional material was published, for example the *Terminologia Kurso* and essay collection of Jan Werner [59, 60] and a handbook for the creation of terms, *Terminologia Gvidilo* [61]. Recently, efforts have again been made to improve the quality of terminology work through the Internet[53]. Thus, UEA in 2010 renewed its contact with *Infoterm* (Vienna) and joined[54] the *ISO/Technical Committee 37*.

Specialized bibliographies, libraries and archives record theoretical studies and current and former practice in Esperanto [62].

PLANNED-LANGUAGE IMPULSES FOR TERMINOLOGY WORK

Efforts originating in the 16th and 17th centuries to create a priori (philosophical) universal languages, based on the classification of all known knowledge, take their place in the search for the "perfect language" which should in turn facilitate "accurate" and "precise" thought. From such efforts derived the impulse to, among other things, develop nomenclatures and classification systems [63]. Esperanto and other planned languages had a direct effect on the development of terminology science, particularly in the work of Eugen Wüster (1898-1977). We can regard his work in Esperanto and in lexicography as preparation for his founding of terminology science[55].

Another example is the Soviet interlinguist, the Latvian Ernest K. Drezen (1982-1937), who was from 1921 to 1937 the leader of the Esperantist Union of the Soviet Republics (Sovetrespublikara Esperantista Unio). He led the team that translated Wüster's principal work into Russian [64]. He was also active in terminology science, among other things as a member of the terminology commission of the All-Soviet Committee on Standardization [65; p.16]. Drezen developed the idea of introducing into ethnic languages an international terminological code (*terminologia ŝlosilo*), based on Esperanto [66], which Wüster accepted and further developed, but never completed [67].

We should also mention the German engineer and Esperantist Alfred Warner (1931-), who collaborated with Haferkorn, maintained contact with Wüster in the period 1966-1997, and after that led the work of the German terminology-standardization institute DIN[56] (see [68; pp.84-99, 69; pp.85-97]).

CONCLUSIONS

If the speakers of an international planned language like Esperanto wish to aid in the exchange of knowledge and experience among speakers of different languages and play a significant role as promoters of their language as an official means of international communication, the language must possess the potential for specialized expression. The results so far have shown that Esperanto is completely suitable for such expression and is clearly useful in international specialized communication in a growing number of fields. If international political relations and economic forces ever bring about an objective need for just and rational linguistic communication, the experience of Esperanto shows that such communication is fully realizable even in specialized fields. Through systematic and end-directed language planning, particularly with regard to terminology, it is possible, given our experience thus far, to adapt the language to future needs for such expression.

REMARKS

[1]"… die Gesamtheit aller sprachlichen Mittel, die in einem fachlich begrenzbaren Kommunikationsbereich verwendet werden, um die Verständigung zwischen den in diesem Bereich tätigen Menschen zu gewährleisten."

[2]On planned languages, see the monographs [14, 70, 71] and their references, and also the volumes [72-74].

[3]"Eine lediglich poetische Literatur, ohne wissenschaftliches Schrifttum, ist geschriebener Dialekt, keine vollwertige Literatur."

[4]Věra Barandovská-Frank [75; pp.17-20] mentions the following fields in which Latino sine flexione texts have appeared: astronomy, biology, ethnology, interlinguistics, culture, linguistics, literature, mathematics, medicine, pedagogy, psychology, sociology, and technology.

[5]http://www.idolinguo.com (this and all other sites last visited on January 12, 2015).

[6]http://www.interlingue.org.

[7]The catalogue is now available at http://www.interlingua.com/libros.

[8]On its beginnings see [69; pp.43-52].

[9]The fullest bibliography of periodicals in Esperanto to have appeared so far covers the period from the beginning of the language to the year 2006 and contains 14 143 titles [76].

[10]See https://scienca-revuo.info/issue/archive.

[11]The journal began publication as *La Monda Lingvo-Problemo* (*LMLP*, 1969-1977). On *LPLP* see: https://benjamins.com/#catalog/journals/lplp/main.

[12]Edited from 1974 to 1977 by Ulrich Lins, from 1983 to 1990 by Ryszard Rokicki and as of 1992 by Detlev Blanke. The bulletin is also available on the Web: http://esperantic.org/en/communications/ipi/archive.

[13]See http://www.interlinguistik-gil.de/wb/pages/bulletin-inti.php.

[14]New publications are mentioned in the new publications section of the journal *Esperanto,* organ of the Universal Esperanto Association, Rotterdam.

[15]The 2014 KAEST conference, for example, had as its principal topic "Libraries and Archives: How to Protect Our Heritage?" Discussion is continuing at bibliotekoj@googlegroups.com.

[16]The catalogue, "Trovanto," is available at: http://search.obvsg.at/primo_library/libweb/action/search.do?dscnt=0&scp.scps=scope%3A%28ONB_aleph_esperanto%29&tab=onb_sondersammlungen&mode=Basic&vid=ONB.

[17]https://www.mla.org/bibliography. On the MLA Bibliography, see [77].

[18]http://www.teleskopo.com/index.htm.

[19]http://www.cb.uu.se/esperanto.

[20]http://lingvakritiko.com.

[21]"An Academic Journal on Planned and Artificial Languages. Universitata revuo pri planlingvoj kaj artefaritaj lingvoj": http://riviste.unimi.it/index.php/inkoj/index. Texts appear in Italian, English or Esperanto.

[22]http://eo.wikipedia.org/wiki/Vikipedio:%C4%88efpa%C4%9Do.

[23]At the end of 2014 a DVD was published with the complete Esperanto-Vikipedio (27 October 2014), containing 204 259 articles and with links to the current Vikipedio (http://www.ikso.net).

[24]http://io.wikipedia.org/wiki/Frontispico.

[25]http://ia.wikipedia.org/wiki/Pagina_principal.

[26]http://ie.wikipedia.org/wiki/Principal_p%C3%A1gine.

[27]http://epo.wikitrans.net.

[28]http://eo.wikipedia.org/wiki/Meta-Vikio.

[29]http://eo.wikibooks.org/wiki/%C4%88efpa%C4%9Do.

[30]http://eo.wikiquote.org/wiki/%C4%88efpa%C4%9Do.

[31]http://species.wikimedia.org/wiki/%C4%88efpa%C4%9Do.

[32]http://eo.wiktionary.org/wiki/%C4%88efpa%C4%9Do.

[33]http://eo.wikinews.org/wiki/%C4%88efpa%C4%9Do.

[34]See Scienc-Teknika Esperanto-Biblioteko, STEB ĉe http://www.eventoj.hu/steb.

[35]See http://www.esperanto.net/veb/org.html, which mentions more than 40 organizations.

[36]Cf. [78-83].

[37]Cf. http://kaest.ikso.net.

[38]On word formation in Esperanto see also [84].

[39]On the earliest efforts see [85-87].

[40]See also the first such overview by Haupenthal [88].

[41]http://www.eventoj.hu/steb.

[42]Cf. http://www.uea.org/teko/terminaro_ekde_1980.html.

[43]https://sites.google.com/site/esperantoporun/dokumentoj/generalaj-dokumentoj/rekomendita-terminaro.

[44][89].

[45][32; pp.51-55, 69; pp.101-150].

[46]Reversible disambiguation = one idea should correspond with one term, and one term with one idea.

[47]http://www.iso.org/iso/iso_technical_committee.html?commid=48104 (terminology and other language and content resources).

[48]In his introductory work to general terminology science and terminological lexicography, Wüster alludes to examples in the *Slipara Vortaro* [90; p.206].

[49]http://eo.wikipedia.org/wiki/Bildvortaro [91].

[50]On TEC's operations and achievements, the problems associated with it, and prospects for the future, see [69; pp.151-219].

[51]Internationales Informationszentrum für Terminologie / International Information Centre for Terminology, Wien. / Internacia Informcentro pri terminologio: http://www.infoterm.info.

[52]Terminology Network, Wien (international network of terminology institutions): http://www.termnet.org.

[53]See, for example, http://esperanto.net/tec.

[54]On recent developments see the article by Mélanie Maradan, *Esperanto aktuell* 3/2010, 15-16. Maradan, a specialist in translation and standardization, serves as representative of the Universal Esperanto Association for its relations with Infoterm and ISO/TC 37. As of 2013 she is a member of Infoterm's board.

[55]On Wüster see [68; pp.62-99, 69; pp.59-97].

[56]DIN = Deutsches Institut für Normung (German Institute for Standardization).

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