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## **PROSODIC STUDIES OF ENGLISH AND POLISH: FROM SYSTEMATIC DESCRIPTION TO CONTRASTIVE ANALYSIS**

**Abstract.** The purpose of this paper is to shed some light on fundamental questions related to English and Polish prosodic studies in general, and contrastive English-Polish prosodic analysis in particular. Much attention is given both to the description of theoretical approaches to the examination of language suprasegmental subsystem, and to the presentation of past findings and current trends in contrastive research.

**Keywords:** contrastive prosodic studies; speech melody; tempo; pauses; rhythm; intonational approaches.

### **1. INTRODUCTION**

Although speech prosody is one of the most affluent fields of phonetic research which has enjoyed a long tradition of both theoretically-aimed and didactically-oriented experiments, contrastive prosodic studies have been given relatively little attention. Without doubt, the contrastive analysis of English and Polish prosodic subsystems has not been undertaken on a large scale.

The following discussion does not aspire to be an exhaustive account of research devoted to speech prosody. Rather, it is an attempt to summarize some of the main issues related to English and Polish prosodic systems with special interest in the contrastive perspective.

The survey of the literature shows that researchers in almost all cases start with the presentation of experiments carried specifically for English and Polish. The contrastive analysis itself is based on the achievements

and conclusions drawn for each language and the comparison of obtained data. Little consideration is aimed at simultaneous analysis of prosodic features in both languages. Although the structure of this article, to some extent, follows this established pattern, I could not avoid additional descriptions and comments which in some parts of the presentation may seem to stray from the point. In my view, however, the reader should treat them as indispensable background knowledge to understand discussed issues.

Consequently, the first section presents terminological ambiguity of the terms *prosody* and *intonation*. In the second section a survey of the main approaches and noticeable achievements concerning English and Polish prosodic subsystems is provided. Moreover, the section explains rudimentary concepts referring to prosodic structure of speech. Then, in the third section, past strategies and findings, as well as current trends in contrastive analysis of Polish-English prosody are described. Additionally, on the basis of the available linguistic literature, attempts are made to generalize and arrange contrasted facts.

## 2. TERMINOLOGICAL CONFUSION

Two terms – *intonation* and *prosody* – are widely used in linguistic literature as regards non-segmental aspects of language. But their definitions are neither obvious nor straightforward, however simple and intuitively understandable for any speaker they may seem (at least the meaning of intonation). This terminological diversity results from different approaches to and interpretations of the phenomena. One of the first most exhaustive definitions of intonation was given by the Russian linguist Torsuyev (1950) over sixty years ago. He defined intonation as a complex unity of pitch, intensity, timbre and tempo of speech which is one of the principle means of expressing the sense of the utterance. A narrow definition of intonation as a speech melody was offered by the representatives of traditional British school of thought (cf. Jones 1956; Kingdon 1958; O'Connor and Arnold 1973). They described intonation as a combination of one or two components – the variations of pitch of voice or pitch and stress. Modern narrow definition also equates intonation with speech melody, restricting it to the “ensemble of pitch variations in the course of an utterance” (t Hart et al. 1990: 10).

Currently, terminological disagreement is embedded in the definitions of prosody (see Bouzon et al. on-line, for a discussion of the terminological dispute). The claim that prosody characterized by lexical prosodic features such as tone, stress and quantity functions on the level of the syllable and the word has gained many followers. Others consider it to function also on an utterance level where non-lexical prosodic characteristics of speech melody and rhythm are situated (cf. Hirst and Di Cristo on-line). Accordingly, utterance prosody is equivalent to intonation in its broad sense, and comprises melody, sentence stress, rhythm, tempo and pauses. These components constitute prosodic subsystems that can be analyzed in terms of their acoustic, phonetic, phonological, formal and functional properties.

In the present discussion, intonation is parallel to speech melody, whereas prosody is considered a multilevel system within which close connection and interrelation of such prosodic components as melody (intonation), utterance prominence, rhythm, tempo and pauses are observed.

### 3. A BRIEF REVIEW OF RESEARCH ON ENGLISH AND POLISH PROSODY

#### 3.1. SPEECH MELODY

The task of describing the main approaches and achievements turned out to be difficult due to several reasons. Firstly, English as an obvious leader of prosodic studies boasts its rich tradition expressed in the greatest number of researchers, the variety of theories and methods, systematic descriptions, as well as most advanced detailed and precise instrumental experiments carried in the field. In contrast, not all experiments and analyses of Polish data conducted by a handful of enthusiasts are advanced and thorough (for early works on selected aspects of Polish prosody, cf. Turska 1950; Koneczna 1951; Topolińska 1961; Dłuska 1974; Dukiewicz 1975; Dobrogowska 1978; Pluciński 1978; Richter 1982; much attention to Polish intonation was paid in books on elocution by Wieczorkiewicz 1977 and Kram 1995).

Secondly, a certain inconsistency in the choice of methodology, tools and units of analysis as regards Polish studies can be observed. Such backwardness may be justified by limited access to expensive equipment

and time-consuming character of instrumental experiments. Furthermore, there is not a single study that generalizes the existing data and defines the place of prosody in the system of the Polish language. Fortunately, the beginning of the 21<sup>st</sup> century witnesses some enlivening and interest in the study of selected aspects of Polish prosodic system (see more below).

Among the variety of methods used in intonational analysis, those of outstanding importance are:

- contour (nuclear tone) approach,
- pitch level approach,
- autosegmental-metrical model,
- discourse model.

#### CONTOUR APPROACH

A discussion on prosodic organization of an English utterance, in which speech melody and utterance stress were of main concern, was initiated by Palmer (1922) who defined its structural units: *head* – the first stressed syllable with the following stressed and unstressed syllables up to the last stressed syllable, *nucleus* – the main stress that constitutes the semantic centre of the utterance, and *tail* – all the syllables which follow the nucleus. Palmer's division of the utterance into structural units proved to be helpful. As elementary units of prosodic analysis, they have been identified in the majority of languages, which enabled the investigators to compare and contrast universal and language-specific prosodic features in various types of sentences expressing different semantic, modal and emotive connotations. Kingdon (1958) developed Palmer's principle of structural elements of the phrase adding the fourth element – *pre-head* (unstressed syllable(s) preceding head). He also presented a thorough analysis of simple and complex tones in English, considering tone to be the most active element of intonation. Other British phoneticians (cf. Crystal 1969; O'Connor and Arnold 1973; Gimson 1992; Cruttenden 1997) delivered detailed description of intonation contours and intonation structures in English speech. Their accounts, impressionistic in character, took into consideration all the peculiarities of tone: its level, configuration, pitch range (the difference between the highest and the lowest meanings of fundamental frequency), as well as the rate of pitch variations.

Polish contribution to the description of English intonation was marked by Jassem (1952) who distinguished twelve tones (simple and

compound) with their full, high and low varieties. Then, Jassem (1962) applied the British model of intonational analysis in his experiments on Polish intonation, in which he revealed three tone heights: low (L), mid (M), and high (H). Moreover, it was concluded that stress in Polish should be considered as melodic instead of dynamic, as assumed by other authors (e.g. Dłuska 1974).

The perceptual analyses of Polish intonation carried out by Dukiewicz (1978) and Steffen-Batogowa (1996) showed that the identified 28 classes of intonation units (intonemes) in Polish are represented by level, fall and rise (monotonal) units, as well as strong/weak fall-rise and strong/weak rise-fall (bitonal) units.

#### LEVEL APPROACH

In the level approach, favoured by and, with rare exceptions, confined to American phoneticians (Chun 2002: 24) melodic patterns are analyzed in terms of sequences of tones, or levels of pitch, i.e. pitch phonemes. Pike (1945) – its originator – was of the opinion that four levels of intonation contours were sufficient to express all differences in the meaning of utterances in the American variety of English. Consequently, melodic contours were described by means of relative pitch levels numbered from 1 to 4 (1 – extra high, 2 – high, 3 – mid, 4 – low) and three terminal pitch directions on the last syllable of an intonation group (falling, rising, and level). To the best of my knowledge, this method has not been used in the analysis of Polish intonation.

#### AUTOSEGMENTAL-METRICAL MODEL

The Autosegmental-Metrical model is currently the most widespread phonological framework for representing intonation. All versions of the approach are based on the principles of metrical phonology, which label the stressed vs. unstressed syllables in an utterance, as well as on the system of tunes, which consist of sequences of high and low tones. Every tune is composed of one or more *pitch accents* (i.e. accents associated with the stressed syllables in the phrase) and additional tones at the end of the phrase: the *phrase accent* and the *boundary tone*. In the system no structural distinction is made between nuclear and pre-nuclear parts of an intonation group, nucleus does not have a special status, and into-

national modifications are depicted as combinations of pitch accents.<sup>1</sup> As regards the description of intonation events of the model, the ToBI (Tone and Break Indices) set of notation tools is extremely popular and used not only for English but for many other languages.<sup>2</sup> In what follows ToBI and the three Ts (one of the traditional contour labellings) are sketched to exemplify the foregoing discussion.

A basic assumption of the ToBI approach is that both prosodic structure and intonation pattern can be described using the same inventory of elements. The system consists of four parallel tiers (levels) of symbolic labels reflecting the prosodic components of an utterance:

- 1) an orthographic tier for the text transcription,
- 2) a tone tier, for indicating the pitch events in the intonational contour (the transcription comprises basic pitch accent types: H\*, L\*, L+H\*, L\*+H, H+!H\*, phrase accents and boundary tones: L-L%, H-H%, L-H%, H-L%),
- 3) a break index tier, for labelling the perceived strength between adjacent words – the numbers from 0–4 are used: 0 represents a tight connection between words, 4 – the proper boundary between full intonational groups,
- 4) a miscellaneous tier, for additional information on effects that accompany speech, e.g. silence, audible breaths, laughter, false starts, etc.

Figure 1 demonstrates the ToBI transcription of a two intonation phrase utterance:

H\* L-H%    L\*    H\*    L-L%  
*Anna            married Lanny*<sup>3</sup>

One of the British School approaches is represented by the three Ts (tonality, tonicity, tone) model (Wells 2009). *Tonality* (chunking) refers to the division of the spoken material into tone groups<sup>4</sup> to which intonation is attributed, *tonicity* (nucleus placement) stands for highlighting the words on which the speaker focuses the hearer's attention, and *tone* re-

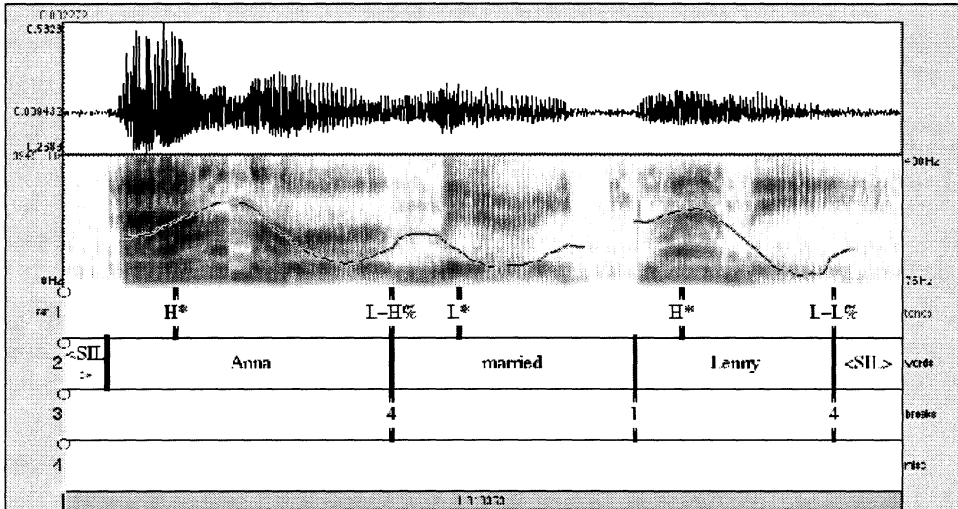
<sup>1</sup> There are abounding studies on English intonation carried out within the framework of AM model. A detailed description of English intonation by means of the generative model can be found in Pierrehumbert (on-line) and Ladd (1996).

<sup>2</sup> Training material for ToBI can be found at <http://www.ling.ohio-state.edu/~tobi/>.

<sup>3</sup> The example is taken from <http://www.ling.ohio-state.edu/~tobi/> (20.02.2011).

<sup>4</sup> Tone group is also called intonation(al) phrase, breath group, sense group, intonation group.

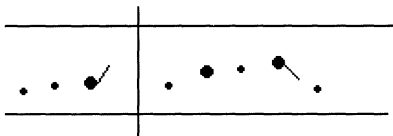
**Figure 1.** An example of the analysis of two intonation phrases in ToBI



presents the pitch movement the speaker associates with the last accent in the tone group. Figure 2 illustrates the melodic contours of a declarative sentence which corresponds with two intonation phrases (IP) and associated labeling according to the three Ts model.

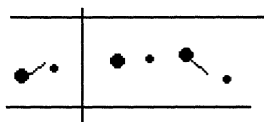
|| We believe | she wants to help us||.

**Figure 2.** An example of interlinear transcription of an utterance *We believe she wants to help us*



*We believe* is an intonation phrase 1 (IP1) and *she wants to help us* – an intonation phrase 2 (IP2). In IP1 the nucleus is the syllable *-lie-* of *believe* and the rising direction of the tone (black dot with a tail indicating the rising direction of the pitch movement), whereas in IP2 the one syllable word *help* represents the nucleus on which the fall of the tone begins (the falling continues on *us* – the unstressed syllable called the tail). In the IP2 all structural elements of the tone group can be distinguished: pre-head (*she* – small dot), head (*wants to* – big dot followed by small dot), nucleus (*help* – black dot with a tail indicating the falling direction of pitch movement) and tail (*us* – small dot).

**Figure 3.** An example of interlinear transcription of the utterance *Anna married Lenny* according to the three Ts model



IP1 *Anna* consists of a nuclear part (nucleus and tail), in IP2 *married Lenny* head, nucleus and tail are distinguished.

Even a superficial comparison of the above examples indicates that:

1. there is an approximate correspondence between elementary units of analysis: intonation phrase/intermediate phrase in ToBI and tone group (intonation phrase) in the three Ts model,
2. while in ToBI pitch movements are high (H), low (L), or combinations of both, in the three Ts falling, rising and level tunes are the primitives,
3. in ToBI the nucleus is marked by the last starred tone in the sequence of tones in an intonation phrase while in the three Ts it is marked by tonal curve which indicates its pitch movement.

In the strand of the AM approach, stylization, modelling and automatic labelling of Polish intonation for the needs of speech synthesis and speech recognition are discussed in works by Oliver (1998), Demenko (1999), Demenko and Wagner (2006), Wagner (2008).

Demenko's (1999) speech-technology oriented analysis of Polish intonation occupies a prominent position due to its findings, as well as the application of modern computation methods and large speech corpora. The investigation comprises distinctive features of the Polish accent, realization of basic intonation patterns and acoustic correlates of phrase boundaries. In the study direction, range, steepness and position of pitch movements with respect to the syllable are taken into consideration. As a result, two prenuclear: L, H, and nine nuclear accent types have been distinguished in Polish: LH (full rise), MH (high rise), LM (low rise), ML (low fall), HM (high fall), HL (full fall), xL (extremely low fall), LHL or MHL (rise-fall), and MM (level tone). Wagner (2008), supplementing this inventory of Polish accent types, has concluded that some accents play a specific structural role in the tune more often than others e.g. H\*L and LH\* occur predominantly in prenuclear, whereas HL\* and L\*H can be found most of all in the nuclear position.



Other empirical research by Francuzik et al. (2002) and Karpiński (2006) on properties of the intonational phrase, the nuclear melody, and pauses in semi-spontaneous texts of short narratives and map task dialogues in Polish as well as intonation of sequences of phrases linked by various discourse relations has proved the need for very large corpora which guarantee reliable confirmation of scientific hypotheses.<sup>5</sup>

It is worth adding that such corpora of annotated utterances allow many quantitative and qualitative analyses with respect to prosodic structures of speech genres (formal vs informal talk, broadcast political discussion, reading prose and poems), pragmatics of intonation in discourse, ways of expressing feelings and emotions in speech (Karpiński and Kleśta 2001).

As regards emotional prosody in Polish, it has been declared that variations of melody in Polish statements may be related to the emotional load of the message. Steffen-Batogowa (1995) demonstrated that high final tone signals irritation, disbelief, or anger. Wnuk and Demenko (2001) confirmed that Polish nuclear tones conveyed different meanings, e.g.: HL – astonishment, HM – persuasion, ML – a matter-of-fact tone, xL – gruffness, LH – question, surprise, MH – politeness, continuation, LM – flattery, LHL or MHL – exuberance, enthusiasm, MM – boredom. Karpiński (2001) reported 1/ a number of optional ways of expressing a given emotion in prosody, 2/ the occurrence of rises in Polish statements connected with either a speaker's uncertainty about what s/he is saying or is about to say, or a speaker's intention or wish to continue speaking.

Except for the above-mentioned directions, modern prosodic studies of Polish include research on the comprehension and production of melodic patterns by hearing-impaired and deaf children trained in oral communication (Gubrynowicz and Sieńkowska 2001), as well as examination of prosodic cues to disambiguate Polish – English speech translation (Krynicky 2001).

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<sup>5</sup> The first prosodically annotated Polish corpus is provided by the Corpus of Polish Intonational Database (PoInt) at [http://www.staff.amu.edu.pl/~inveling/pdf/maciej\\_karpinski\\_inve8.pdf](http://www.staff.amu.edu.pl/~inveling/pdf/maciej_karpinski_inve8.pdf) (22.02.2011).

## DISCOURSE MODEL

In contrast to the traditional and generative treatments of intonation which concentrated on sentence-level processes, the approach combining the study of intonation with the study of discourse has dominated current suprasegmental research. (For a detailed description of discourse intonation theory, cf. Brazil et al. 1980; Couper-Kuhlen 1986). Prosodic analysis of larger units of speech integrates and describes a wide range of attitudinal, pragmatic and sociolinguistic features signaled in an utterance. As Brazil and his research associates argue:

intonation choices [made by speakers] carry information about the structure of the interaction, the relationship between the discourse function of individual utterances, the interactional 'givenness' and 'newness' of information and the state of convergence and divergence of the participants (Brazil et al. 1980: 11).

Brazil et al. (1980) – the first who introduced the term *discourse intonation* – proposed five tones (falling-rising or *referring* tone **r**, falling or *proclaiming* tone **p**, rising **r+** tone, rising-falling **p+** tone, and low rising tone) and three keys (high, mid, low) the speaker should choose from while taking part in spoken interaction. For example, by selecting the **p** tone, the speaker signals new information whereas by using the **r** tone, he shows that information is shared by both participants of the discourse. In addition, a speaker can decide upon one of the three keys (the pitch levels of the tone group) to sound neutral (mid key), or involved (high/low key), e.g.:

<i>high</i> //r she will leave for ↘↗CRAcow	
<i>mid</i>	//p in ↘ NoVEMber//
<i>low</i>	

In the example above, the information that she leaves for Cracow is shared (old) but the time (November) is a new fact. High key may be chosen either because the information is delivered at the beginning of a sentence, due to the involved attitude on the part of a speaker, or other discourse/pragmatic features of the intercourse.

In the study of discourse intonation, a growing number of issues have emerged since Brazil and his associates' early work. Chun (2002) mentions application of discourse intonation in language teaching, its

contribution to discourse interpretation, its role with respect to the organization of conversational sequences, topic development, discourse flow, and communicating emotions and attitudes of interlocutors towards the subject matter in conversations, many of which still need to be studied.

As regards Polish researchers' work, as few as four studies have concentrated on selected questions of discourse intonation. Dukiewicz (1977) investigated the prosodic cues of the communicative structure of an utterance, and the position of *rheme* in particular. It was shown that rheme in Polish utterances is manifested by the highest level of the accented syllable, wide interval between the accented syllable and the one following it, and longer duration. Pakosz (1981, 1983) and Marek (1987, 1992), who studied pragmatics of intonation in English, focused their attention on the relation between prosody and attitudinal meaning, as well as on the link between prosody and focus.

Pakosz and Flashner's (1988) investigations involved the analysis of interaction between narrative structure and prosodic structure. Curiously enough, their study was based on Polish data, which fact puts the author of the article under an obligation to present its details.

Firstly, the correspondence between clauses and tone units was considered. The recognition and delimitation of tone units was based on the presence of a pitch prominent syllable (the nucleus) and the tone unit boundary. The data obtained showed that in 76% cases tone units coincide with clause boundaries. Additionally, the size of the tone units in terms of the number of words was investigated. It was revealed that the average length of tone unit per speaker in Polish is 4.7 words as opposed to 6–9 words for English data (op. cit.: 36).

Secondly, the examination of the status of subordinate clauses indicated that subordination is basically shown through intonation, and body gestures. Besides, in the majority of cases subordinates do not form tone groups of their own but belong to a tone unit containing other clauses. Thirdly, the analysis of pause distribution features led to the conclusion about the crucial role of pauses in discourse organization, which is manifested by their co-occurrence with tone unit boundaries rather than with clause boundaries. Next, it was concluded that prosodically integrated event line sequences in narratives are as frequent as unintegrated ones. Moreover, integrated sequences typically consist of a series of tone units with rising nuclear movements terminating with a single falling tone unit. In contrast, non-integrated sequences comprise intermingled falling

and rising tone units. Finally, it was brought to light that special effects in narratives in the majority of cases are signaled prosodically. For utterance attenuation speakers use level tone, low and narrow pitch range, allegro, accelerando, and diminuendo articulation, while highlighting of utterance chunks is achieved through the use of wide range, lento and forte articulation (op. cit.: 44). It was emphasized, however, that occasionally a feature from either category may be used for conveying an exactly opposite effect.

### 3.2. RHYTHM

Research in the field of speech rhythm has been based on the assumption that languages fall into two rhythmic categories: *stress-timed*, e.g. German, English, Russian, Arabic, in which stressed syllables are pronounced at roughly equal intervals of time, no matter how many unstressed syllables between the stressed ones appear, and *syllable-timed*, e.g. French, Spanish, Italian, Turkish, in which syllables, not stresses, tend to be pronounced at regular intervals. Hockett (1955, quoted after Kohno on-line) proposed the third category – *mora-timed* languages, e.g. Japanese or Estonian in which rhythm depends on sub-units (mora) of syllables consisting of one short vowel and any preceding onset consonants (cf. Kohno on-line, Gibbon, Gut on-line).

The general idea of stress-timing and syllable-timing classification was expressed in the works of Pike (1945) and Abercrombie (1967), and then continued by O'Connor (1973) and Ladefoged (2001), among others. In order to assign a language to one category or another Abercrombie offered the following claim:

there is considerable variation in syllable length in a language spoken with stress-timed rhythm, whereas in syllable-time rhythm the syllables tend to be equal in length (...), in syllable-timed languages, stress pulses are unevenly spaced (Abercrombie 1967: 97).

Interestingly enough, Roach (on-line), who examined the above declarations, concluded that it is difficult to set out clear rules for assigning a language to a particular category, and rhythmic dichotomy may only be a matter of perception. His scepticism was shared by Dauer (1983), and many others (cf. Bertran on-line, for linguists rejecting clear-cut division of languages into stress-timed and syllable-timed) who argue that

languages should be placed on the so-called rhythmic continuum where some languages are more/less stress/syllable-timed. Additionally, they claim that different types of rhythm are due to different sets of phonological properties, i.e. stress-timed languages approve complex syllables and have vowel reduction, while syllable-timed languages have simpler syllables and no vowel reduction.

More recently, Fenk-Oczlon and Fenk (2006) added that speech rhythm should be viewed as a faster or slower succession of syllables of higher or lower complexity. Nonetheless, they favour the stress-timed and syllable-timed dichotomy and define typological properties of rhythm. So, in languages with stress-timed rhythm metric properties include: a high number of phonemes per syllable, low number of syllables per word and clause, and high number of words per clause. For syllable-timed languages, a low number of phonemes per syllable, high number of syllables per word and clause, and low number of words per clause are relevant.

The first preliminary observations on the nature of Polish rhythm were presented in the experiment aimed at investigating consonantal duration in stress groups by Dłuska (1932) who reported that:

1. duration differences of consonants of identical quality within one stress group may amount to 0.10 seconds, usually they range from 0.01 to 0.04 seconds,
2. stressed consonant is not always the longest in the stress group, the initial consonant may be longer,
3. rhythm is determined by two consonantal positions – initial and stressed – in the stress group.

Other studies of Polish rhythm were carried out from the perspective of metrical phonology and concentrated on syllable structure and primary and secondary stress assignment in two-three word sequences (cf. Awe-dyk 1974; Hayes and Puppel 1985<sup>6</sup>; Rubach and Booij 1990).

Steffen-Batogowa (1987, 1988) and Steffen-Batogowa and Katulska (1984, 1986), who experimented on fully-fledged sentences, focused their attention on the criteria according to which elementary units of rhythmic-accentual structure of an utterance are distinguished, as well as on factors that determine the perception of primary and secondary stresses and stress group boundaries. The results of their studies indicat-

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<sup>6</sup> The third section of the article is devoted to the discussion on Polish rhythm in comparison to the features of English rhythm.

ed that the stress structure of Polish utterances on the perceptual level is shaped by:

1. listeners' individual sensitivity to the acoustic stimuli,
2. different perceptual distinctiveness of main stress and stress group boundaries,
3. speech tempo,
4. variety of spoken Polish.

Roach's (on-line) idea of perceptual character of speech rhythm reappeared in modern crosslinguistic studies (Ramus et al. on-line), which are even more attractive from the perspective of Polish linguistics since they include the analysis of Polish data. In their experiment, based on eight languages (English, Dutch, Polish, French, Spanish, Italian, Catalan and Japanese), Ramus (on-line) and his research associates perceptually tested the notion of rhythm categories and the question of intermediate languages. Measurements of the duration of consonantal/vocalic intervals and perceptual data suggest that Polish is different from any other language studied (neither stress, syllable, nor mora-timed), and thus may constitute an altogether distinct rhythm class to be defined and studied.

### 3.3. TEMPO AND PAUSES

Cross-language differences in rhythm are closely related to differences in *speech tempo* – relative speed of utterance measured by the *rate* of syllable succession and the number and duration of *pauses* in a sentence. The average rate of delivery may contain from about 2–4 syllables per second for slow tempo (*lento*), 3–6 syllables for normal speech, and 5–9 syllables for fast speech (*allegro*) (see Sokolova et al. 2001). Indeed, the rate of speaking varies constantly and depends on different factors, e.g.: individual properties of a speaker, speaking style, the importance of message delivered (the more important a message is, the slower tempo is applied), attitudinal and emotional functions (fast rate may be associated with irritation and scolding, slower rate may indicate anger or accusation), linguistic aspects (the structure of an intonation group). The average speech tempo in English was reported to be 6 syllables per second for spontaneous speech (see Cruttenden 1997; Braun and Oba on-line).

Tempo in Polish speech was discussed in the context of factors determining the stress structure of Polish utterances on the perception level. Wierzchowska (1967) and Steffen-Batogowa (1988) reported the interplay

between the rate of speech and its perception. The point is that the perception of the average number of main stresses and rhythmic group boundaries diminishes once the tempo is accelerated. Additionally, inter-hearer consistency regarding the perceived number of main stresses and rhythmic group boundaries declines.

As mentioned, speech is separated by *pauses* – acts of stopping in the flow of speech.

Zellner (1994) examines the structure of two types of pauses:

1. physical/linguistic
2. psychological/psycholinguistic.

The first category includes physical pauses marked by silence in the acoustic signal. They are divided into *intra-segmental pauses* related to the occlusions of the vocal tract in normal speech production, and *inter-lexical pauses* that appear between two words. The second category is represented by pauses of perception (the effect of silence may be produced by sharp change of pitch direction, by variations of duration, or both) and filled (voiced/ hesitation) pauses (the quality of central vowel / ɜ: (ə) / with or without nasalization, drawls, false starts, repetitions of sounds, words, phrases, etc.).

As regards other issues connected with investigation of pauses in speech, scientific papers address the origin of pauses, their prosodic features, distribution, and role in the signaling of utterance structure (cf. Fant et al. 1989; Bruce and Horne 2000).

#### 4. ENGLISH AND POLISH PROSODIC SUBSYSTEMS CONTRASTED

Most English-Polish phonetic contrastive studies have centered on the sound systems, focusing primarily on segmental features. In contrast, there have been few studies on suprasegmental aspects of speech. This, in the first place, may result from the lack of solid description of Polish prosodic system. Two decades ago Krzeszowski (1990: 59) pointed out that “any contrastive studies of this phenomena are still very much a pioneering endeavour” and “the available descriptions and comparisons suffer from lack of uniformity, rigour and reliability”, which only conceal more deeply grounded differences in the description of the linguistic data.

Attempts to compare and contrast selected aspects of English-Polish prosody date back to the late 1960s and early 1970s. A number of

pedagogically-oriented contrastive articles were published by the participants of the English-Polish Contrastive Project in Poznań.<sup>7</sup> Auditory experiments confined to investigations of word stress and utterance stress distribution, as well as melodic structure in declarative, interrogative and imperative sentences (see Mackiewicz-Krassowska 1974; Marek 1974; Mieszek 1974; Wołoszyk 1974; Dogil 1979; Szwedek 1985 on-line). Their authors emphasized the preliminary character of the analyses and imprecise nature of remarks on Polish intonation against the background of well-defined features of English intonational system.

Fisiak et al. (1978), comparing selected suprasegmentals, came to the conclusion that:

1. in Polish and English four degrees of word stress can be recognized;
2. word stress in Polish is fixed, whereas in English it is free;
3. for both languages there are 12 intonation patterns (with high level, low level, rising, or falling head and falling, rising, falling-rising, or rising-falling terminal tone) in statements, wh-questions, yes-no questions, commands and interjections;
4. the meaning of intonation patterns may be similar or different.

Over two decades later a number of studies reported on universal and language-specific prosodic features (Valimaa-Blum 1999; Durand et al. 2002; Jun 2005; Kawaguchi et al. 2006). In the light of their results it can be concluded that English and Polish share the following characteristics:

1. the global intonation – with falling direction – is characterized by declination and final lowering,
2. interrogatives and incomplete utterances tend to end with no-fall or, additionally in Polish with a level tone,
3. rising intonation is optional in wh-questions,
4. yes/no questions carry the rise or fall-rise in English; the rise in Polish is optional when *czy*-word occurs (with no *czy*-word the rise is obligatory),
5. in declarative questions the rise is obligatory,
6. intonational phrase (IP) can include a number of pitch accents, phrase accents, boundary tones, and intermediate phrases,

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<sup>7</sup> A significant contribution to the analysis of contrastive studies based on Polish and other Slavonic languages belongs to Skorek (1981, 1997) and Phonological Suprasegmental School in Zielona Góra.



7. intonation expresses information structure and attitude, conveys grammatical relations.

The first contrastive analysis of English and Polish intonation was delivered by Grabe and Karpiński (2003). Specifically, their investigations addressed the production of nuclear accent shapes in selected types of sentences comparable in two languages, relationship between high pitch and questions, tone distribution, and melodic pattern. Their findings can be summarized as follows:

1. Polish speakers produce a smaller range of nuclear accent types than English speakers,
2. six nuclear accent types were found for Polish: HL, ML, LL, LH, LM, MH, and 13 for English: HL, ML, LL, LH, LM, MH, HH, HM, LHL, LHM, HLH, MLH, MHL; all nuclear accent types found in Polish were also observed in English,
3. bitonal types HH and HM were found in English but not in Polish; studies by Francuzik et al (2002) also confirmed the presence of HH and HM in Polish,
4. tritonal accents in English but not in Polish were observed (tritonal accents in Polish occur in emotional speech),
5. Polish declaratives predominantly end in ML (this type dominates in Polish declaratives), English declaratives – in HL and ML,
6. the rising tone in Polish is used in fewer contexts than in English,
7. rising declaratives are present in both languages – in English this involves fall-rise, which is not unusual for Polish,
8. wh-questions in both languages are characterized by rising and falling contours, which is generally determined by speakers' interpretation of utterances,
9. Polish yes/no questions end predominantly in LH, English – in LH or HL,
10. Polish declarative questions end in LH or MH; English – in LH (10% of cases – in HL),
11. in both English and Polish high pitch is produced at the end of utterances more frequently when the utterances contain fewer markers of interrogativity,
12. the fundamental frequency peak in English occurs late in the stressed syllable while in Polish it occurs early (Oliver & Clark 2005).

As regards the contrastive analysis of speech rhythm it may seem to be superficial in view of the fact that it is based on data obtained independently

for both languages.<sup>8</sup> Taking into consideration arguments described in the previous section, I consider English a stress-timed language. In contrast, Polish takes an intermediate position on a rhythmic scale although its temporal features place it closer to syllable-timed languages. An attempt made to contrast rhythmic subsystems in English and Polish results in the following conclusions:

1. English manifests the tendency to isochrony (stresses in an utterance are separated by approximately equal intervals of time). Isochrony is observed in Polish but it is not so regular as in English (Richter 1983, 1987).
2. Unstressed syllables occur irregularly and are compressed between the stressed ones in English. An alternation between stressed and unstressed syllables in Polish is not so significant as in English.
3. English stressed syllables are louder and longer than unstressed ones; stressed syllables have always full vowel, unstressed – either full or reduced weak vowel. No regular vowel reduction is present in Polish where each vowel tends to preserve its quality irrespective of the amount of stress given to it. The structure of syllables in Polish, as in most syllable-timed languages, is simpler in comparison to English (Smith 1976, quoted after Roach on-line).
4. The length of stressed and unstressed syllables depends on the number of syllables and their position in a rhythmic-accentual phrase (group); the more unstressed syllables between stressed ones there are, the shorter the stressed and unstressed syllables must become.
5. In English there is a preference for alternating stressed and unstressed syllables rather than having too many unstressed or stressed syllables in a row: **fast and easy** (⊥U⊥U)<sup>9</sup> rather than **easy and fast** (⊥UU⊥), **salt and pepper** (⊥U⊥U) rather than **pepper and salt** (⊥UU⊥).
6. Weak forms are a consequence of stress-timed nature of English rhythm (Couper-Kuhlen 1986). Rhythmic organization of Polish is determined by the absence of vowel reduction and the absence of weak forms, therefore, the alternation between stressed and unstressed syllables in Polish is not so visible as in English (Ramus et al. 2003).

<sup>8</sup> Unfortunately, few comments on Polish rhythm are found in the literature.

<sup>9</sup> ⊥ – stressed syllable, U – unstressed syllable

As regards contrastive analysis of temporal structure, it was part of a PhD project devoted to prosodic features of Polish and English information texts (Szymaniuk 2002). Auditory-acoustic investigations based on radio and TV news, sport commentaries, and weather forecasts aimed at revealing their mutual and language-specific prosodic features (melodic structure, rhythmic organization, accentual and temporal shape) with special focus on prosodic style-forming means. The obtained data showed that rate of speech delivery is a controversial issue. It was revealed that Polish information texts are delivery with tempo of 6,47–6,82 syllables per second, but 156–171 words per minute; the tempo in English information texts is 4,83–5,18 syllables per second, but 181–224 words per minute. Taking into consideration the fact that tempo of speech is inversely proportional to syllable length (the shorter the syllable, the faster the tempo) additional measurements were introduced to verify the results. An average length of Polish information texts ranges from 146 to 154 ms while in English – from 192 to 206 ms. Auditory analysis of tempo delivered even more contentious conclusions since the majority of its participants claimed the tempo in English to be faster in comparison to Polish.

The study also included modifications of tempo depending on the position of an intonation group in an utterance. In general, all varieties of English information texts are characterized by moderate tempo in an initial position, which rises in the middle of an utterance to reach the highest values in the final part. In contrast, the tempo in Polish texts slows down within an utterance progress. The analysis provided no evidence of interplay between tempo changes and the type of terminal tone.

## 5. CONCLUSIONS

We have seen in this article that English prosodic studies with their long tradition, solid theoretical grounding and advanced experimental base have provided a detailed and systematic description of all prosodic units. As regards the research devoted to Polish prosody, only a small number of many questions have been given profound and satisfactory treatment.

These differences in the extent of studies are by no means conducive to the development of English-Polish prosodic investigations. I hope the foregoing illustrates that in the present state of contrastive studies many areas in the field of prosody, e.g. rhythm, tempo, pauses, remain

uncovered. This should change once a thorough description of all the elements of the Polish prosodic system is provided.

## REFERENCES

- Abercrombie, David. 1967. *Elements of General Phonetics*. Edinburgh: Edinburgh University Press.
- Awedyk, Wiesław. 1974. "The syllabic structure of English and Polish". *Papers and Studies in Contrastive Linguistics* 2, 89–95.
- Baranowska, Emilia, Francuzik, Katarzyna, Karpiński, Maciej and Janusz Kleśta. 2003. "Determining phrase boundaries in written texts for the purpose of Polish speech synthesis". *Speech and Language Technology* 7, 71–78.
- Bertran, Antonio Pamies. 1999. "Prosodic typology: On the dichotomy between stress-timed and syllable-timed languages". *Language Design* 2, 103–130 (at: [www.elies.rediris.es/Language\\_Design/LD2/pamies.pdf](http://www.elies.rediris.es/Language_Design/LD2/pamies.pdf), 30.07.2011).
- Bouzon, Caroline, Auran Cyril and Daniel Hirst. n.d. "Comparative approaches to prosody across varieties of English" (at: [www.3.pac.univ-tlse2.fr/pdf/bouzon.pdf](http://www.3.pac.univ-tlse2.fr/pdf/bouzon.pdf), 30.07.2011).
- Braun, Angelika and Oba, Reiko. n.d. "Speaking tempo in emotional speech – a cross-cultural study using dubbed speech" (at: [www.2.dfki.de/paraling07/papers/16.pdf](http://www.2.dfki.de/paraling07/papers/16.pdf), 12.07.2010).
- Brazil, David, Coulthard, Malcolm and Catherine Johns. 1980. *Discourse Intonation and Language Teaching*. Longman Group Ltd.
- Bruce, Gösta and Merle Horne. 2000. *Prosody, Theory and Experiment: Studies Presented to Gösta Bruce*. Springer.
- Chun, M. Dorothy. 2002. *Discourse Intonation in L2. From Theory and Research to Practice*. Amsterdam/Philadelphia: John Benjamins Publishing Company.
- Couper-Kuhlen, Elizabeth. 1986. *An Introduction to English Prosody*. Tübingen: Niemeyer.
- Cruttenden, Allan. 1997. *Intonation*. Cambridge: Cambridge University Press.
- Crystal, David. 1969. *Prosodic System and Intonation in English*. Cambridge: Cambridge University Press.
- Dauer, Rebecca.M. 1983. "Stress-timing and syllable-timing reanalyzed". *Journal of Phonetics* 11, 51–62.
- Demenko, Grażyna. 1999. *Analiza cech suprasegmentalnych języka polskiego na potrzeby technologii mowy*. Poznań: Wydawnictwo Naukowe UAM.
- Demenko, Grażyna and Agnieszka Wagner. 2006. "The stylization of intonation contours". *Proceedings of Prosody 2006*. Dresden (at: [www.iscaspeech.org/archive/sp2006/papers/sp06\\_254.pdf](http://www.iscaspeech.org/archive/sp2006/papers/sp06_254.pdf), 04.05.2010).

- Demenko, Grażyna, Wagner, Agnieszka, Cylwik, Natalia and Oliver Jokisch. n.d. "An audiovisual feedback system for acquiring L2 pronunciation and L2 prosody" (at: [www.eee.bham.aac.uk/SLaTE2009/papers%5CSLaTE2009-31.pdf](http://www.eee.bham.aac.uk/SLaTE2009/papers%5CSLaTE2009-31.pdf), 10.02.2010).
- Dłuska, Maria. 1932. *Rytm spółgłoskowy polskich grup akcentowych*. PAU Prace Komisji Językowej 20, Kraków.
- Dłuska, Maria. 1974. *Prozodia języka polskiego*. Warszawa: PWN.
- Dobrogowska, Katarzyna. 1978. "Badanie zależności pomiędzy akcentem a intonacją". *Lingua Posnaniensis XXI*, 65–76.
- Dogil, Grzegorz. 1979. "Some remarks on the stability of lexical stress in Polish and English". *Papers and Studies in Contrastive Linguistics 9*, 63–87.
- Dukiewicz, Leokadia. 1975. "Cechy prozodyczne i audytywna różniczalność niektórych wypowiedzi pytajnych i kontynuatywnych oraz niezakończonych i zakończonych w języku polskim". *Polonica I*, 29–69.
- Dukiewicz, Leokadia. 1977. "Prosodic expressions of communicative structures of an utterance". *Polonica III*, 5–15.
- Dukiewicz, Leokadia. 1978. *Intonacja wypowiedzi polskich*. Wrocław.
- Durand, P., Durand-Deska, Anna, Gubrynowicz, Ryszard and Bogusław Marek. 2002. "Polish: prosodic aspect of «czy» questions" (at: [www.isca-speech.org/archive/sp2002/sp02\\_255.pdf](http://www.isca-speech.org/archive/sp2002/sp02_255.pdf), 19.10.2010).
- Fant, Gunnar, Kruckenberg, Anita and Lennart Nord. 1989. "Stress patterns, pauses, and timing in prose reading". *STL-QPSR 30*, 7–12 (at: [www.speech.kth.se/qpsr](http://www.speech.kth.se/qpsr), 12.12.2010).
- Fenk-Oczlon, Gertraud and August Fenk. 2006. "Speech rhythm and speech rate in cross-linguistic comparison" (at: [www.u.uni.klu.ac.at/gfenk/Speech%20Rhythmfinal.pdf](http://www.u.uni.klu.ac.at/gfenk/Speech%20Rhythmfinal.pdf), 23.05.2011).
- Fisiak, Jacek, Lipińska-Grzegorek, Maria and Tadeusz Zabrocki. 1978. *An Introductory English-Polish Contrastive Grammar*. Warszawa: PWN.
- Francuzik, Karol, Karpiński, Maciej and Janusz Kleśta. 2002. "A preliminary study of the intonational phrase, nuclear melody and pauses in Polish semi-spontaneous narration" (at: [www.isca-speech.org/archive/sp2002/sp02\\_303.pdf](http://www.isca-speech.org/archive/sp2002/sp02_303.pdf), 20.02.2011).
- Gibbon, Dafydd and Ulrike Gut. 2001. "Measuring speech rhythm". *Eurospeech 2001* (at: [www.isca-speech.org/archive/eurospeech\\_2001/e01\\_0095\\_06.01.2011](http://www.isca-speech.org/archive/eurospeech_2001/e01_0095_06.01.2011)).
- Gimson, Alfred Charles. 1992. *An Introduction to the Pronunciation of English*. London/New York/Melbourne/Auckland.
- Grabe, Esther and Maciej Karpiński. 2003. "Universal and language-specific aspects of intonation in English and Polish" (at: [www.phon.ox.ac.uk/files/people/grabe/Grabe\\_Karpinski.pdf](http://www.phon.ox.ac.uk/files/people/grabe/Grabe_Karpinski.pdf), 12.02.2011).
- Gubrynowicz, Ryszard. 1999. "Projekt i realizacja bazy danych mowy polskiej w programie Babel", in: W. Jassem, Cz. Basztura, G. Demenko and K. Jassem (eds.). 1999. *Speech and Language Technology III*, 257–276.

- Gubrynowicz, Ryszard and Helena Sieńkowska. 2001. "Voice of oral educated deaf children 20 years later: a study of pitch contours and tonal range variations", in: St. Puppel and G. Demenko (eds.). 2001. *Prosody 2000*. Poznań: Faculty of Modern Languages and Literature, UAM, 75–81.
- Hayes, Bruce and Stanisława Puppel. 1985. "On the rhythm rule in Polish", in: H. van der Hulst and N. Smith (eds.). 1985. *Advanced in Nonlinear Phonology*. Dordrecht
- Holland Cinnaminson, USA: Foris Publication (at: [www.humnet.ucla.edu/humnet/linguistics/people/hayes/papers/HayesPuppelRhythmRuleInPolish1985.pdf](http://www.humnet.ucla.edu/humnet/linguistics/people/hayes/papers/HayesPuppelRhythmRuleInPolish1985.pdf), 12.02.2011).
- Hirst, Daniel and Albert Di Cristo. 1998. *Intonation Systems: A Survey of Twenty Languages*. Cambridge: Cambridge University Press (at: [www.homes.uni-bielefeld.de/gibbon/Docs/1998HirstDiCristo.pdf](http://www.homes.uni-bielefeld.de/gibbon/Docs/1998HirstDiCristo.pdf), 02.11.2010).
- Hockett, Charles Francis. 1955. "A manual of phonology". *International Journal of American Linguistics* 21/4, 1–246.
- Jassem, Wiktor. 1952. *Intonation of Conversational English (Educated Southern British)*. Wrocław.
- Jassem, Wiktor. 1962. *Akcent języka polskiego*. Wrocław.
- Jassem, Wiktor and Katarzyna Kudela-Dobrogowska. 1974. "Inwarianty w przebiegach parametru Fo". *Biuletyn PTJ* XXXII, 159–171.
- Jones, Daniel. 1956. *An Outline of English Intonation*. Cambridge.
- Jun, Sun-Ah. 2005. *Prosodic Typology: The Phonology of Intonation and Phrasing*. Oxford: Oxford University Press.
- Karpiński, Maciej and Janusz Kleśta. 2001. "The project of intonational database for the Polish language", in: St. Puppel and G. Demenko (eds.). 2001. *Prosody 2000*. Poznań: Faculty of Modern Languages and Literature, UAM, 113–118.
- Karpiński, Maciej. 2001. "The prosodic expression of surprise and astonishment in jokes: a listening task", in: St. Puppel and G. Demenko (eds.). 2001. *Prosody 2000*. Poznań: Faculty of Modern Languages and Literature, UAM, 105–111.
- Karpiński, Maciej. 2006. *Struktura i intonacja polskiego dialogu zadaniowego*. Poznań: Adam Mickiewicz University Press.
- Kawaguchi, Yuji, Fonagy, Ivan and Tsunekazu Moriguchi. 2006. *Prosody and Syntax: Cross-linguistic Perspectives*. John Benjamins Publishing Company.
- Kingdon, Roger. 1958. *The Groundwork of English Intonation*. London.
- Kohno, Morio. n.d. "Rhythmic patterns in languages and psychology of speech perception" (at: [www.ler.letras.up.pt/uploads/ficheiros/8542.pdf](http://www.ler.letras.up.pt/uploads/ficheiros/8542.pdf), 24.06.2010).
- Koneczna, Halina. 1951. "Co wiemy o akcencie polskim". *Poradnik Językowy* 4, 4–13.
- Kram, Jerzy. 1995. *Zarys kultury żywego słowa*. Warszawa.

- Krynicky, Grzegorz. 2001. "Prosodically aided word sense disambiguation in Polish-English speech translation", in: St. Puppel and G. Demenko (eds.). 2001. *Prosody 2000*. Poznań: Faculty of Modern Languages and Literature, UAM, 127–134.
- Krzyszowski, Tomasz. 1990. *Contrasting Languages: the Scope of Contrastive Linguistics*. Mouton de Gruyter (at: [www.amazon.com/Contrasting-Languages-Contrastive-Linguistics-Linguistics/dp/3110121336#reader\\_3110121336](http://www.amazon.com/Contrasting-Languages-Contrastive-Linguistics-Linguistics/dp/3110121336#reader_3110121336)), 14.05.2010).
- Ladd, D. Robert. 1996. *Intonational Phonology*. Cambridge University Press.
- Ladefoged, Peter. 2001. *A Course in Phonetics* (4<sup>th</sup> edition). Harcourt College Publishers.
- Mackiewicz-Krassowska, Halina. 1974. "Intonation of English and Polish declarative sentences". *Papers and Studies in Contrastive Linguistics* 2, 137–144.
- Marek, Bogusław. 1974. "Intonation of imperative sentences and requests in Polish and in English". *Papers and Studies in Contrastive Linguistics* 2, 161–180.
- Marek, Bogusław. 1987. *The Pragmatics of Intonation*. Lublin: Wydawnictwo KUL.
- Marek, Bogusław. 1992. "Focus and intonation", in: J. Fisiak and St. Puppel (eds.). 1992. *Phonological Investigations, Literary and Literary Studies in Eastern Europe* 38, 443–465.
- Mieszek, Aleksandra. 1974. "Intonation of compound sentences in English and Polish". *Papers and Studies in Contrastive Linguistics* 2, 181–188.
- O'Connor, Joseph Desmond. 1973. *Phonetics*. Harmondsworth: Penguin.
- O'Connor, Joseph Desmond and Gordon F. Arnold. 1973. *Intonation of Colloquial English*. London: Longmans.
- Oliver, Dominika. 1998. *Polish Text to Speech Synthesis*. MSc Thesis in Speech and Language Processing, University of Edinburgh (at: [www.coli.uni-saarland.de/~dominika/Oliver\\_1998\\_MSc.thesis.pdf](http://www.coli.uni-saarland.de/~dominika/Oliver_1998_MSc.thesis.pdf), 14.04.2010).
- Oliver, Dominika. and Robert A. J. Clark. 2005. "Modeling pitch accent types for Polish speech synthesis". *Proceedings of Interspeech*, 1965–1968.
- Pakosz, Maciej. 1981. "Prosodic manifestation of the scope of focus in English". *Kwartalnik Neofilologiczny* XXVII/1, 85–99.
- Pakosz, Maciej. 1983. *Emotive Intonation: Evidence from English*. Lublin.
- Pakosz, Maciej and Vanessa Flashner. 1988. "Prosodic features and narrative strategies in Polish discourse". *Papers and Studies in Contrastive Linguistics* 24, 33–46.
- Palmer, Harold E. 1922. *English Intonation with Systematic Exercises*. Cambridge: Heffer.
- Pierrehumbert, Janet Breckenridge. 1980. *The Phonology and Phonetics of English Intonation* (at: [www.faculty.wcas.northwestern.edu/~jbp/publications/PierrehumbertPhD.pdf](http://www.faculty.wcas.northwestern.edu/~jbp/publications/PierrehumbertPhD.pdf), 20.01.2010).
- Pike, Kenneth L. 1945. *The Intonation of American English*. University of Michigan Press.

- Pluciński, Andrzej. 1978. "Interdependencies between the fundamental frequency and the intensity levels In Polish colloquial speech". *Lingua Posnaniensis XXI*, 77–89.
- Ramus, Franck. n.d. "Acoustic correlates of linguistic rhythm: perspectives" (at: [www.cogprints.org/2273/3/ramus.sp02.pdf](http://www.cogprints.org/2273/3/ramus.sp02.pdf), 23.06.2010).
- Ramus, Franck., Dupoux, Emmanuel and Jacques Mehler. 2003. "The psychological reality of rhythm classes: perceptual studies" (at: [www.ehess.fr/lscp/persons/ramus/docs/ICPhS03.pdf](http://www.ehess.fr/lscp/persons/ramus/docs/ICPhS03.pdf), 24.10.2010).
- Roach, Peter. n.d. "On the distinction between 'stress-timed' and 'syllable-timed' languages" (at: [www.personal.reading.ac.uk/~llsroach/phon2/frp.pdf](http://www.personal.reading.ac.uk/~llsroach/phon2/frp.pdf), 20.05.2010).
- Richter, Lutosława. 1982. "Rola poszczególnych czynników w procesie percepcji intonacji w mowie polskiej". *Polonica VIII*, 7–36.
- Richter, Lutosława. 1983. "Wstępna charakterystyka izochronizmu zestrojowego w języku polskim". *Prace IPPT PAN 4*, 3–39.
- Richter, Lutosława. 1987. "Modeling of the rhythmic structures of utterances in Polish". *Studia Phonetica Posnaniensia 1*, 91–125.
- Rubach, Jerzy and Booij, Geert. E. 1990. "Syllable structure assignment in Polish". *Phonology 7*, 121–158 (at: [www.jstor.org/pss/4420010](http://www.jstor.org/pss/4420010), 23.03.2010).
- Sawicka, Irena. 1995. Fonologia, in: Wróbel H. (ed.). 1995. *Gramatyka współczesnego języka polskiego. Fonetyka i fonologia*. Kraków, 107–198.
- Skorek, Julian. 1981. *Intonacja jednosyntagmatycznych zdań języka rosyjskiego i polskiego*. Zielona Góra: Wydawnictwo WSP.
- Skorek, Julian. 1997. *Fonologia suprasegmentalna języków rosyjskiego i polskiego*. Zielona Góra: Wydawnictwo WSP.
- Smith, Alexandra. 1976. "The timing of French, with reflections on syllable timing". *Work in Progress 9*, 97–108.
- Sokolova, M. A., Gintovt, K. P., Kanter, L. A., Krylova, N. I., Tighonova I. O and G. A. Shabadash. 2001. *Practical English Phonetics*, Moscow: Vladoš.
- Steffen-Batogowa, Maria. 1987. "Tempo of speech and stress structure of Polish utterances". *Studia Phonetica Posnaniensia 1*, 127–147.
- Steffen-Batogowa, Maria. 1988. "Czynniki determinujące strukturę akcentową wypowiedzi polskich w płaszczyźnie percepcyjnej". *Polonica XIII*, 141–162.
- Steffen-Batogowa, Maria. 1995. "Międzyosobnicze różnicowanie sposobów wyrażania emocji w mowie aktorów". *Polonica XVII*, 37–65 .
- Steffen-Batogowa, Maria. 1996. *Struktura przebiegu melodii polskiego języka ogólnego*. Poznań: Adam Mickiewicz University Press.
- Steffen-Batogowa, Maria and Krystyna Katulska. 1984. "Individual differences in the perception of main stress and stress group boundaries". *Lingua Posnaniensis XXVII*, 101–116.



- Steffen-Batogowa, Maria and Krystyna Katulska. 1986. "The perceptual distinctiveness of main stress and stress group boundaries". *Lingua Posnaniensis* XXIX, 117–128.
- Szwedek, Aleksander. 1985. "On contrasting the sentence stress". *Papers and Studies in Contrastive Linguistics* 19, 39–46.
- Szwedek, Aleksander. n.d. "The role of sentence stress in the interpretation of coreferentiality in English and Polish". *Poznań Studies in Contemporary Linguistics* 4, 13–23 (at: [www.ifa.amu.edu.pl/psicl/files/4/02.Szwedek.pdf](http://www.ifa.amu.edu.pl/psicl/files/4/02.Szwedek.pdf), 24.06.2010).
- Szymaniuk, Dorota. 2002. *Prozodia ustnego tekstu informacyjnego w polskich i angielskich mass mediach*. Unpublished PhD dissertation. Uniwersytet w Białymstoku.
- t'Hart, Johan, Collier, Rene and Antonie Cohen. 1990. *A Perceptual Study of Intonation*. Cambridge: Cambridge University Press.
- Topolińska, Zuzanna. 1961. *Z historii akcentu polskiego od wieku XVI do dziś*. Wrocław–Warszawa–Kraków.
- Torsuyev, Gennadiy P. 1950. *English Phonetics*. Moscow.
- Turska, Halina. 1950. "Zagadnienia miejsca akcentu w języku polskim". *Pamiętnik Literacki* 41, 435–468.
- Valimaa-Blum, Riitta. 1999. "Intonation in English, Finnish and French: Ethology versus typology". CD, *Proceedings of the 14<sup>th</sup> International Congress of Phonetic Sciences*. San Francisco, 301–304.
- Wagner, Agnieszka. 2008. *A Comprehensive Model of Intonation for Application in Speech Synthesis*. Unpublished PhD dissertation. Adam Mickiewicz University. Poznań.
- Wells, John Christopher. 2009. *English Intonation. An Introduction*. Cambridge: Cambridge University Press.
- Wierzchowska, Bożena. 1967. *Opis fonetyczny języka polskiego*. Warszawa.
- Wieczorkiewicz, Bronisław. 1977. *Sztuka mówienia*. Warszawa.
- Wnuk, Przemysław and Grażyna Demenko. 2001. "Perception of intonational variation in Polish", in: St. Puppel and G. Demenko (eds.). 2001. *Prosody 2000*. Poznań: Faculty of Modern Languages and Literature, UAM, 247–252.
- Wołoszyk, Alicja. 1974. "Intonation of interrogative sentences In English and Polish". *Papers and Studies in Contrastive Linguistics* 2, 145–160.
- Zeller, Brigitte. 1994. "Pauses and temporal structure of speech", in: E. Keller (ed.). 1994. *Fundamentals of Speech Synthesis and Speech Recognition*. Chichester: John Wiley, 41–62 (at: [www.cogprints.org/884/3/Zellner.SpeechPauses.pdf](http://www.cogprints.org/884/3/Zellner.SpeechPauses.pdf), 24.06.2010).