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REMARKS ON SYMBOLS

Originally published as "Uwagi o symbolach," Studia Semiotyczne 7 (1977), 91–99. Translated by Magdalena Tomaszewska.

The term "symbol" is one of the most ambiguous terms in philosophy, aesthetics, and the theory of art. Some use it interchangeably with the term "sign." Others use the term "symbol" in the sense in which I use the term "conventional sign." As regards my opinion, by 'symbol' I understand a sensually perceptible object, present in nature or produced by man, which evokes in a recipient a thought about another object different than itself — an object sensually perceptible, partially perceptible or sensually imperceptible — physical or mental, real or imaginary, concrete or abstract, empirical or transcendental — neither on the basis of similarity in appearance as in the case of an iconic sign, nor on the basis of a custom or convention as in the case of a conventional sign, but on the basis of some other often vague link between it and the object symbolized. For example, the lion evokes a thought about strength and courage, the flame — a thought about revolution, struggle of light and darkness at sunset — a thought about struggle between Good and Evil. There is no similarity in appearance between strength, courage and the lion. However, the link between them is not only a matter of a custom or convention: it is not possible to replace the lion as a symbol of strength and courage with e.g. the fly. Similarly, there is no similarity in appearance between revolution and the flame. However, the relationship between them is not purely conventional: it is not possible to replace the flame as a symbol of revolution with e.g. still water.

Let's elaborate on the link between a symbolizing object and the symbolized object. It seems that there are a few different cases.

Sometimes the link consists in a certain, perhaps distant analogy. The struggle of light and darkness is a symbol of the struggle between Good and

Evil because there is a certain analogy between what is light and bright and what is good, and also between what is dark and gloomy and what is evil. There is a distant analogy between expansionism, impetuousness and the destructive and purifying force of the flame, and expansionism, impetuousness and the destructive and purifying power of the revolution, and this analogy causes the flame to be understood as a symbol of revolution. The snake biting its own tail is a common symbol of eternity: the analogy consists here in the lack of beginning and end.

Sometimes the mentioned link is based on metonymy: a symbolizing object is a part of the symbolized object. The cogwheel is a part of the world of technology and is often used as a symbol of this world. Sometimes a symbolizing object is not so much a part of the symbolized object as its abbreviation, a condensed equivalent. This is how Sigismund's Column, Warsaw's element with a strong emotional tinge, is sometimes used as a symbol of Warsaw.

Sometimes the link between a symbolizing object and the symbolized object is based on metaphor. In the film *The General Line* by Eisenstein, a rusty typewriter symbolizes fossilized bureaucracy.

Finally, sometimes an object that has a certain property to a significant degree becomes a symbol for this property. The dog is a symbol of faithfulness in medieval art, because the dog has this property to a significant degree.

Usually symbolized objects are by no means more significant than symbolizing objects. Christ is more significant than his symbols — the lamb, the eagle, the lion; the revolution is more significant than the flame; the world of technology is more significant than the cogwheel, Warsaw is more significant than Sigismund's Column. It can be claimed that symbolizing objects derive their significance, their emotional value from the objects they symbolize.

How do symbols originate? No object is a symbol by itself. In order for an object to become a symbol, somebody needs to feel it as a symbol, to think of it as a symbol. Let's call this intellectual activity, by means of which somebody constitutes a certain object as a symbol, a "symbol-creating act." This act may remain an internal property of the symbol creator. Thus, for example, a sawn fragment of a railway track used as a paperweight can be a symbol of the world of technology for the owner and only for the owner of the paperweight. In Tolstoy's *War and Peace*, prince Andrew, when going to the Rostovs' estate in early spring, notices a bare leafless oak. On the return way he barely recognizes the oak: it is covered with luxuriant leaves. Prince Andrew feels this change as a symbol of change that took place in

him, a symbol of internal revival that occurred in him during the stay at the Rostovs'. Let's call symbols of this type, which are only an internal property of an individual, "monosubjective."

Mostly, however, somebody who creates a symbol somehow communicates it to others. A poet or a painter introduces in their work e.g. a certain object as a symbol. An individual monosubjective symbol becomes then an individual "intersubjective" symbol. The albatross, a powerful bird when in its element but unable to walk on the ground, as a symbol of a poet in Baudelaire's poem; a split pine tree as a symbol of the internally split hero in the last chapter of Żeromski's *Homeless people*; a man without a heart as a symbol of the destroyed city in Zadkine's statue in Rotterdam: these are examples of intersubjective symbols that are individual creations of a particular artist.

The mentioned individual intersubjective symbols known to its audience remained the property of their creators, and were not incorporated as a means of communication used by a certain social group. However, sometimes individual intersubjective symbols can be adopted as a means of communication by a certain social group — a religious community, a political organization, a nation, a state. They become collective symbols, a part of tradition, the cultural heritage of a particular social group. Thus, for example, the hammer and sickle was a commonly adopted symbol of the alliance of the working class and the peasants in the Soviet Union.

Collective symbols are usually established through a custom or convention. In this respect they are close to conventional signs.[1] There is, however, one principal difference between symbols and conventional signs. A conventional sign is, in principle, arbitrary and can be replaced with any other sign. A symbol cannot be replaced with any other object.

Collective symbols are usually anonymous, that is their creator are unknown. For example, it is not known who was the first to use the Chinese figure "yin-yang" as a symbol of the universe. Only in exceptional cases it is possible to attribute a particular collective symbol to the author and the date of creation. Ilia Erenburg made a certain natural phenomenon a sign of a political transformation in his novel *The Thaw* (*Ottiepiel*, 1956).

[1] In the course of history symbols acquire new senses. The cross, initially an iconic sign of the instrument of Christ's death, then a conventional sign of Christianism, is also (through generalization) a symbol of faith, one of three theological virtues. Also, the cross — as a crossing of a vertical and horizontal line — is associated with different moral and cosmic symbolism, the same as the lotus in India and the bamboo in Japan. They become so to speak condensed equivalents of whole complexes of concepts and values, which, obviously, improves their usefulness in rites and pieces of art.

The symbol was widely adopted, especially in journalism. In this case it is possible to pinpoint the moment when a particular individual symbol whose authorship and the time of creation can be established became an anonymous collective symbol.

Symbols, as I understand them, are not signs. A sign is an object created physically or at least used in a particular situation by a certain living being. A symbol can be a certain natural phenomenon which is not created by a certain living being.

Signs have a three-fold function. They evoke in a recipient a thought about an object other than itself, they direct the thought of a recipient to the object other than itself, they are "transparent" (evocative function); they represent this object (representative function; an exception to this are dependent conventional signs which are used to create new independent conventional signs from old independent conventional signs); and express its author's or user's thought (expressive function). Symbols have the evocative and representative function, while the expressive function only in a certain special sense — that is, they express the thought of the one who was the first to make a particular object a symbol, the one who constituted it as a symbol through a symbol-creating act. The lion as symbol of strength and courage expresses the thoughts of an unknown individual who in a distant past made this animal a symbol of strength and courage.

A symbol can be represented by an iconic or a conventional sign. Such an iconic sign representing a symbol is called 'symbolic sign'. A symbolic sign is, for example, a dog engraved in a medieval tombstone sculpture of the wife. The sculpture of the dog is an iconic sign; the dog symbolizes faithfulness. Thus, it is a two-level representation.

Great religions, especially Christianity, Hinduism, Buddhism, Confucianism, Taoism, developed rich and complicated systems of symbols. The literature and art — sculpture, painting, architecture, dance, theater, poetry — of the mentioned religions drew heavily on the repository of these symbols and used them as a powerful means of emotional action.

A rich system of symbols was created by medieval Christianity. It was related to the characteristic of the epoch symbolic interpretation of the reality given in experience. Almost all objects, not only animals, plants, precious stones and fantastic creatures, but also the four cardinal points, numbers, geometrical figures, colors, sounds and smells had a symbolic meaning. Medieval thinkers and artists understood and felt the surrounding reality symbolically, they saw symbols everywhere around them. It was believed that God created animals, plants and precious stones not only for the convenience

of humans, but also to make them symbols of particular persons or objects, the expressions of a unique language in which he spoke to humans. Hugh of Saint Victor (12^{th} century) writes: "All visible things have their *symbolical* sense, that is, they are given *figuratively* to denote and explain invisible things [...]. They are *signs* of invisible things and *images* of those things which dwell in the perfect and incomprehensible nature of the Deity in a manner passing all understanding" (Tatarkiewicz 1970: 200). For Thomas Aquinas objects of perception are spiritual things taught in Scripture "by means of metaphors drawn from bodily things" ("spiritualia sub metaphoris corporalium") (Thomas Aquinas 2006: 16 [Question 1, Article 9]). Alain de Lille (Alanus ab Insulis, died c. 1203) presented the theory of symbolism in the poem whose first verse reads:

Omnis mundi creatura
quasi liber et pictura
nobis est, et speculum;
nostrae vitae, nostrae mortis,
nostri status, nostrae sortis
fidele signaculum.
("Every creature of the world
is like a book and a picture
to us, and a mirror.
A faithful representation
of our life, our death,
our condition, our end."
(Evans 1983: 151))

Another, incomparably better, non-sensuous and super-sensuous world was accessible beyond, and so to speak through, the visible, audible, touchable, sensuously perceptible world. Even the most inconspicuous objects and the most common activities could direct thought to what was holy and divine. Any worldly love was to some extent a symbol of heavenly love. Bonaventura saw making the handicrafts as a symbol of a creative act of God.[2]

Symbols of medieval liturgy and art were established symbols. Their meaning was not only established by custom, but very often codified in

[2]"Bonaventura identified the handicrafts symbolically with the eternal generation and incarnation of the World" (Huizinga 1955: 208).

special treatises such as *Speculum Ecclesiae* by Honorius of Autun (12^{th} century), *Mitrale* by Sicard of Cremona (beginning of 13^{th} century), or *Rationale divinorum officiorum* by Wilhelm Durand (c. 1286), in numerous "bestiaries," "herbaries," lapidaries."

An interpretation of these symbols in each particular case would be very easy if the set of symbolizing objects and the set of symbolized objects corresponded to each other unambiguously, if an object was always represented by one symbol, and if a symbol always represented one object. However, it was not so. One person could be represented by many different objects. Especially numerous were symbols of Christ, Mary and Satan. The symbols of Christ were: a lamb, the eagle, the ostrich, the deer, the dove, the lion, the peacock, the pelican, the bull, the unicorn, the phoenix, a bunch of grapes, gold, the diamond, the pearl, the rising sun. The symbols of Mary (who herself was sometimes a symbol of the Church) were: the fiery bush, the Lebanon cedar, the lily, the olive, the rose, the peony, the diamond, the pearl. Also, the following symbols, which appeared in the late Middle Ages and are present in the Litany of Loreto, can be added: the above mentioned rose (*plantatio rosae*) and cedar (*cedrus exaltata*), but also the sun (*electa ut sol*), the moon (*pulchra ut luna*), the star (*stella maris*), the gate of heaven (*porta coeli*) and the mirror without blemish (*speculum sine macula*).

The symbols of Satan were: the viper, the snake, the whale, the male goat, the bat, the dog, the frog, the toad, the crocodile, the hedgehog, the leopard, the bear, the fox, the wild boar, the monkey, the dragon, the basilisk, the sphinx, the centaur, the satyr, the siren (Réau 1955 : 79-100, 107-124; Molsdorf 1926: 75).

One object could symbolize different objects depending on context. And thus, for example, the pearl could symbolize the Word of God, the Heavenly Kingdom, Christ, the Host, Divine Mother, the soul (Delbrueck 1952: 142, 143-145;[3] Réau 1955: 137). The peacock could symbolize pride, vanity, immortality. By the early Middle Ages, it had been realized that one object could symbolize many different objects. John Scotus Erigena says that "the sense of divine utterances is manifold and infinite, (...) even as in one and the same feather of the peacock we behold a marvelous and beautiful variety of colors" (Gilbert, Kuhn 1939: 150).

One object could also symbolize different objects depending on interpretation. The Middle Ages developed a special theory of quadruple interpretation, that is literal, allegorical, tropological (moral) and anagogical (mystical).

[3]Delbrueck's article is based here, among others, on writings of the Eastern Fathers of the Church.

The origins of this theory can be found in Philo of Alexandria (1^{st} century BC) and Clement of Alexandria (2^{nd} century BC). Initially, it was used for exegesis of the Holy Scripture, but later was also applied to poetry and the fine arts (Nicholas of Lyra, 14^{th} century). And thus, for example, a painting or a relief of a winged lion was an image of a winged lion in literal interpretation, an emblem of saint Mark in allegorical interpretation, a symbol of strength in a moral interpretation, and a symbol of Christ crucified in a mystic interpretation (Réau 1955: 62). One and the same object symbolized different objects here depending on the interpretation, and these different senses were not mutually exclusive.

Sometimes one object could symbolize not only different but even contrary objects with different values. What we can discuss here is not only the polysemy but the ambivalence of symbols. Thus, the lion could symbolize both Christ and Antichrist, both God and Satan. The snake usually symbolized the devil, but sometimes could also symbolize Christ. The peony could symbolize both Divine Mother and "vile delight" (*caduca voluptas*). The green color could be both the color of hope and the color of Satan. Only the context provided interpretative clues for a particular symbol in each case.

This ambivalence of certain symbols was realized by medieval thinkers. In the treatise *De bestiis* Hugh of Saint Victor claims that animal symbols can be interpreted both positively and negatively. The lion can symbolize both Christ (in the Book of Revelation 5, 5: "Ecce vicit leo de tribu Juda") or Satan (in the First Epistle of Peter 1, 8: "Diabolus tamquam leo rugiens circuit, quaerens quem devoret").[4]

In paintings and sculptures of the early and mature Middle Ages iconic signs, which represented symbols, usually formed a special class and were treated schematically thanks to which they were easily recognized as such. In the art of the late Middle Ages, especially in early Netherlandish paintings of the 15^{th} century, which was hungry for reality, this explicit symbolism was replaced by a symbolism which Erwin Panofsky called "concealed or disguised symbolism" (Panofsky 1953). Iconic signs which represented symbols, were treated extremely realistically, equally to images of all other objects. Very often scenes of Annunciation extremely realistically depicted a bowl and a towel: symbols of the moral chastity of Mary. In Jan van Eyck's *Arnolfini Portrait* the single candle burning in the chandelier symbolizes Christ. The contrast of Roman and Gothic buildings in religious paintings symbolized

[4]Cf. the following claim: "Leo propter aliquam similitudinem significat Christum et diabolum" (Thomas Aquinas, *Quaestiones Quodlibetales* VII, Article XIV, ad 4; quoted after Gombrich 1963.

the antithesis of Judaism and Christianism. All these symbolic meanings were, however, concealed for the uninitiated.

The concealed symbolism originated in the Trecento, culminated in the Netherlandish painting of the 15^{th} century, especially in the paintings of Jan van Eyck and Rogier van der Weyden, and disappeared from sacred art after the Council of Trent. However, a rich concealed symbolism was present in Flemish and Dutch still life of the 17^{th} century. In the centuries to come this symbolism started to decay. In the 19^{th} century the above mentioned still life was interpreted only realistically — as masterpieces depicting fragments of reality — bunches of flowers surrounded by butterflies, cups of golden liqueurs, plates with oysters, sliced pieces of lemon. It was only in the 1930s when the symbolic meaning of objects depicted in this still life was rediscovered. A bunch of flowers symbolized the passing of things. The bird or the butterfly — the soul. The apple was a symbol of the original sin, the bread — of Christ's body, wine — of Christ's blood that shed on the cross, the glass or the decanter — of the source of life. The caterpillar symbolized the worldly life of man, the chrysalis — death, the hatching of a butterfly — resurrection. The laurel symbolized fame, the evergreen ivy — immortality. The initiated in this symbolism learned the Christian teaching about the original sin, redemption and resurrection in the paintings which are only masterpieces depicting flowers, food and vessels for today's uninitiated audience.

The symbolic meaning of many iconic signs fades with time, and even falls into oblivion. The iconic sign which represents a certain symbol survives only as an iconic sign or becomes an ornament. The erudition and perspicacity of Emil Mâle, Erwin Panofsky and their followers to retrieve from oblivion many symbols of medieval Christian art. The rich Flemish and Dutch symbolism of still life of the 17^{th} century, as mentioned above, started to decay in the centuries which followed . It was rediscovered only in the 20^{th} century.[5] Only few realize today that the so called star of David — a sign used to disgrace Jews during the Hitler occupation, and now the state emblem of Israel — was at first a symbol of the universe, or the holy marriage of Heaven and Earth, to be more precise. The triangle whose apex was at the top symbolized

[5]"Since about 1935 countless works of art of the Flemish and Dutch őrealisticí schools have been interpreted in a new way, and the deep symbolic content underlying them has been brought to light. Writings of Panofsky, Millard Meiss, Charles de Tolnay, Meyer Schapiro, Wolfgang Stechow, Julius S. Held, J. G. van Gelder, H. van de Waal, and Hans Kaufmann have created a new concept of early Flemish and Dutch art" (Białostocki 1963: 778).

Heaven, while the triangle whose apex was at the bottom symbolized Earth. Also, when looking at a silhouette of a tree in a Kurpie cut-out, we do not usually realize that the silhouette originally represented the tree of life (*arbor vitae*), one of the symbols of the universe. The palmette (a small palm tree), was also a symbol of the tree of life at first but became only an ornament on numerous Renaissance and Classicist buildings.

Contrary to symbols whose meaning were established by custom or convention, there are vague symbols which have a whole gamut of meanings and enable various interpretations, symbols aimed at evoking a certain mood. Such symbols can be found especially in the symbolic poetry and fine art at the turn of the 19^{th} and 20^{th} centuries. Examples of such vague symbols are: the drunken boat in the poem by Arthur Rimbaud, the shot duck in Henrik Ibsen's drama *The Wild Duck*, the golden horn in Stanisław Wyspiański's *The Wedding*, fantasy characters in Arnold Böcklin's or Jacek Malczewski's paintings, the golden dragonfly in Józef Mehoffer's *Strange garden*. Sometimes such symbols are even more vague, less noticeable. Examples of such vague symbols in the mentioned symbolic poetry are: the twilight, the dusk, the fog, the road, the journey.[6]

The need to create and use symbols is deeply rooted in human mind psyche. Unusually many things, processes, matters, both in nature and in the human world are felt symbolically. We sometimes feel that the contrasts: high — small, big — small, wide — tight, closed — open, light — dark, etc. are symbolic. We feel rising and falling in space as a symbol of moral rising or falling, or climbing or falling down the social ladder. The dying of nature in autumn is felt as a symbol of passing away, the waking of nature in spring — as a symbol of revival and resurrection.

Egypt, Mesopotamia, India, China, antiquity, Christianity developed a multitude of symbols which, by savoring magical practices, religious rites, ceremonials, dance, theater, the fine arts, poetry, immensely enriched all these areas.

To conclude, I attempted to differentiate between signs and symbols — two significant areas of human creation which direct the thought of a recipient to objects different than themselves. If there were to be one term to encompass "sign" and "symbol," I would propose the word "sem." Semiotics, then, would be a study of sems, that is signs and symbols, it would deal with

[6]My distinction of established and vague symbols more or less corresponds to Stanisław Ossowski's distinction of signs, semantic equivalents and symbols that suggest certain moods (or, in other words, of symbols of clear interpretation and symbols aimed at vague interpretation) (Ossowski 1966: 178-180).

the "sem-sphere," which would divide into the sphere of signs — "sign-sphere" — and the sphere of symbols — "symbol-sphere."[7]

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[7]The present article is a slightly improved version of the paper entitled *Remarks on symbols* which was delivered during the sitting of the Polish Semiotic Society, on 21 March 1975, in Warsaw.

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Alicja Helman

ON THE INTERPLAY OF SOUND SUBCODES IN FILM

Originally published as "O podstawach wzajemnego oddziaływania subkodów dźwiękowych w dziele filmowym," Studia Semiotyczne 7 (1977), 101–113. Translated by Rafał Jantarski.

Intentionally or not , film semiotics is drawing from ideas already circulating in semiotic studies focusing on morphology or cinematic ontology. Some semiotic discussions accommodate these familiar themes to contribute new arguments or demonstrate what have so far been only intuited by the theory, still others fail to deliver valuable insights.

The latter happens when semiotic theory targets the problem of sound in film. The issue has never been in the primary focus of semiotic studies, coming to the spotlight only when it's impossible to ignore film as an audiovisual experience. For example, in *Clés and codes du cinema*, Iveline Baticle (Baticle 1973) goes on to distinguish a dozen image codes, but never does this with regard to sound codes. Semiotics is thus emulating film theory which prioritizes image over sound or leaves the latter entirely to other disciplines. Indeed, it was not film theorists but musicologists and composers who developed the theory of the film score.[1] Similarly, the verbal component in film was apparently left for the consideration of other fields: with film theory barely touching on the issue, recent studies on this subject are coming from linguists and philologists.[2]

[1]The first study to explore this field was *Music for the Films* (Sabaneev 1978). For a standard work of reference, see Adorno and Eisler 2005. The most comprehensive theoretical account of film score was offered in Lissa 1964.

[2]This particular topic is explored in various Master's thesis' completed at the University of Warsaw, University of Silesia and Adam Mickiewicz University.

Film theory works under the assumption that cinema is primarily a visual art, with sound only duplicating either visual aesthetics or the inherent message and at best playing second fiddle to image. Believing that the cinematic message is built of iconic codes, semioticians very much share this assumption. Sound codes, although not exactly meaningless, are said to operate under some other frameworks that lend the key to their interpretation. Umberto Eco suggests that "sound and verbal messages, although deeply influencing denotation and connotation of iconic facts (and *vice versa*), have their own independent codes, analyzable under different frameworks" (Eco 1968).

And this is the standard practice followed in semiotic studies. When writing about a film score one discusses leitmotifs, minor or major keys, the Neoromantic style, and so forth, but this doesn't say anything of how the musical score functions within the structure of the film. All it does is name the code in question. Eco makes a similar remark when discussing film dialogue: "when a character speaks English, then what is said is (. . .) driven by a code called 'English"' (Eco 1968). In other words, should we wish to explore the topic further our only option is to study the code identified as "English." This, however, leaves us empty-handed.

As we can see, semiotics revived the idea of film as a layer-structured phenomenon. Note that "layers" in this particular context do not refer to the Ingardenian sense of the word, denoting rather its ordinary meaning to stress that film consists of various substances, such as image, music, word, and noise.[3] In a nutshell, the framework developed by film theorists and adopted by semioticians goes as follows: image is identified with the notion of "film," which is equivalent to "message." It is accompanied by the three remaining layers, each having an independent source: music accompanies the image as another artistic genre, noise is generated by the physical reality (irrespective of its frequent artificiality), whereas the word is regarded as the stuff of ordinary language, or a remainder of literary "prefabricate," the script.

Layers are vertically interconnected in a number of ways (many theories explore this area, but all ultimately rest on the same principle (Eisenstein 1991; Lissa 1964). This, however, cannot disguise the fact that a movie is perceived as a work of art consisting of separate bands, each differing in substance, aesthetics and communication.

In its beginnings, film theory was both preoccupied and shaped by

[3]First proposed and developed by Boleslaw Lewicki (Lewicki 1964), this division is widely adopted in the literature.

the technological side of cinematic creation, perceived as a series of steps in a technological process. First came shooting, followed by recording of dialogues, music, and noise, with the production culminating in the merging of all components into a single work of art. With the invention of the synchronic camera, the process of cinematic production changed entirely as it enabled registering of all layers simultaneously. This revolution, clearly, must have had little impact on theory, if semioticians still prefer to explore film as a layered structure (Spottiswoode 1965; May 1947; Martin 1977; Lewicki 1959; Płażewski 1961).

Film is often conceived as a reflection of reality (again, in purely mechanistic-naturalistic terms,[4] without philosophical connotations). On this account, film is an audio-visual copy of physical reality, a reproduction, a cast, an imprint on photosensitive film, true-to-life recording of visuals and soundscapes of the surrounding world, something what Kracauer labelled "camera reality" (Kracauer 1960).

This idea directly inspired Barthes' perception of film as *analogon* (Barthes 1964; Delahaye and Rivette 1986; Pilard and Tardy 1964). The co-presence of image and sound is ruled by the analogy to life, itself a mixture of images and sounds. In film, the constant flow of imagery is accompanied by sound effects -this mixture doesn't have to be justified since sound naturally blends in with the environment.

Various film-theoretical concepts are often inspired by the fact that film is a product of various materials, inviting interpretations along the lines of the Wagnerian notion of *Gesamtkunstwerk* (Müller and Liebeneiner 1952). In semiotic theory a similar approach was proposed by Christian Metz who suggested viewing film as a multi-code phenomenon (Metz 1974, his claim is shared by other semioticians, however different their vocabulary may be). Metz is never explicitly naming these codes, let alone outlining rules governing their interactions or implications that follow. Much like other authors, he describes these codes as parallel structures, each governed by its own set of rules, determined, one may imagine, by the material itself.

For all its imprecision and arbitrary application, semiotic theory nevertheless manages to offer a fresh perspective on sound codes in cinema, helping understand their mutual interactions and suggesting their relationship with film as a whole.

It would be absurd to claim that irrespective of the film being spoken in English it does not contain the code called "English," or that the minor

[4]This approach was first proposed by André Bazin in *The Ontology of the Photographic Image* (Bazin 1960). See also Cavell 1971.

or major key does not play a role in the cinematic message despite hearing Rachmaninov's Concerto No. 2 in David Lean's *Brief Encounter* or Chucijev's and Mironer's *Spring On Zarechnaya Street*. Nevertheless, I will argue that it is an entirely misplaced effort to analyze verbal utterances exclusively as a code of the given language, or treat a sonata or a symphony strictly as a musical piece. In my view, the cinematic message employs incomplete, isolated and deformed sound codes incorporating them into the system of cinematic interactions, ultimately infusing them with meanings that would be hardly imaginable on their own ground. Certain communicative and expressive qualities of those sound bits emerge only in effect of interplay within the cinematic structure. Detached, they are immediately drained of these qualities, although their own structure and substance remain intact. An English expression may have a fixed meaning outside the cinematic environment, but it may as well resonate differently when incorporated into the film. If we cannot understand what the characters are talking about although we speak the language and what is said is perfectly logical, or, conversely, if the message is sufficiently conveyed by a gesture or intonation, or both — this means that the message is governed by something else than just the linguistic code itself. What would that be?

By itself, French *chanson* cannot tell us that someone is thinking of a departed women. Similarly, a musical theme won't reveal the murderer or illuminate future events. Nevertheless, if the film score conveys an explicit or unambiguous message, has a fixed meaning and signifies something else than itself, it would mean that these powers are neither contingent on its inherent qualities nor governed by any musical code. What kind of code would it be?

Once we dismiss the multi-code notion of film, taken to mean parallel structures or complicated interplay of various independent codes, we may finally advance a wholly different idea, one that would emphasize a synthesis of codes, merged into a single complex code that picks only selected features of the original codes, thus transforming them, forging new relationships and shaping new qualities within the cinematic environment.

This approach isn't entirely new, it did not originate in semiotics either. I was exploring it in my earlier papers where I proposed to treat film as an integral audio visual unity, with the process of integration transforming and altering the aesthetics of the involved components (Helman 1964). Semiotic perspective paves the way for the argument that the process itself is powerful enough to reorganize meanings. Its final product forms a coherent message composed of elements incapable of communicating on their own.

In *Funkcja znakowa muzyki i słowa w filmie* [*Signification of Music*

and Word in Film] (Helman 1977), my analysis focused primarily on music, attempting to map out fundamental and far-reaching transformations of musical codes once they're incorporated into the cinematic structure. They retain, or rather may retain, their material quasi-identity, but in this new setup they cannot reach the receiver as musical expression *per se*. They become infused with new meanings, or become their component parts or carriers, sometimes assuming roles one would hardly associate with musical works. Finally, in film, music, much like any other sound, is delivered by electrical means. Transmission is to a considerable degree only a channel, but in modern or experimental cinema, where sound directors enjoy broad autonomy, transformations within the channel are becoming messages themselves, bearing the mark of those in charge of the recording process.

My analysis of musical substance produced some preliminary generalisations, which I would now like to verify by taking a closer look at the transformations of verbal expressions in film. Although more difficult to transform from a technical, aesthetical, and semiotic perspective, verbal expressions seem to be both a promising and recalcitrant material for verification of theoretical speculation or conclusions drawn from analyses of such peculiar matter as music.

It is not without consequence that verbal expression is not exclusive or even the most important vehicle of meaning. In film, verbal expression — governed by its specific code when considered in isolation — is always intertwined with other expressions, controlled by their respective sub-codes and ultimately by the master code of the film as a whole. Thus, a verbal expression can be defined as a component (or a co-agent, given its proactive behaviour) of a larger structure conveying a more general message and producing a far greater variety of meanings. More importantly, however, it is not the entire verbal expression that usually participates in the message-building process. Often, the structure engages only its specific elements, for example its tonal or behavioral aspect, understood along the lines of Ingarden's suggestion that spoken word in film is always a "sound behaviour," a sound of purely human origin (Ingarden 1958). The context, however, may put a spin on its original meaning, leaving it radically transformed away from its literal reading. My claim is that precisely this happens in the cinematic experience — the verbal expression conveys different information than itself. The viewer never gets the primary message, or departs from it.

In film, this invalidation or transformation of the original sense of words can be achieved in a number of ways, ultimately boiling down to two communicative scenarios.

Under the first scenario, specific components of the expression are physically eliminated or distorted, for example through muting or electroacoustic interference. The nature and goal of this operation is perceptible and usually quite clear.

The second scenario is much more complicated. Here, the sound track leaves the words intact, technical imperfections of the recording process aside. Still, the message is conveyed only via chosen components of the utterance, with the remaining part present but negligible. There are films that may be watched without the viewer speaking the language of the movie. Not that words are superfluous or unimportant, but because they communicate the most general senses where understanding of specific words and sentences is not a pre-requisite. One is satisfied by identifying standard situations such as "yells like a typical Italian," "lovers' tiff," "talking nonsense," etc.

The second scenario is possible precisely because informative content of the artistic message is redundant by default; it is also, so to say, redundant aesthetically. However, one would be inclined to call the encounter with the work of art — a reception, understanding, experiencing, — it is meant to be viewed as a whole, but not necessarily in all its details (I am well aware that this calls for some justification on the grounds of the psychology of reception, something I cannot demonstrate here, but some observations and experiments, most notably by such Gestalt psychologists as Rudolf Arnheim, seem to be supporting this claim). Familiar with this mechanism, the creator may design his work to be accessible through various levels of perception. For example, *Hiroshima, mon amour* features a subtle and complex musical code that can reach only a handful of viewers which does not mean that others are engaging with a mutilated and incomplete version of the work. The musical code is designed as a surplus value, an ornament of sorts, while the director is primarily focusing on reaching the viewer with the core message of the movie. For example, the attention is drawn to the interplay between hues (relations between objects may at that point be of lesser importance) or the tone of a dialogue (its sense allowed to fade away). But I shall not be developing here claims with little to support them. For my purposes it is enough to assume that the meaning of words often falls outside the essence of the cinematic message. Communicative and aesthetical qualities of other artistic measures are actively shaping the cinematic message — particularly when concentrated around verbal expression, creating an environment where words are exposed to various process in literature or daily life — after all it is often depicted in film - would be achievable only with the utmost difficulty, or even impossible.

In both those scenarios verbal expression interacts with anthropological sub-codes that follow the rules established by proxemics and kinesics, with paralinguistic phenomena also playing a vital role in the process. Additionally, it seems that it is a common practice to limit semantic independence of the text to the single sentence, which means that there is no place for larger semantic units carrying communicative value of its own.

Let's now exemplify the basic and most interesting variants of both models outlined above.

As mentioned above, the first scenario unfolds following the destruction of certain components within the verbal expression. But it does not mean that the most basic variant of such situation, muting of the dialogue, causes the verbal expression to evaporate entirely.

In *Dziura w ziemi* [*A Hole in the Ground*], the director, Andrzej Kondratiuk, shows a scene where people talk, or, should we say, engage in an intense shouting match. But although the camera is shooting a typically verbal behaviour, we are cut off from the sound. A geologist on a fieldwork assignment is visited by his girlfriend who brings him his sheepskin coat. A violent quarrel ensues, followed by the abrupt departure of the girl. The scene is silent, but rapid gestures and faces tell it all. One may wonder why Kondratiuk muted the scene, never providing justification for this lack of sound. Maybe this is just because the film is formally sophisticated, kooky, as some would say. But presented in this manner, the scene underscores banality of this mundane scene, stripping it of individual character and focusing on what all similar situations have in common. With satirical purpose in mind, Kondratiuk seeks to demonstrate not one unique event in life of a particular individual, but a paradigmatic situation where life and work clash. Also, he introduced the trick well into a film when the viewer is knowledgeable enough to imagine reactions of the protagonist. Kondratiuk was not obliged to narrate the event in full and left it roughly sketched.

In *The Structure of Crystals*, Krzysztof Zanussi visualises the metaphor: friends no longer speak the same language. The conversation between the two friends, Marek and Jan, is initially shot in a realistic convention, with the narrative retaining visual and acoustic qualities of the scene. But when Marek goes into details of the recent developments in physics, Jan, along with the average viewer, loses the thread; and the other way round, Marek cannot follow musical and philosophical discourse of Jan. To stress that what characters say is hermetic to the point of confusion, felt not only by the viewer but also by the characters themselves, Zanussi mutes the dialogue and fills the background with music.

Destruction of dialogue may be achieved not only through simple elimination of the spoken word. One can also arrive at this effect by emphasizing sound through electroacoustic manipulation of the word and eclipsing its semantic side. Above, I discussed a situation where verbal expression is conveyed via the behaviour of the speaker. Now, I would like to explore examples where the message consists of both behaviour and sound.

In film, such circumstances are usually set up by the introduction of some obscure language invented for the purposes of the movie. Strictly speaking, since it carries no communicative value, it is language by name only. Such a technique was employed by Chaplin in his parodies of official speeches in *City Lights*, in a song in *Modern Times*, or in a caricature of a fascist leader in *The Great Dictator*. In this way, the viewer is reached not with a particular speech or a particular song, but a model speech or song that seeks to expose their general features. This mode of communication was heretofore foreign to the cinema, traditionally considered unfit to transcend individual events. This situation is peculiar in that it never portrays either a presentation of the individual fact or a generalized conceptualization. It is always a mixture of both. Certain psychological observations appear to confirm that, although further inquiry into that matter would require a separate study.

Returning to the subject of pseudo-meaningful language, it seems that its most radical example is delivered in Claude Faraldo's *Themroc*. The director uses this method to show the corruption of the modern world, confronting it with humans longing for a more simple existence. His characters put this idea into life by exchanging apartments for caves, cannibalism, and collective life, with roaring replacing speech as the preferred mode of communication and self-expression. The film builds on the premise that, before turning into a cavemen, the protagonist did not use language either. This is because his social role was that of a cog in a machine, not really requiring him to engage in human communication. Other characters do sometimes speak, but their language is always artificial, reaching the viewer only as a meaningless sound. Faraldo's message is that speech no longer serves communication, eroding, as it is, into a formalised ritual. We do not know exactly what the characters say, but we can easily guess what they can, or rather must, say.

In *The Brig*, directed by the Mekas brothers, natural language undergoes similar mutation. The film is an adapted version of a play by Kenneth H. Brown produced by the Living Theater Group. Characters speak English throughout the whole performance, but, although specific phrases are left

intact, verbal communication is arranged in such way as to effectively eclipse and wipe out its sense. Viewers soon realise that under circumstances set by the movie, semantics plays no role in communication. *The Brig* takes place on a ship turned into a military prison. Any verbal exchange between the guards and prisoners follows a strict ritual, each situation is governed by a set of expressions, and situations and expressions never change. The prisoners are required to speak loud and clear, a rule enforced with absurd rigor. Any verbal exchange turns into a formalized screaming match, a nerve- and ear-wracking experience considering the unbearable noise and apparent absurdity of this quasi-communication. The ritual is self-fulfilling: each party exactly knows when and what needs to be said (the viewer, too, masters the code after the while), which is why there is no real need to hear and understand the others (the viewer is put in the exact same position), the initial gesture is enough to know how the situation will unfold. We quickly learn that rather than convey meaning, shouting functions as a part of a wholly different message — a prison ritual transformed into a mechanical dance. Linguistic code is dissected and incorporated into the cinematic code before the eyes of the viewer, exposing the mechanism governing transformation of functions and meanings. We are invited to observe not only the result but also the process itself.

Let's now consider the second model of communication. It will serve to demonstrate that electroacoustic manipulation is able to transform functions and meanings in a way which does not eliminate sounds or obscure the message.

In *Kod elektrycznego przekazu dźwięku w filmie* [*The Code of Electrical Sound Transfer in Film*], Wojciech Chyła explores various ways of how electroacoustic interference can contribute to the cinematic experience. He goes on to argue that a powerful impact can be achieved through distortion of the human voice. It may effectuate through a simple manipulation, or a more advanced interference, such as linear phase correction, specially designed microphone effects or non-linear transformations (Chyła 1977). Chyła provides examples where the very sound of the distorted word is used to achieve effects that transcend the meaning associated with the word itself. For example, in *Alphaville*, Jean-Luc Godard "lends symbolic sense to the fact that the word is subject to electroacoustic manipulation." The director, claims Chyła, seeks to stress the inhuman nature of the dictatorship run by alpha-60, a computer which took over the inert community of Alphaville. Chyła also cites a resonant experiment of Carmelo Bene, who filmed Wilde's *Salome* using special acoustic techniques to twist the meaning of the text

and produce a message far different than one resulting from conventional forms of dialogue delivery.

The meaning or function of verbal expression can also be transformed by other means. For example, the gravity of context opens possibilities for words to develop new meanings, offering in this respect far greater opportunities than would normally happen in the circumstances of daily life.

When appearing in the movie for the first time, the meaning of the phrase is naturally limited to one carried in words or sentences. But from that moment on it becomes embedded in the context, which is recalled when the phrase reappears and evokes its potential ambiguity. Thanks to this, it can be used in more complex and diverse ways than its initial meaning would suggest. Let's examine Bo Widerberg's *Ådalen 31*. A young protagonist by the name of Kjell befriends the daughter of the factory owner, Anke, and develops a habit of spending evenings with her family. In one of the seemingly redundant scenes the characters browse through an album of French painting, prompting Anke's mother to enthuse over the French accent displayed by Kjell. When Kjell meticulously pronounces "Pierre August Renoir," it simply signifies the name of the painter.

Well into the film, Kjell lets out an impassionate "Pierre August Renoir" when the father of the girl reveals that her mother talked Anke into an abortion. Siding with the young man rather than with his own wife, the father offers him words of sympathy, to which indignant Kjell responds by repeating the phrase. At this point the name of the painter has nothing to do with what the boy wants to communicate. What he does is mock high-brow aspirations of the bourgeoisie and its pretence to spiritual superiority. Kjell's cry vents hatred and contempt for what he clearly perceives as a crime. Of course, this may not be Kjell's exact words, but, by and large, this is how we emotionally resonate upon hearing the name of the painter cried out with such heartfelt passion. This would not be possible without the earlier album scene, where the name of the painter signifies nothing but itself. The new context decouples the phrase from its primary meaning, producing new senses, although triggered by the recollection of its original setting. In my opinion, this happens also with regard to film music and may also be responsible for attaching symbolic meaning to imagery. The creator must first show an item as an object, only then can it be utilised as a symbol, or, more generally, signify something. This refers only to symbols and meanings that are generated by the cinematic code exclusively for the purposes of the specific work. If one deals with "stereotypical connotations," as Eco terms them, well settled in culture and easily recognisable, the author is free to

use such objects, verbal phrases or musical themes directly, without the intermediate scene preparing ground for specific meaning.

Another kind of interference with verbal expressions can be found in the works of Miklós Jancsó, for example in *Silence and Cry*. Stopping short of erasing or deforming the word, Jancsó seeks to minimalise or even nullify its communicative function. We cannot, however, accuse the characters of using impenetrable jargon, wordplays or allusions. The verbal message is unclear and imprecise, but not because of the ill-chosen words, bizarre sentences or obscure phrases. Its meaning is elusive because it is designed for communication between the characters, not with the audience. In traditional cinematography, the viewer is typically ahead of the characters in terms of the developments on the screen. In modern cinema, however, the viewer may as well know as little as the protagonist. Jancsó's audience knows this much or nothing of the environment in which characters live and act, with personal dynamics on the screen shrouded in mystery.

Thus, we may be capable of grasping literal meaning of the dialogue, but, put bluntly, we do not get it. The reason for this is that Jancsó's experiments with spoken word are part of a broader strategy: formally, the movie fits in realistic convention and depicts events similar to the daily experience of the viewer. At the same time, Jancsó seeks to minimalize the importance of verbal components of the experience, instead emphasizing the code which usually escapes our attention, this being an anthropological code of distance — a key theme of the movie that ultimately serves to unlock the message that Jancsó wishes to convey. What is significant can be read from distances and how they are transgressed: there are distances between the oppressors and the victims, as well as distances existing within each particular group. I present here only brief summary of this phenomenon, with detailed analysis provided elsewhere (Helman 1974).

While exploring the rules governing sound sub-codes within the cinematic structure I have used rather extreme or model examples that film has to offer. This may invite criticism that my findings do not apply to more traditional cinema. It goes without saying that there are films, or rather whole genres, in which words are modelled on language used in daily life, on stage, or in literary dialogue. However, modern sound in films was born much later than the technical ability of providing the film with sound, and that particular element of cinema still remains in the early stages of development. For decades, film has been emulating other arts in the way of using sound and it is only now that it has started forging its unique approach to the problem. Nevertheless, some basic rules also guide these

hybrid creations of the interim period, which means that verbal expression is never independent in terms of aesthetics or communication, but rather electro-acoustically modified and transformed to proactively shape the final product of cinematic creation. This applies to and enables all examples discussed in this paper, as well as others not addressed in this article. The extent to which the emerging possibilities will materialize in the cinematic environment is left for the consideration of the director and the concept he chooses to pursue.

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THE NOTION OF INFORMATION AND TEXT ANALYSIS

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1. INTRODUCTION

In semiotic works one often employs the notion of information. Authors use it mainly in descriptions of the communicational role of language signs. Many works are devoted to the problems of transfer, recording, processing and searching for information. A separate issue is in obtaining information on the cognitive process and the necessity to use the term "information" in works on cognitive tolls, which include prepositions, theories or definitions. Connected therewith is research concerning the inference methods and in particular non-deductive inference methods.

The information theory, through the attainments of recent years, is not sufficiently spread in the circles of semioticians, and therefore the notion of information is usually employed in accordance with the intuitive feeling of a given author. In the situation, where on one hand there exists a clear need to use the notion of information in semiotic works, and on the other hand, where the theory of information disposes of an explication of the notion of information, it seems interesting to try the usefulness of the information theory for the purposes of language research.

The term "information" similarly to "probability" belongs presently to well-defined expressions of the scientific dictionary and is convenient to use in those cases when we are dealing with events. I will not discuss the notion of an "event," I assume that the sense thereof is known. Generally, we call an event results of experiments or observations. These results are recorded in a certain language. E.g. a connection obtained as a result of the dialling of a

certain number on the telephone is an event, whose record is the telephone number indicated in the phone book. The fact that Johnny is going to school is an event, which is recorded as "Johnny is going to school."

I limit my discussions only to an analysis of records, and more strictly speaking to an analysis of written texts in the Polish language. The notions of language and text which I will be using, are defined in more detail in part 4.

In this paper I use the notion of information characterised by J. Kampé de Fériet in the publication *La Théorie Généralisée del Information et la Mesure Subjective de l'Information* (1974) and moreover I use the axiomatics provided by J. Losfeld in *Information Généralisée et Relation d'Ordre* (1974). Kampé de Fériet's article is accompanied by a rich bibliography, which lists almost all the most important works on information theory published in the years 1967-1974. The books used by me for discussion of the topic, have been listed in the footnotes and in the bibliography.

2. THE NOTION OF INFORMATION

Most generally, we define information as a function defined on a class of subsets of a non-empty set Ω, whose main property is monotony for inclusion. This means that: if with an S we mark the class of subsets Ω, with $\leqslant$ we mark the relation of partial order (reflexive, transitive, asymmetrical) on set S, and with R^+ we mark the set of positive real numbers, and with function I, the function of information, then we will obtain the following notation:

1.1. $I\colon S \rightarrow R^+$
1.2. For each $A, B \in S$
$A \subseteq B \Rightarrow \mathrm{I}(A) \geqslant \mathrm{I}(B)$

The above definition of information does not impose any conditions upon sets Ω and S, apart from the fact that class S is a set partially ordered by the relation of inclusion. For example, we interpret set S as a set of sentences ordered by the relation of logical resulting, then according to 1.2., if from sentence p there follows logically sentence q, then information of sentence p is greater than the information of sentence q. Which we may write down as follows:

1.3. $p \rightarrow q \Rightarrow \mathrm{I}(p) \geqslant \mathrm{I}(q)$

If for the relation of order in S there exists the smallest element m and the biggest element M, then we assume that:

1.4. $\mathrm{I}(m) = +\infty$
1.5. $\mathrm{I}(M) = 0$

If empty set $\emptyset$ and set Ω belong to S, then the smallest element of set S is the empty set, since it is contained in any set, and the largest element of set S is the full set Ω. According to 1.4. and 1.5., information of the empty set is equal to $+\infty$, and the information of the full set Ω is equal to 0.

1.6. $\mathrm{I}(\emptyset) = +\infty$
1.7. $\mathrm{I}(\Omega) = 0$

The above establishments agree with our intuition connected with the notion of information. If, for example, John and Mary informed us that they would come to us tonight for dinner, then the repeated message that they give to us does not provide any new information. On the other hand, a message that Mary and John will bring their pet crocodile to the dinner might be surprising for us. The measure of information is therefore in this case the degree of our surprise, astonishment.

When formulated differently, the same thought is expressed in the following manner: we obtain information always and only as an answer to a question, in other words, information is a function of a question. If in the answer we obtained only what we already knew, then the answer does not provide any information, it is not simply an answer to the question asked. An answer brings more information the more it liquidates the degree of our ignorance.

Going back to the example with a set of sentences, an always false sentence $p \wedge \sim p$ is the smallest element of the set of sentences S, since from this sentence every other sentence results. An always false sentence is indefinitely informative:

1.8. $\mathrm{I}(p \wedge \sim p) = +\infty$

An always true sentence $(p \cup \sim p)$ has, by such interpretation, zero information. If we mark an always true sentence with t, then the above statement shall be noted in the following manner:

1.9. $\mathrm{I}(t) = 0$

Set S, partially ordered by the relation of order, having the smallest and the largest element and closed to the set theory operation of union and multiplication, shall be called a check. In case of such an algebraic system, for each A, $B \in S$, $A \cap B$is an element of S and $A \cup B$ is an element of S. If set S, on which we determine the function of information, is a check, then we may introduce the notion of independence of set, with the use of the notion of information in the following manner:

1.10. A independent of $B \Leftrightarrow \mathrm{I}(A \cap B) = \mathrm{I}(A) + \mathrm{I}(B)$.

Two sets, A and B, A, $B \in S$, are independent if and only if the information of their product is equal to the information contained in each of those sets. For example, if set S of sentences is closed due to conjunction $\wedge$ and alternative $\vee$, then sentence p is independent of sentence q if and only if the information contained in the conjunction of these two sentences is equal to the sum of information in these two sentences:

1.11. p is independent of $q \Leftrightarrow \mathrm{I}(p \wedge q) = \mathrm{I}(p) + \mathrm{I}(q)$.

Formula 1.11. reflects our intuitions well: information of the sentence "Johnny is ill and primroses have blossomed today" is equal to the information of the sentence "Johnny is ill" plus the information of the sentence "Primroses have blossomed today." The sentences "Johnny is ill" and "Primroses have blossomed today" are independent of each other.

If set S has the structure of a check, then on this set we define conditional information provided by element A of subset S by knowledge of element B of subset S. For each A, $B \in S$

1.12. $\mathrm{I}(A/B) = \mathrm{I}(A \cap B) - \mathrm{I}(B)$ if $\mathrm{I}(B) < +\infty$
1.13. $\mathrm{I}(A/B) = \mathrm{I}(A)$ if $\mathrm{I}(B) = +\infty$

For example, information in the sentence "Johnny has a flu, provided that Johnny is ill," if the sentence "Johnny is ill" is not always false, it is equal to the information of "Johnny has a flu and Johnny is ill" minus the information in the sentence "Johnny is ill."

Using the notion of conditional information, we define independence of two sets in the following manner:

1.14. A is independent of $B \Leftrightarrow \mathrm{I}(A/B) = \mathrm{I}(A)$.

If for example the information in the sentence "Johnny is ill provided that primroses have blossomed today" is equal to the information in the sentence "Johnny is ill," then the sentences "Johnny is ill" and "Primroses have blossomed today" are independent.

We supplement the description of the function of information provided in points 1.1., 1.2., 1.3., 1.4., 1.5., 1.6., 1.7., 1.12. and 1.13. by the axiom specifying the information contained in the sum of both sets:

For $A, B \in S$, $A \cap B = \emptyset$
1.15. $\mathrm{I}(A \cup B) = F(\mathrm{I}(A), \mathrm{I}(B))$

where F is a real positive function defined on $R^+ \times R^+$, and therefore F: $R^+ \times R^+ \rightarrow R^+$.

Axiom 1.15. plays a particularly material role by determination of the measure of information. Depending on the choice of function F we obtained varying measures of information. Detailed discussions concerning the properties of function F are presented in the articles of J. Kampé de Fériet, C. Bertoluzza and M. Schneider (1974), C. Langrand (1974) and others. Therefore, I refer all of the readers more interested in this problem to their articles. In this paper I assume that for $A, B \in S$ such that $A \cap B = \emptyset$:

1.16. $F(\mathrm{I}(A), \mathrm{I}(B)) = - c \log [e^{- \frac{I(A)}{c}} + e^{- \frac{I(B)}{c}}]$,

where c is a positive constant, which makes it possible to select the unit of information. From 1.15. and 1.16. we get:

1.17. $\mathrm{I}(A \cup B) = - c \log [e^{- \frac{I(A)}{c}} + e^{- \frac{I(B)}{c}}]$.

3. MEASURE OF INFORMATION

The secret of success enjoyed by the notion of information lies not only in its generality, thanks to which it may be used by a description of various kinds of events, but above all in fact, that it has been included in the category of measureable values.

The first step in the development of the contemporary theory of information was the quantitative definition of information by means of the measurement of probability. A combination of the notion of information with

the notion of probability, and therefore application for the description of information of the notional apparatus of the probability theory, has resulted in the use of the notion of information, when the notion of probability may be used (Shannon, Weaver 1949).

One may also measure information without the measure of probability. I adopt this point of view in this paper.

We shall obtain a unit of information by the introduction of the normalization of function *I*. Let $\Omega = \{A, B\}$, $A \cap B = \emptyset$. If $\mathrm{I}(A) = \mathrm{I}(B)$, then in accordance with 1.17. and 1.7.:

2.1. — $c \log 2e^{-\frac{I(A)}{c}} = 0$

and therefore

2.2. — $c \log 2 + \mathrm{I}(A) = 0$ 0

and therefore 0

2.3. $\mathrm{I}(A) = c \log 2$ 0

If we therefore assume that $c = \frac{1}{\log 2}$, then:

2.4. $\mathrm{I}(A) = 10$

The unit of information defined in this manner shall be called a bit. In other words, the information of event A is equal to 1 bit, if and only if set Ω is a two-element set, $\Omega = \{A, B\}$, and when $\mathrm{I}(A) = \mathrm{I}(B)$. Generally, when set $\Omega = \{A_1, A_2, ..., A_n\}$ and $\mathrm{I}(A_1) = \mathrm{I}(A_2) = ... = \mathrm{I}(A_n)$, then:

2.5. $J(A_i) = \log_2 n \quad i = 1, 2, ..., n$

For example, when set Ω contains only two elements 0 and 1 such that $0 \cap 1 = \emptyset$ then set $S = \{0 \cap 1, 1, 0, 0 \cup 1\}$ is a check. If we assume that $\mathrm{I}(0) = \mathrm{I}(1)$, then

$\mathrm{I}(0 \cap 1) = +\infty$
$\mathrm{I}(0 \cup 1) = 0$
$\mathrm{I}(1) = 1$
$\mathrm{I}(0) = 1$

Another kind of example is a set of contradictory sentences $\{p, \sim p\}$. Set $S = \{p \cap \sim p, p, \sim p, p \cup \sim p\}$ is a check. If we assume that $\mathrm{I}(p) = \mathrm{I}(\sim p)$,

then:

$\mathrm{I}(p \cap {\sim}p) = +\infty$
$\mathrm{I}(p) = 1$
$\mathrm{I}({\sim}p) = 1$
$\mathrm{I}(p \cup {\sim}p) = 0$

For example, a measuring device, which reacts only to the colour red, provides one-bit information.

Let us consider the situation, when we have n sentences, each of which may by either false — F or true — V. In other words, we assume that the set of valuations is two-element and that the set of sentences is analysed from the point of view of their value. Then the information of each n obtained from set $\{V, F\}$ is equal to $n \log_2 2 = n$ (Giedymin 1964). In the first multi-value system proposed by Łukasiewicz, the set of valuations is as follows: $\{0, \frac{1}{2}, 1\}$. If we assume that $\mathrm{I}(0) = \mathrm{I}(\frac{1}{2}) = \mathrm{I}(1) = \mathrm{I}(A)$ then $\mathrm{I}(A) = \log_2 3$. If we consider the set of valuations of n sentences, then the information of an n ordered from the three-element set $\{1, \frac{1}{2}, 1\}$ is equal to $\log_2 3^n = n \log_2 3$.

In many mathematical machines, a memory cell is composed of 24 elements, each of which can have the value of 0 or 1. Set Ω is composed of 2^{24} elements. Information of the entire machine "word" is equal to 24 bits.

In order to write down in the telegraphic code a letter of the Latin alphabet, which has 32 characters, it is sufficient to dispose of five elements of the memory cell, since $\log_2 32 = 5$ bites.

One more example:

In written texts the yes/no question is a one-bit question, In other words, the answer to a yes/no question can provide one bit of information. For example, one answer to the question "Did John go to school" with either yes or no.

A yes/no question may be understood in a specific context as referring not to the entire expression, but to particular elements thereof. Then, the information of a yes/no question depends on the number of those elements, For example the question "Did John go to school" may be understood in the following manner (Marciszewski 1974: 133; Koj 1972: 23):

"Did John go to school?" (John? not John?)
"Did John go to school?" (did he go? did he not?)
"Did John go to school?" (to school? not to school?)

The set of elementary events Ω is composed of 8 elements in this case. By the assumption that each answer is equally informative, the answer to

the yes/no question provides, in this understanding, 3 bits of information.

Let us return once again to the example with the letters of alphabet. Let us assume that the alphabet of the Polish language has 32 letters and that each of those letter is equally informative. Then $\Omega = \{a, b, ..., x, y, z\}$, $\mathrm{I}(a) = \mathrm{I}(b) = ... = \mathrm{I}(z) = \log_2 32 = 5$ bits.

If we are estimating the information of two letters of the alphabet, then the set of elementary events is a set of ordered pairs of $\Omega \times \Omega$ and contains 32^2 elements. Information of each of the ordered pairs, by assumption of informational equality, is equal to $\log_2 32^2 = 2 \log_2 32 = 2 \cdot 5 = 10$. Respectively, sequences of three, four and five ordered letters of the alphabet may provide information: $3 \log_2 32$, $4 \log_2 32$, ..., $n \log_2 32$.

At this point it is worth noticing that by the same length of a sequence of signs, information contained in such a sequence depends on the set, to which the signs in this sequence belong. For example a sequence of four ordered letters of alphabet $\{0, 1\}$ can at most provide four-bit information ($4 \log_2 2 = 4$), whereas a sequence of four ordered signs being Chinese ideograms, by the assumption that there are 32,768 such ideograms, provides 60 bits of information ($4 \log_2 32{,}768 = 4 \cdot 15 = 60$).

On the basis of formula 1.17. we calculate the information contained in the events, which are the sum of elementary events. A simple example will explain this procedure. Let $\Omega = \{A_1, A_2, B\}$, $\mathrm{I}(A_1) = \mathrm{I}(A_2) = \mathrm{I}(B) = \log_2 3$. Information $(A_1 \cup A_2)$ is calculated in the following manner:

2.6. $\mathrm{I}(A_1 \cup A_2 \cup B) = 0 = - c \log \left[e^{\frac{-I(A1 \cup A2)}{c}} + e^{\frac{-I(B)}{c}}\right]$
2.7. $e^{\frac{-I(A1 \cup A2)}{c}} + e^{-\log 3 = 1}$
2.8. $e^{\frac{-I(A1 \cup A2)}{c}} = 1 - e^{-\log 3}$
because $e^{-\log 3} = \frac{1}{3}$
2.9. $e^{\frac{-I(A1 \cup A2)}{c}} = 1 - \frac{1}{3} = \frac{2}{3}$

Logarithmising both sides, we get:

2.10. $- \frac{I(A1 \cup A2)}{c} = \log 2 - \log 3$
2.11. $\mathrm{I}(A_1 \cup A_2) = c \log 3 - c \log 2$

If we assume that 1 bit is our unit, then $c = \frac{1}{\log 2}$ and having put this value in formula 2.11, we get

2.12. $\mathrm{I}(A_1 \cup A_2) = \log_2 3 - \log_2 2$

For example, in the text "Jaś poszedł do szkoły"(*John went to school*) there are 18 signs plus three spaces, 21 signs in total. The set of elementary events is therefore composed of 21 elements. Information provided by each element of this text is equal to log21. If we want to calculate information of letter *o*, which appears in the text in three different places, then we apply formula 2.12 $I(o_1 \cup o_2 \cup o_3) = \log_2 21 - \log_2 3$. Information contained in letter *d* in the same text is equal to $I(d_1 \cup d_2) = \log_2 21 - \log_2 2$.

Apart from the information of a particular event, we often determine the average information in subsets of set *S*. Let $\Omega = \{a, b, c\}$, then $S = \{\{a\},\{b\}, \{c\}, \{a, b\}, \{a, c\}, \{b, c\}, \{a, b, c\}, \emptyset\}$. The divisions of set *S*, which we shall mark as P_1, P_2, P_3, P_4, P_5 are as follows:

$P_1 = \{\{a\},\{b\}, \{c\}\}$
$P_2 = \{\{a\},\{b, c\}\}$
$P_3 = \{\{a,b\}, \{c\}\}$
$P_4 = \{\{a, c\}, \{b\}\}$
$P_5 = \{\{a, b, c\}\}$

The average information for each of these subsets we mark respectively, as I_{P1}, I_{P2}, I_{P3}, I_{P4}, I_{P5} and we calculate it in accordance with the following formula:

$$2.13.\ I_p = \sum_{i=1}^{k} I(A_i) \cdot 2^{-I(A_i)}$$

where k is the number of elements of a given subset.

example:

$$I_{P1} = \sum_{i=1}^{3} I(A_i)\, 2^{-I(A_i)} = 3 \cdot\ I(A_1)\, 2^{-I(A_1)}$$

since $I(A_1) = I(A_2) = I(A_3) = \log_2 3$

$$I_{P1} = 3 \cdot 2^{-log_2 3} \log_2 3 = \log_2 3$$

Division P_1 is the finest division of set *S*. Information of the finest set is, in the case of average information, equal to the information of the elementary event.

$$I_{P2} = I_{P3} = I_{P4} = (\log_2 3 - \log_2 2) \cdot 2^{\log_2 2 - \log_2 3} + \log_2 3 \cdot 2^{-\log_2 3} = \tfrac{2}{3}\log_2 \tfrac{3}{2} + \tfrac{1}{3}\log_2 \tfrac{3}{1} = -\tfrac{2}{3}\log_2 \tfrac{2}{3} - \tfrac{1}{3}\log_2 \tfrac{1}{3} = \log_2 3 - \tfrac{2}{3}$$

$$I_{P1} > I_{P2}$$

The thicker the division of set S, the smaller the average information. It might be said that by a thicker division we are losing information, In case of the thickest division, this is division P_5 in this case, the average information is equal to zero.

4. LANGUAGE AND TEXT

In this paper I use the notion of language, which will be discussed in more detail in the article titled "O pewnym modelu języka" (Starosta 1974: 147). Let V be a finite not empty set called the vocabulary. The elements of the vocabulary shall be called words, and each finite sequence of words shall be called a phrase. K. Bogacki, the translator of John Lyon's *Introduction to Theoretical Linguistics,* introduces the term "rządek" (order) corresponding to the term phrase. In certain publications, translations from Russian, we may also encounter the term "łańcuszek" (chain), as description of the notion of phrase.

The set of all phrases is the universal language which we will mark as V^*. We say that set V^* is generated by set V. Each subset of set V^* is called a language, of which V is the vocabulary. The language is marked as L.

If we assume that the elements of vocabulary V are three signs $V = \{a, b, c\}$, then the infinite set of phrases which are possible to be created from these three signs, is a universal language generated by V, and each subset, e.g. $\{ab, ac, aaa\}$, $\{bbbb, acacb, a\}$ ... etc. is a language, whose vocabulary is set $\{a, b, c\}$.

If we assume that the elements of the vocabulary are simple expressions of the Polish language, and we will mark as Fa set of these phrases appearing in the epic poem *Pan Tadeusz,* then this set will be a language, whose vocabulary is the set of simple expressions of the Polish language. This is the language of this precise selected epic poem.

Generally, we will describe as language L an ordered pair of $<V, F>$, where V is a non-empty, finite set, and F is a set of selected phrases.

Text shall mean each subset of set F, in other words, each subset of a given language L. Text in this sense means both one-elements of subset F, as well as the entire subset F. In the examples presented above, a text is the set $\{ab\}$, $\{ab, aaa\}$ and the entire set $\{ab, ac, aaa\}$, if we assume that the selected phrases are *ab, ac* and *aaa.* A text is both book four of *Pan Tadeusz*, as well as the sentence "A już deszcz wciąż pluszczy."

The same inscription in the Polish language may be studied as a text of the language whose vocabulary is the set of the signs of alphabet, or as a text of the language, whose vocabulary is the set of simple expressions. In the first case, we will be speaking of an analysis at the level of letters, in the second case we will be speaking of an analysis on the level of expressions. Hereinafter, I limit my considerations to these two levels.

It needs to be indicated that in the case of both of these analyses, one needs to clearly define the vocabulary V. E.g. by the letter analysis one needs to decide, whether the considered vocabulary is the Polish alphabet containing 35 signs, or an extended alphabet including all punctuation marks and the most common abbreviations, containing 68 elements, or finally a vocabulary containing only the small letters of the alphabet, without letters *ś, ć, ę, ą, ź, ó,* etc., which contains only 26 signs. We may also assume that vocabulary V contains only the signs which appear in the studied inscription. E.g. if the studied text is the word *kot* (*cat*), then the word *kot* is the only selected phrase of interest for us. The vocabulary V contains only tree signs $V = \{k,\ o,\ t\}$.

By expression analysis it needs to be determined, whether vocabulary V contains almost all simple expressions of the Polish language appearing in Polish literature, or only those appearing in the natural language or in the technical literature, or in a single publication only. By determination of vocabulary V we somewhat determine are measuring apparatus, which we will then apply for text analysis.

The knowledge of this measuring apparatus is of particular importance, if we use the notion of information for the text analysis, since the function of information is the function of the measuring apparatus, in the widest possible understanding of the latter expression. In other words, the measuring apparatus determines the set of information, which is possible to obtain with the use thereof. For example, if we used for the analysis of a written text an apparatus reacting only to red colours, we would obtain only information concerning the colour of the inscriptions, whether they are red or not. If we used for the analysis an apparatus which reacts solely to the length of particular, simple expressions, i.e. the number of letters in an inscription from one space to the next, then we would obtain information concerning the length of the expression in the text. If we limited the text analysis to the abovementioned letter and expression levels, our first task would be to provide an informative description of the vocabulary. Only after we have obtained such a description, is it possible to compare the information contained in the texts in a given, determined language.

Providing a description of the written Polish language requires the use of a mathematical machine, since firstly the use of a machine makes it possible to examine the large empirical material in a relatively short period of time. In Poland machine research has been applied for phonetic analysis. i.a. one has determined the phonetic information contained in the Polish spoken text, in particular the information conveyed by particular phonemes or phonetic dyads, triads or tetrads, on the basis of tape recorded material composed of 100,000 phonemes of running text (Jassem 1974). Information research of written language is carried out sporadically and it is even difficult to speak of a partial description of the information conveyed by the Polish language.

All research carried out in Poland employs the probability theory: one calculates information by measuring the probability of events. The English and Russian languages have been analysed in a similar manner. In this paper I present a proposal of the determination of various types of information contained in text, without resorting to calculation of probabilities. Application of a general theory of information considerably simplifies the calculation procedure and provides direct data concerning the information description of a given language, which we need the most.

In view of the lack of results of measurement of information conveyed by the letters of the Polish alphabet, not mentioning ordered pairs or threes, as well as in view of the total lack of information description of the simple expressions of the Polish language, in the chapter to come I will use very simplified examples, which are sufficient to present the mere research method, but however, do not provide reliable numerical results. The latter could be obtained, as I have mentioned already, after examination of a large portion of empirical material with the use of a mathematical machine.

5. THE NOTION OF INFORMATION AND THE TEXT ANALYSIS

Text analysis from the point of view of information theory requires determination of a set of elementary events, and then a set of events S, for which we will determine the function of information. I am assuming that vocabulary V will be treated by us as a set of elementary events. In case of letter analysis set $\Omega = V$ and contains the signs of the alphabet and other signs comprising vocabulary V. In the case of expression analysis set Ω contains selected simple expressions. By the assumption of equal information of each of the elements of the vocabulary, the average information of the entire vocabulary, as well as the average information of the particular elements thereof, is calculated with the use of formula 2.5.: for each $x \in V$, $\mathrm{I}(x) =$

$I_a(V) = \log_2 n$, where n is the number of elementary events. For example, if vocabulary V is composed of 64 elements, the average information contained in this vocabulary and the information of each element thereof is equal to $\log_2 64 = 6$ bits. If we assume that the set of elementary events is a vocabulary containing 32,768 simple expressions of the Polish language, then, by assumption of the equal informational value of each of those expressions, the average information of this vocabulary and the information of each of the expressions thereof shall be equal to $\log_2 32{,}768 = 15$ bits.

Average information, equal in the first example to 6 bits, and in the second example to 15 bits, is the maximum average information conveyed by a given vocabulary, which we obtain, if we are dealing with the finest division of vocabulary V. Every thicker division of the vocabulary results in a smaller value of the average information. This is intuitively understandable. We treat vocabulary V, as I have already mentioned, as a measuring device. In case of the finest division of this vocabulary, we get the maximum number of objects, to which a given device reacts. A letter vocabulary divided into individual signs distinguishes every one of these signs as a separate object. The same vocabulary divided for example into vowels and consonants does not distinguish between such signs as *o, i, a* or *e*, neither does it distinguish between signs *g* and *f* or *z* and *c*. Signs included in each of the abovementioned classes shall be undistinguishable. Division into vowels and consonants somewhat combines particular letters with one another, and as a result we obtain a two-element set $P = \{A, B\}$, where A is the set of vowels and B is the set of consonants. Whereby the information contained in set A is not equal to the information contained in set B. If we assume that vocabulary V contains 32 letter of the alphabet, and there are 6 vowels among them, and the remaining letters are consonants, then:

$$I(A) = \log_2 32 - \log_2 6 = 4 - \log_2 3$$
$$I(B) = \log_2 32 - \log_2 26 = 4 - \log_2 13$$

The average information of this division $I(P)$ is therefore equal, according to formula 2.13., to:

$$I(P) = - 6/32 \log_2 6/32 - 26/32 \log_2 26/32 = 0.7$$

In the above considerations we have assumed the informational equality of the expressions of vocabulary V. Languages used in practice demonstrate an informational variety of the vocabulary elements. In order to obtain the

value of the information conveyed by particular expressions of the dictionary, one needs to examine a certain specific number of texts of the Polish language, sufficiently large enough to be treated as a representative sample. For example, if the sentence "Jaś poszedł do szkoły" was our representative text, then the information conveyed by the letter *o* in this text is equal to $\log_2 18 - \log_2 3$, information conveyed by letter *a* is equal to $\log_2 18$, information conveyed by letter *ł* is equal to $\log_2 18 - \log_2 2$, etc. In the text "Dziś zakwitły krokusy" (Crocuses have bloomed today) information conveyed by letter *o* is equal to $\log_2 19 - \log_2 2$, and the information conveyed by the letter *ł* is equal to $\log_2 19$.

In a similar manner we can calculate the information contained in pairs, threes, fours or fives of ordered letters of a given alphabet. The number of signs in the examination sample increases thereby.

It is much more troublesome to calculate information in case of text analysis on the expression level. If we assume that the set of elementary events has 30,000 elements, which is not a lot, then if we are to consider the simple expressions of the natural language, then the set of pairs of theses expressions shall have $30{,}000^2$ elements and the set of threes shall have $30{,}000^3$ elements. Not all twos and threes appear in the natural language. However, in order to determine the information contained in the pairs or threes, one needs to examine texts counting hundreds of thousands of expressions. This task can be accomplished only with the use of a mathematical machine.

Informational text analysis may be performed partially in selected languages, e.g. we may consider the texts of the language of chemistry or fragments of publications on farming equipment, etc. The considered vocabularies contain in such cases only the expressions which can be found in such publications. A vocabulary obtained on the basis of such an initial analysis, in particular a frequency vocabulary, is used as a template, with which we compare the vocabularies obtained from the analysis of other texts from the same field and the vocabularies obtained from the analysis of texts from other fields. Comparing vocabularies makes it possible, for example, to find the so-called specific terms of a given field or particular publications. Yet, I do not intend to discuss this problem in any detail.

At the end I would like to note that it is possible to use the information text analysis in other kinds of ways, which are particularly interesting from the point of view of semiotics. It seems namely that by using extremely simple assumptions concerning the notions of information, language and text, which I have presented in the preceding chapters, it is possible to obtain a relatively rich description of syntactic, semantic and pragmatic

relations of the natural Polish language. Justification of this claim requires a separate paper, in which one needs to i.a. provide results of particular machine examinations. In this work I merely signal the problem by presenting a simple example, which gives a certain idea of both the research method, as well as the issue itself.

The first text that we are going to analyse is as follows: "Wartość istnieje niezależnie od człowieka. Wartość istniała przed człowiekiem" ("Value exists irrespectively of the human. Value existed before the human did"). Vocabulary V_1contains the following elements: V_1 = {Wartość, istniała, istnieje, niezależnie, od, człowieka, człowiekiem, przed}. For the sake of simplification we assume that the piece of information carried by each of the words from the vocabulary is equal with respect to quantity: the piece of information carried by the words of the vocabulary is equal to the average information and is equal to $\log_2 8 = 3$ bits.

Let us consider in turn a set of ordered pairs, threes, fours, fives, sixes, sevens and eighths of vocabulary V_1. In Polish only certain combinations of expressions are treated by the users of this language to constitute correctly constructed and meaningful sentences. And so, for example, from among 64 possible ordered pairs, the following pairs can be considered to be sentences in the Polish language: <wartość istnieje>, <istnieje wartość>, <wartość istniała>, <istniała wartość>, <istnieje niezależnie>, <niezależnie istnieje>, <istniała niezależnie>, <niezależnie istniała>. Such pairs, as for example, <istnieje człowieka>, <wartość od> or <wartość człowieka> are not considered sentences in the Polish language and therefore we shall reject such pairs. The selection is obviously arbitrary to a certain extent. In each case, not all pairs are equally informative. The piece of information contained in the pairs calculated on the basis of an experiment is smaller than the piece of information calculated theoretically, which is equal to $2 \log_2 8 = 6$ bits. The value of information in the case of the text presented above calculated on the basis of an experiment is equal to $\log_2 8 = 3$ bits.

Theoretically, the informational value in the presented example is equal to $3 \log_2 8 = 9$ bits. In practice, we consider the following threes to be meaningful sentences of the Polish language: <istnieje wartość niezależnie>, <niezależnie istnieje wartość>, <wartość istniała niezależnie>, <niezależnie istniała wartość>, <istniała przed człowiekiem>, <przed człowiekiem istniała>, <istnieje przed człowiekiem>, <przed człowiekiem istnieje>. The informative value of the threes is equal to $\log_2 10$.

Information contained in the fours is equal to $4 \log_2 8 = 12$ bits. We consider the following sentences to be meaningful: <wartość istniała przed

człowiekiem>, <istniała wartość przed człowiekiem>, <przed człowiekiem istniała wartość>. We moreover consider meaningful the three sentences in which <istniała> is replaced with <istnieje>, as well as the 6 sentences obtained from combining various expressions in the sentences: <istnieje niezależnie od człowieka>, <istniała niezależnie od człowieka>. In total, we assume that it is possible to obtain 12 meaningful four-word sentences from vocabulary V_1. Information contained in the fours is equal to $\log_2 12$.

Information contained in the fives is theoretically equal to $5 \log_2 8 = 15$ bits. In practice, we consider the following sentences to be meaningful: <Wartość istniejenie zależnie od człowieka>, <wartość istniała niezależnie od człowieka>, <wartość istniała niezależnie przed człowiekiem>, and sentences obtained from the possible mix of expressions in the above sentences, which results in a total of 12 sentences. Information contained in the fives is equal $\text{tolog}_2 12$.

We do not in practice treat ordered sixes and eights obtained from this dictionary as sentences, but we do consider sevens as sentences. These are the sentences composed of combinations of expressions <wartość istniała przed człowiekiem niezależnie od człowieka> and <wartość istnieje przed człowiekiem niezależnie od człowieka>, which in total gives us 16 sentences. The information contained in the sevens is equal to $\log_2 16 = 4$ bits. Theoretically, the information of the sevens is equal to $7 \log_2 8 = 21$ bits.

We will compare with the above text another text which is also composed of eight elements: "Błysneło. Kobieta stanęła. Tygrys podchodzi powoli. Dziecko zapłakało" (It flashed. A woman stopped. A tiger is approaching slowly. A baby cried.). Vocabulary V_2 contains the following elements: $V_2 =$ {błysnęło, kobieta, stanęła, tygrys, podchodził, powoli, dziecko, zapłakało}. The average information value of the vocabulary is 3 bits. Theoretically, information contained in ordered pairs, threes, fours, fives and sixes is equal, as in the previous example, to 6, 9, 12, 15 and 18 bits respectively. In these examples, however, different numbers specify the information contained in the pairs, threes and fours calculated on the basis of an experiment. Information contained in pairs, if we consider the following pairs to be meaningful sentences <błysnęło powoli> and <dziecko błysnęło>, is equal to $\log_2 14$, and if we reject these pairs, is equal to $\log_2 10$. Information contained in threes is equal at most to $\log_2 9$. Fours and fives cannot be obtained from the given vocabulary.

Juxtaposition of both texts provides the following results:

Text I	Text 2
I(V_1) = $\log_2 8$ = 3 bits	J (V_2) = $\log_2 8$ = 3 bits
I(pairs) $\log_2 8$	$\log_2 10$
I(threes) $\log_2 10$	$\log_2 9$
I(fours) $\log_2 12$	—
I(fives) $\log_2 12$	—
I(sixes) —	—
I(sevens) $\log_2 16$	—

The first conclusion that comes to mind concerns the elements of both vocabularies: the elements of the first vocabulary less freely combine in pairs than the elements of the second vocabulary. Comparing to vocabulary V_2 however, their combinations in threes, fours, fives and even sevens are less limited. The elements of vocabulary V_2 are in a sense predetermined as far as the possible combinations are concerned. As a result, text 2 is far less informative than text 1. The question now is, where the differences come from.

A comprehensive answer to this question cannot be obtained without conducting competent research. We may suspect however that we will not get such an answer if we do not enrich the language model. As a result of the research we obtain, however, a material which only partially specifies the differences between the theoretically calculated and practically used information characteristic for a given text. These differences indicate the existence of certain regularities. We may assume that the difference as to the amount of information theoretically carried by a text and the amount of information possibly carried is indirectly the measure of these regularities — it is the measure of the semiotic information of the text. One should expect that the greater the differences, the more information contained in syntactic, semantic and pragmatic relations of a given text.

It is difficult for me to say at the moment, whether, if we stayed at the research level discussed above, it would be possible to experimentally separate particular types of semiotic relations. Separating syntactic relations from semantic relations seems doable: we namely calculate experimentally the set information of pairs, threes, fours, etc., obtained from a given vocabulary, being directed firstly by the choice of sentences by their mainly syntactic correctness (by provision of strict grammatical rules, etc.) and secondly by their meaningfulness (meaning). The obtained difference in the layer of information would characterise the semantic information. Should it turn out that the difference is practically equal to zero, we could say that the regularities occurring in the language are of syntactic character.

If we wanted to specify the syntactic and semantic information of a text in more detail, and later also separate and calculate the pragmatic information, one would need to enrich the theoretical language model. One of the steps in this direction is the following:

Let us assume that the language is an ordered three $<V, F, P>$, where P is a set of divisions of set V (Starosta 1974). Among the possible divisions we differentiate e.g. the division into distribution classes and the division into paradigms. In case of the division of vocabulary V_1 into distribution classes, we get the following set:

P_{D1} = {{wartość}, {istnieje}, {istniała}, {niezależnie}, {od}, {człowieka}, {przed}, {człowiekiem}}

In case of division of vocabulary V_1 into paradigms, we obtain the following set:

P_{P1} = {{wartość}, { istniała, istnieje}, {niezależnie}, {od}, {przed}, {człowieka, człowiekiem}}

In case of division of vocabulary V_2 divisions into distribution classes and paradigms are as follows:

$P_{D2} = P_{P2}$ = {{błysnęło}, {kobieta}, {stanęła}, {tygrys}, {podchodził}, {powoli}, {dziecko}, {zapłakało}}

Vocabulary V_1 constitutes from this point of view a less precise measuring device than V_2. Information contained in divisionP_{P1} is smaller than the information contained in division P_{P2} and smaller than the information contained in vocabulary V_1. In this vocabulary certain expressions may be combined with one another in accordance with the division rules. Information contained in the division rules limits the possibilities of the free combining of expressions of the vocabulary: reduces the information contained in the vocabulary itself.

Summing up: text information analysis may be carried out, if we determine the langue to which we include a given text and if we provide the information description of this language, the Information description of the language is a blueprint with which we compare information descriptions of particular texts.

Information provided by the language is specified on various levels.

In particular this is the level of letters and expressions. Examination of the information provided by a given language on the level of expressions results in the setting of curtain regularities, which result in reduction of the theoretically possible information contained in the texts. Information contained in the text should be treated as locating information: it decreases to zero, when the searched object is placed in the area of events. This locating information is the semiotic information.

It seems that determination of the information of text will make it possible to describe the syntactic, semantic and pragmatic relations of the language in the language of information theory.

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Henryk Kardela

INTERPRETIVE VS. GENERATIVE SEMANTICS – TWO WAYS OF MODELLING MEANING IN GRAMMAR

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1. INTRODUCTION

1.0. Within the paradigm of main-stream generative theory, two basic modes of inquiry can be distinguished: interpretive semantics (IS) and generative semantics (GS). In IS the semantic component is held to interpret the syntactic structures generated by the grammar, hence the name of the approach: "interpretive semantics. In contrast, the model proposed by the advocates of GS assumes that what generates sentences is a uniform semanto-syntactic component, hence the name of the model: "generative semantics."

2.0. The name "interpretive semantics" has come to be associated nowadays with the so-called *Extended Standard Theory* (EST), a model of grammar, developed by Noam Chomsky in 1971. EST evolved out of the so-called *Standard Theory* (ST), proposed by Chomsky in his 1965 book *Aspects of the Theory of Syntax*. ST was the first "complete" model of grammar which consisted of the syntactic, semantic and phonological components. The main representatives of EST are N. Chomsky, A. Akmajian, R. Jackendoff and others. It is this theory that is competing nowadays with GS for the title of "the best theory."

3.0. GS owes a great deal to such linguists as J. McCawley, G. Lakoff, J. R. Ross, P. Postal and P. Seuren. This model of grammar is discussed

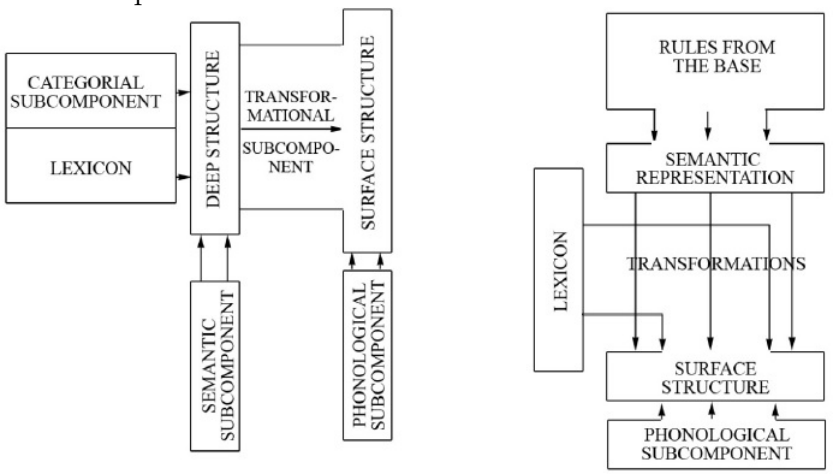
briefly in the second part of this paper, and in detail, in the third part of this article.

4.0. The paper makes an attempt to compare and evaluate GS and EST, the latest model of IS. The first part includes diagrams and descriptions of GS and EST, while the part that follows presents the basic assumptions of the two models. The third part discusses the internal relations between the components of grammar postulated within each model.

2. STANDARD THEORY AND GENERATIVE SEMANTICS

1.0. Both interpretative and generative models of grammar attempt to explain the linguistic — unconscious by nature — knowledge of the user of language. The diagrams representing IS and GS are given below:

Interpretive semantics[1] Generative semantics



2.0. In the model of interpretive semantics, the syntactic component consists of a categorial subcomponent, the lexicon, a level of deep structure, a transformational subcomponent and a level of surface structure. The phrase structure rules (PSRs) of the categorial subcomponent generate the so-called trees or 'phrase markers', which capture the relations between particular elements of a sentence. The branches of the trees, ending in nodes, are labelled by grammatical category symbols. The categorial subcomponent together with the lexicon form the so-called base of the syntactic component. Owing to the rewriting rules of the categorial subcomponent, an infinite number of sentences can be generated. Below we give a sample of the rewriting rules:

1. S → NP + VP

[1]This is Chomsky's model of grammar from 1965 — the Standard Theory.

2. VP → V + NP
3. NP → NP + S

S = sentence NP = nominal phrase VP = verbal phrase.

Rule 1 informs us that the sentence consists of a nominal phrase and a verbal phrase. Rule 2 rewrites the verbal phrase as a verb plus a nominal phrase. Finally, Rule 3 states that the nominal phrase consists of a nominal phrase and a sentence.

2.1. The rules of the categorial subcomponent can create a sentence consisting of only an NP and a VP, as in 'Chłopiec je' [A boy is eating] (cf. Rule 1) or, after the application of appropriate transformations, a sentence consisting of an NP, a VP, a V or an S, as in 'Chłopiec je jabłko, które dała mu matka' [A boy is eating an apple which his mother gave him] (Rules 1, 2, 3, after being collapsed into one rule: S → NP + VP + [V +NP (NP+S)]).

2.2. After the rewriting rules of the categorial subcomponent have created a phrase marker, the special context-sensitive rules, called lexical insertion rules, insert words from the lexicon under appropriate categorial nodes in the tree. As a result, deep structure is formed. Interpreted by the rules of the semantic component, deep structures are operated on by transformational rules which successively derive surface structures.

2.3. Surface structures, in turn, provide an input to a phonological representation of a linguistic unit from which — through the successive application of phonological rules — the unit's phonetic manifestation is derived.

3.0. In the model of grammar postulated by the advocates of GS no distinction is drawn between the semantic and syntactic components as the semanto-syntactic component, or to be more exact, the rules of the base, generate semantic trees with the categorial nodes labelled with logic symbols, including S — sentence, V — predicate, and NP — argument.

3.1. There is no well-defined level of deep structure in the GS model; instead all meaning in GS resides in the semanto-syntactic component, that is (i) in the semantic representation, (ii) the lexicon and (iii) in the partial semanto-syntactic structures derived by the so-called predicate raising rule (see below). The two components postulated in the IS model, namely the syntactic and the semantic component, are thus replaced in GS by one semanto-syntactic component.

3.2. The difference in the application of transformations operating in IS and in GS is that whereas in GS lexical insertion rules operate jointly with

other transformations such as, say, the passive transformation, in IS, the transformations apply only after all lexical items have been inserted under appropriate nodes in the phrase markers, that is, after the deep structure of the sentence has been formed.

4.0. It should be stressed that whereas in Standard Theory transformations are held to preserve meaning, in the Extended Standard Theory model, they are capable of changing the meaning of a sentence in that they create appropriate syntactic contexts for semantic interpretation to be assigned at both the deep and surface structure levels of the sentence.

5.0. As far as the phonological component is concerned, it has no influence on the meaning of the sentence in either Standard Theory or in the Generative Semantics model; its role in the two models is purely interpretive. This is not so, however, in the EST model. In EST, semantic interpretation applies at both deep and surface structure, and because the rules of the phonological component apply at the level of surface structure, semantic interpretation in the EST model is, *eo ipso*, sensitive to phonological information as well.

3. THE CONTROVERSY BETWEEN GS AND IS

1.0. The dispute between IS and GS mainly concerns the autonomy of syntax, which in IS is held to generate deep structures of sentences. Specifically, with the emergence of new linguistic facts, especially those related to sentence meaning, deep became more remote from surface structures. Because deep structures started to resemble semantic representations, the question was raised whether the idea of deep structure was needed at all. Why — Lakoff and Ross (1967) asked — can the semantic component not generate sentences accompanied with their semantic representations, which would eliminate completely the deep structure from the model of grammar?

1.1. Because Standard Theory was unable to account for phenomena such as focus assignment, presupposition and the use of quantifiers in the sentence (see below), a new theory was called for. This theory came to be known as Generative Semantics. To counter the solutions offered by GS, Chomsky proposed to modify the Standard Theory model. The new model of IS, known as the Extended Standard Theory, preserves, just like the Standard Theory model, the autonomy of syntax and retains deep structure.

2.0. The absence of deep structure in the Generative Semantics model is not the only bone of contention between GS and IS. The models also make different claims with respect to the lexicon and word structure. GS lays emphasis on the semantic complexity of words. The theory of so-called *lexical decomposition* allows for the explanation of why it is possible to say,

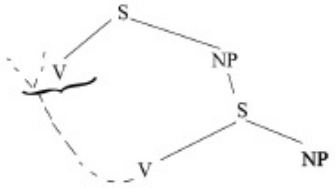
e.g.: 'Wymknąłem się przez okno' [I slipped out through the window], but not: 'Okno zostało wymknięte się przeze mnie' [The window was slipped out through by me]. If the expression 'wymykać się' [to slip] has the complex semantic structure of the type 'biec sobie od (czegoś)' [to run from (something)], then the passive transformation cannot be applied to such expressions, since one of them, i.e. 'biec' [to run], is intransitive. This means that the word 'wymknięty' [slipped] in the passive sentence: 'Okno zostało wymknięte się przeze mnie' [The window was slipped out through by me] is improperly used as the conditions for the application of the passive transformation to the component parts of the verb 'wymykać się' [to slip] are not satisfied.

2.1. IS rejects the concept of decomposition of words' meanings of the sort presented above. According to the advocates of IS, there are no syntactic relations that manifest themselves in transformations between words and their component parts. The so-called transformation of *predicate-raising*,[2] which assembles a word from the word's particular component parts, is, according to the advocates of IS, "syntactically unmotivated" (Chomsky 1972: 151-2). The proponents of IS also reject generative semanticists' claim that the lexical insertion rules operate jointly with other transformations. In the IS model, grammatical transformations can apply only after all lexical items have been inserted under appropriate nodes in the trees.

2.2. According to IS, the example involving the passive voice, mentioned above, is ungrammatical because the verb 'wymykać się' [to slip] is intransitive, hence the passive transformation cannot apply. What this means, however, is that on this approach, any verb marked as "intransitive" in the lexicon excludes the possibility of capturing more general meaning-related conditions on the use of the passive voice.

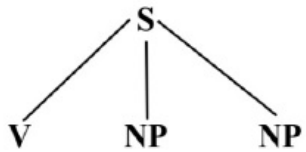
3.0. Interpretive semanticists challenge the view on semantic representation endorsed by GS. According to generative semanticists, the semantic representation assumes the form of a tree with symbols taken from logic

[2]The transformation raises the predicate (V) to a higher branch of a derivational tree, which can be presented as follows:



Consequently, there are two predicates that form one expression on the left side of the tree.

such as predicate (V) or argument (NP):



where the predicate (v) comes first, followed by one up to three arguments (NP). The so-called VSO hypothesis, proposed by McCawley (1970), assumes that English is a language of the VSO type, which means that in the semantic representation of English sentences, the order of elements is as follows: verb (V), subject (NP) and object (NP). The hypothesis considerably simplifies the operation of the predicate raising transformation. Otherwise, so the argument goes, the predicate raising transformation would be a very complicated operation, assuming that English sentences can be decomposed into a nominal phrase (NP) and a verbal phrase (VP). IS rejects the VSO hypothesis as completely arbitrary and syntactically unmotivated.

4.0. As already stated, in the Extended Standard Theory not only deep structures, but also surface structures are interpreted semantically. This means that surface structure has an influence on the meaning of the sentence. This conception was severely criticised by the advocates of GS. Thus, Postal (1972) undertakes to show that, seen from a methodological point of view, the GS model of grammar is a "better theory" than the EST model. For, unlike IS, the theory of GS is, according to Postal, a "uniform theory". Where IS needs two types of rules: rules linking the deep structure to the surface structure (transformations) and rules linking the deep structure to the semantic description of the language (the interpretative rules of the semantic component), in GS only one type of rules is needed to link the semantic structure with the surface structure representation, namely syntactic transformations which are meaning-sensitive.

5.0. Both IS and GS aim at characterizing the intuitive knowledge of a native user of a language. In the IS model, deep structure functions as a kind of "interface", as a point of contact between the syntactic and the semantic component. Meaning in IS is purely analytical, i.e. it resides exclusively in the meanings of the parts of the sentence.

5.1. For the advocates of IS, a sentence can be either grammatical or ungrammatical. What counts is the intuitive grammaticality judgment of a language user. In GS, however, because the meaning of a sentence is also determined by extralinguistic factors such as the context in which an expression is used, beliefs or convictions of a language user, one should

speak rather of acceptability or unacceptability of a sentence. In contrast, IS excludes extralinguistic context from its analysis of meaning. For the adherents of IS extralinguistic context is associated with performance, not competence. It is competence, not performance that is, according to Chomsky, the proper object of linguistic inquiry.

5.2. The issue of "extralinguistic context" is thus another disagreement point between the two theories. Katz and Bever (1974), for instance, accuse generative semanticists of "opening the way for empiricism in linguistic studies" by taking into consideration the convictions and beliefs of a language user. According to these authors, IS, which represents a rational mode of inquiry, is much superior to "irrational theories" such as GS. By embracing the Cartesian rationalist view and postulating the existence of Universal Grammar (Descartes' 'idee innate'), their model grammar, the adherents of IS claim, can readily account for language acquisition by a child (i.e. for the fact that children can learn a given language effortlessly when exposed to it and that they can learn it no matter how poor linguistic data they are exposed to are).

6.0. Yet, it seems that it is too early — at the present state of the development of GS — to unequivocally state, as Katz and Bever do, that incorporating in the model of grammar the convictions of a language user is tantamount to "opening the door through which empiricism may enter linguistic studies." Although, according to the advocates of IS, beliefs and convictions may be explained on the grounds of a separate theory (i.e. linguistic pragmatics), it seems that for methodological reasons, one general theory is better than two separate ones, with each of them explaining only a part of the phenomena otherwise explained by the more general theory.[3]

4. RELATIONS BETWEEN THE COMPONENTS IN IN THE TWO MODELS OF GRAMMAR

1.0. As noted above, the rejection of deep structure by the adherents of GS considerably simplifies the model of grammar. In this section an attempt will be made to describe the inner relations holding between the levels of descriptions in each model.

1.1. In the GS model, transformations are powerful devices; their role is twofold: a transformation must not only be sensitive to the grammaticality

[3]This approach is represented by P. Postal (1972) and J. McCawley (1972: 508).

of a sentence structure, but also must link surface structures of sentences to their meanings, i.e. to their logical-semantic forms.[4]

1.2. In contrast, the transformational component in IS is a great deal more constrained. Here, transformations have only one function to perform: to link a deep structure to the surface structure regardless of the sentence's meaning. As mentioned above, meaning in this model is determined by the interpretive rules of the semantic component. The syntactic component in IS is extensively developed as it must not only guarantee the grammaticality of a sentence, but it must also include the information about the conditions on the application of the semantic rules.

1.3. The deep structure, and more specifically its semantic representation, assigns to each sentence a set of elements characterising the sentence such that the sentence's ambiguity at the levels of both its deep structure and its semantic representation could be eliminated. Thus a sentence such as (1):

(1) 'Krytyka studentów spotkała się z powszechnym oburzeniem' [The criticism of students caused general indignation] is ambiguous.
can be interpreted as either (1a) or (1b):

(1) a. 'Ktoś skrytykował studentów, co spotkało się z oburzeniem.' [Somebody criticised students, which caused indignation]
b. 'Studenci kogoś (coś) skrytykowali, co spotkało się z oburzeniem.' [Students criticised somebody (something), which caused indignation]

Sentence (1) has thus two separate deep structures (or two semantic representations): (1a) and (1b), respectively.

Consider now sentence (2):

(2) '(Janek) NP_1 widzi (Janka). NP_2'[(John) NP_1 sees (John) NP_2]

According to the Standard Theory, if NP_1 equals NP_2, then the reflexive transformation must obligatorily apply:

(2) a. 'Janek widzi siebie.' [John sees himself].

[4]In GS the semantic structure of a sentence is represented by logico-semantic formulas (Lakoff 1972: 559), modelled on łukasiewicz's idea of logical formulas: a predicate followed by one or more arguments (McCawley 1972: 513).

How about sentence (3), then?:

(3) (Każdy artysta) NP_1 chwali (każdego artystę) NP_2. [Every artist praises every artist]

It is clear that because in (3) we have two isomorphic nominal phrases, 'każdy artysta' [each artist]), the reflexive transformation must apply. As a result, we get a sentence such as (3a):

(3) a. 'Każdy artysta chwali siebie.' [Each artist praises himself].

Yet, note that sentence (3) is grammatical even if the reflexive transformation has not applied, in contrast to (2), which is incorrect under the assumption that $NP_1 = NP_2$. This phenomenon, seemingly irregular, cannot be explained on the grounds of the Standard Theory, where the reflexive transformation is obligatory in such cases.

1.4. The linguistic facts discussed above can be explained on the grounds of GS as follows. Sentence (3) is assigned a semantic representation which overlaps with the logical form of the sentence. As a result, we get the following two logico-semantic representations:

Diagram I

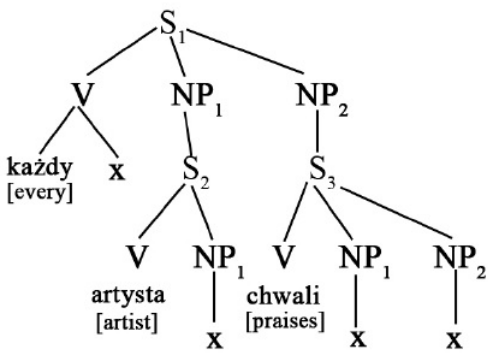
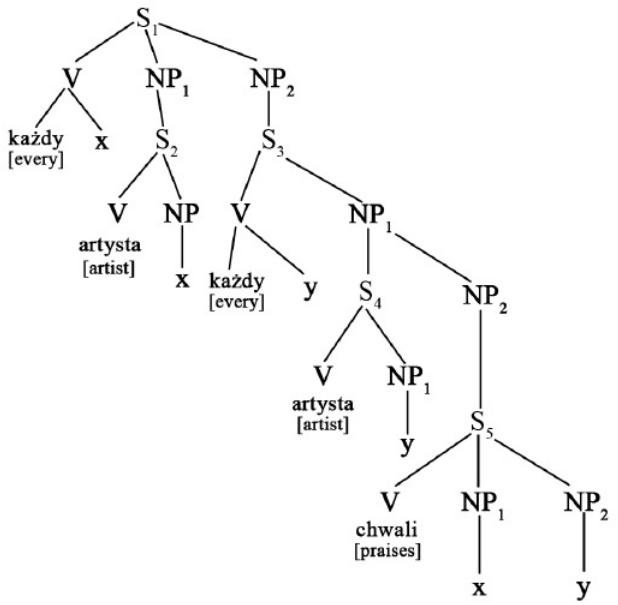
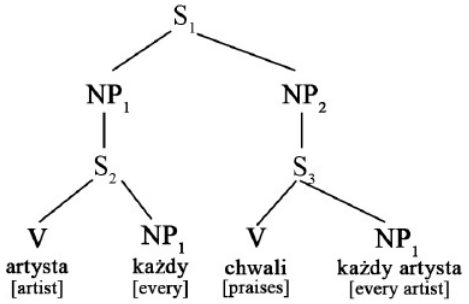


Diagram II



The semantic representations of sentence (3), given above, show which variable, x or y, is linked with the appropriate argument (NP). Diagram I shows that (both) arguments are the same (NP1 = x and NP2 = x) and thus trigger the reflexive transformation. First, however, a special transformation, the so called quantifier-lowering transformation,[5] assigns the quantifier 'every x' (which is also the predicate[6]) to NP_1 under S_2 and to the arguments NP_1 and NP_2 under S_2. As a result, we get the following tree:

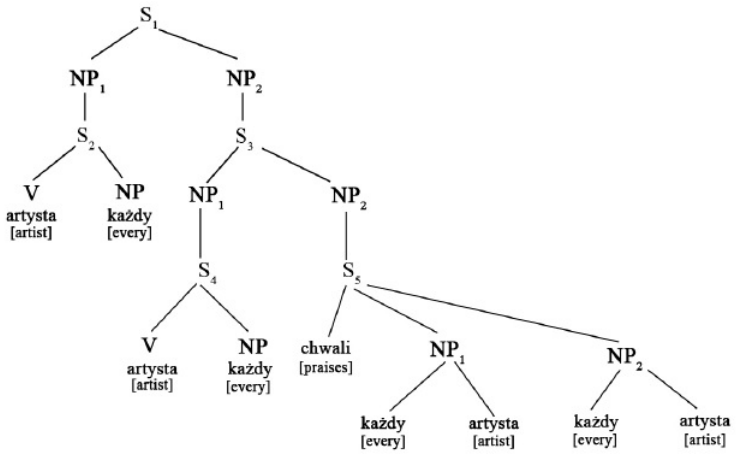


Now that the tree is subjected to the operation of the reflexive rule, we can derive the sentence 'Każdy artysta chwali siebie' [each artist praises

[5]Since quantifiers are beyond the quantified expressions (they are higher on the trees than these expressions), a special transformation must lower them, thus connecting them to the expressions.

[6]In GS, the predicate can be a verb, a noun, the particle 'not', the conjunctions 'and', 'or' and quantifiers representing the conjunctions 'and' and 'or'.

himself]. When, however, the quantifier lowering applies, then the following tree structure is derived:



which reads: 'Every artist praises every artist'.

1.5. Note that the introduction of the variables to the semantic representation requires a new rule: the quantifier-lowering transformation, which expands the transformational component. The above analysis shows that the reflexive transformation and the quantifier-lowering transformation are applied in a fixed order: first, the quantifier-lowering transformation operates and then, the reflexive transformation. Otherwise, the process of sentence derivation could not proceed as the reflexive transformation can be applied only to the structure resulting from quantifier lowering. In GS, transformations operating on sentence structures function as filtering tools; they block the derivation of the sentence when the conditions for applying the transformations are not satisfied.

1.6. Although, as already remarked, sentences such as (3) and (3a) cannot be properly analysed in the framework of the Standard Theory, they can be given a principled account in the Extended Standard Theory, owing to the application of the interpretative semantic rules.[7] In this case *coreference* is established between the reflexive pronoun (NP_2) and its antecedent (NP_1) whenever the structural (syntactic) conditions for the application of the reflexive rule are satisfied. Thus, if a structural tree configuration looks as the one given below

X	NP_1	Y	NP_2	Z
1	2	3	4	5

[7]The analysis is based on the theory developed by Jackendoff (1972).

[refl]

then the structure enters the table of coreference,[8] which establishes a semantic link between NP_2[+refl] and NP_1. However, if the coreference between NP_1 and NP_2 cannot be established, then such a structure is ruled out, i.e. the derivation of the sentence is stopped. Reducing the power of the transformational component in EST, then, leads — through the introduction of the table of coreference — to the expansion of the semantic component.

2.0. As mentioned above, Chomsky's model of IS from 1965 (the Standard Theory) assumes that transformations do not change meaning. Consider now sentences such as (4) and (5), which involve presupposition and focus.[9] In particular, note that in (4):

(4) 'Antek wie, że JANEK zjadł jabłko.' [Anthony knows that JOHN ate the apple]

the emphasised JANEK [JOHN] is the focus, while the fact that the apple has been eaten is the presupposition. In sentence (5), however, the APPLE is the focus:

(5) 'Antek wie, że Janek zjadł JABŁKO.' [Anthony knows that John ate the APPLE].

Now, according to the Standard Theory model, because sentences such as (4) and (5) have different meanings, their deep structures should be different. This need not be so in the Extended Standard Theory, however, where the semantic rules are said to apply at both deep and surface structure. Indeed, according to Chomsky (1972) and Jackendoff (1972), sentences such as (4) and (5), although they differ in meaning, are claimed to have the same deep structure; the differences in meaning arise at their surface structures, when the FOCUS-assignment rule applies.[10]

2.1. Consider now the following sentences involving the quantifier lower-

[8] The table of coreference was introduced in the model of IS developed by Jackendoff.

[9] In generative grammar, 'presupposition' (theme) is the information that is known to both, the speaker and the hearer. 'Focus' (rheme) is the information included in the sentence which the speaker assumes to be unknown to the hearer.

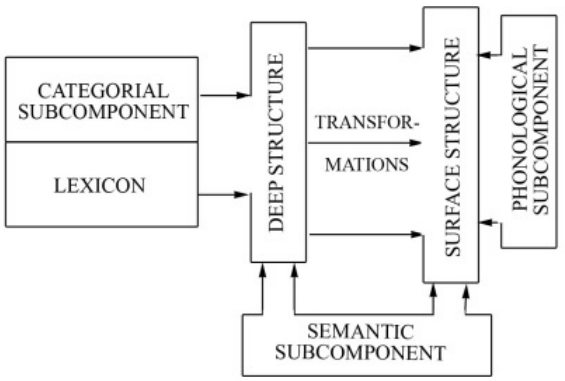
[10] In GS, sentences (4) and (5) differ as regards their semantic representations. A special marker "focus" will be introduced to their semantic representations.

ing rule:[11]

(6) 'Niewiele strzał trafiło do celu.' [Not many arrows hit the target]
(7) 'Wiele strzał nie trafiło do celu.' [Many arrows didn't hit the target]
(8) 'Cel nie został trafiony wieloma strzałami.' [The target wasn't hit by many arrows]

According to EST, the surface structure arrangement of the quantifiers and negative particles here is responsible for the synonymy of (6) and (8) but not for the synonymy of (6) and (7), despite the fact that, according to EST, the deep structures of sentences (6), (7) and (8) are identical. Indeed, if the surface subject has a qualifier as in (6), then (6) (with sentence negation) has a different meaning than (7) (with verb-phrase negation). If, however, the quantifier 'many' is a part of the noun phrase which follows the verb, then the order of the negation and the quantifier is identical in both the sentence negation and in verb-phrase negation. This being the case, (6) is the paraphrase of (8). From the above considerations it follows that both deep structure and surface structure are interpreted semantically, because, as already mentioned, the surface arrangement of quantifiers influences the meaning of the sentence.

2.2. The model of grammar that emerges now looks as follows:[12]

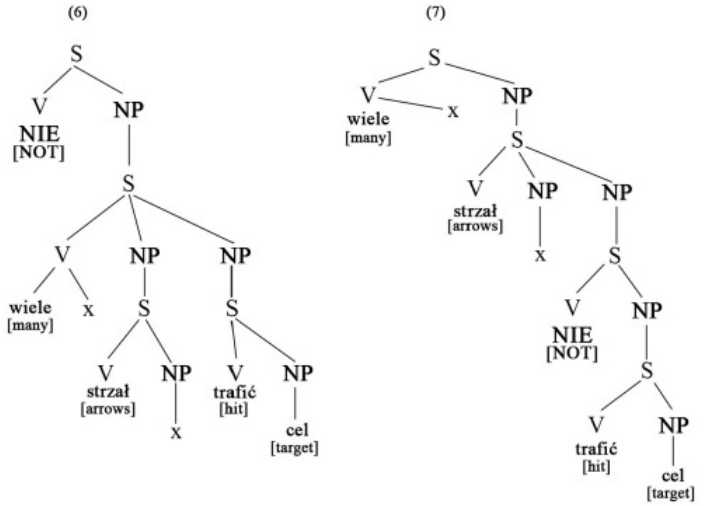


This model of grammar (Extended Standard Theory) differs from Standard Theory in that in EST the interpretative rules of the semantic component interpret both the deep and surface structure.

3.0. Sentences (6), (7) and (8) are analysed differently in GS. In Generative Semantics quantifiers are introduced to the semantic representation, but

[11]The author of the sentences is Jackendoff (1972: 327).
[12]This is Chomsky's (1972) model of grammar.

are beyond their quantified arguments. There exist two different semantic representations for (7) and (8), depending on the scope of negation.



3.1. The above structures undergo now the quantifier-lowering transformation, which obeys the so-called derivational constraint. The constraint on quantifier-lowering can be formulated as follows (Lakoff 1971: 240):

Quantifier A which commands quantifier B in the surface structure, must also command B in the semantic representation.

Derivational constraints of this sort inevitably enhance the power of the transformational component. In GS, this component includes node-acceptability conditions, that is, rules which generate semanto-syntactic trees, transformations that derive surface structures from semantic representations, and the above-mentioned constraints which restrict the application of transformations, e.g. the constraint restricting the quantifier-lowering transformation.

Consider now the so-called Coordinate Structure Constraint (Lakoff 1972: 613):

No transformation can move an element within or out of a coordinate structure.

This constraint blocks ungrammatical sentences such as (10) while "letting through" sentences such as (9):

(9) 'Jan jest podobny do każdego maszynisty.' [John looks similar to every

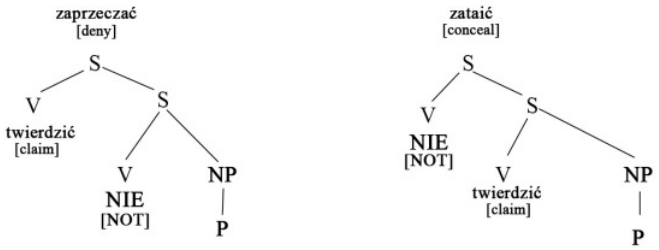
engine-driver]

(10) 'Jan i każdy maszynista są podobni.' [John and every engine-driver look similar]

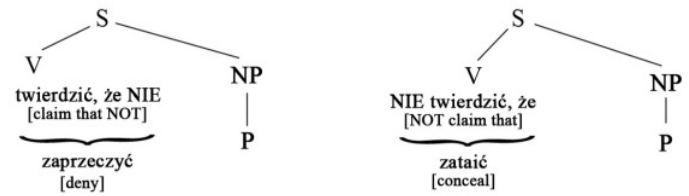
The quantifier 'every' in (10) quantifying 'engine-driver' has been moved to the coordinate structure 'John and', hence the unacceptability of (10).

The Coordinate Structure Constraint blocks not only unacceptable sentences but also unacceptable words. A case in point could be a non-existent Polish word 'podobisty' [similarish] which would mean: 'x is and y similar'.

4.0. Note that the non-word 'podobisty' can be shown to be ruled out by the Coordinate Structure Constraint precisely because this constraint operates on the complex word structure. Such complex structures have the words zaprzeczać' [deny] and 'zataić' [conceal], which, according to GS, are claimed to contain an element of negation:



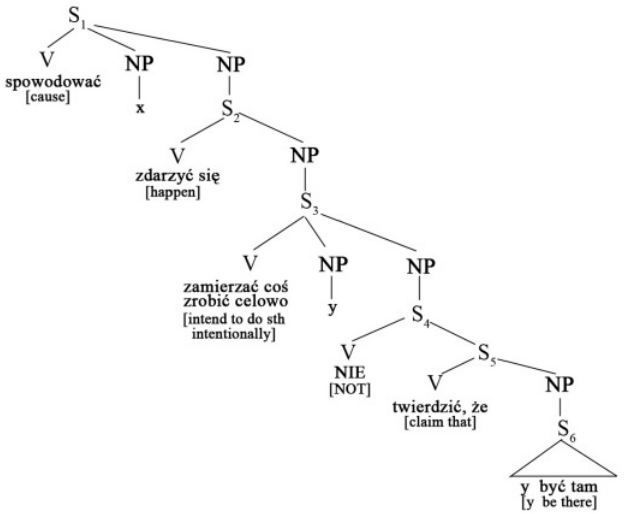
4.1. What is important in the case of these two expressions is the localization of the predicate 'not' in the trees; because the scope of 'not' is different, the meaning of these words is different too. The "lexical decomposition" of this sort has far reaching consequences for the structure of the lexicon in GS. Words take the form of either 'not assert that p' or 'assert that not p'. Thus words such as 'zaprzeczyć' [deny], 'zdementować' [deny, contradict] or 'zanegować' [negate] are decomposed into 'assert that not p'. Apart from lexically decomposed items, the lexicon also contains syntactic information that, for instance, a given verb is transitive or not, or phonological information that, say, the cluster 'ng' never occurs initially in Polish. To create words such as 'deny' or 'conceal', the transformation of *Predicate-Raising* must be applied. As a result of its application the following structures are derived:



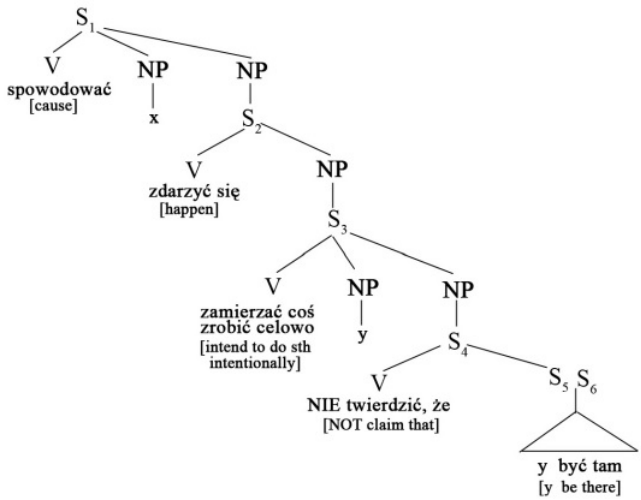
Naturally, the Predicate Raising transformation applies not only in morphology but also in syntax. Thus the derivation of a sentence such as (11) might looks as follows:

(11) 'Jan namówił Roberta, aby zataił, że on (Robert) tam był.' [John persuaded Robert to conceal that he (Robert) was there]

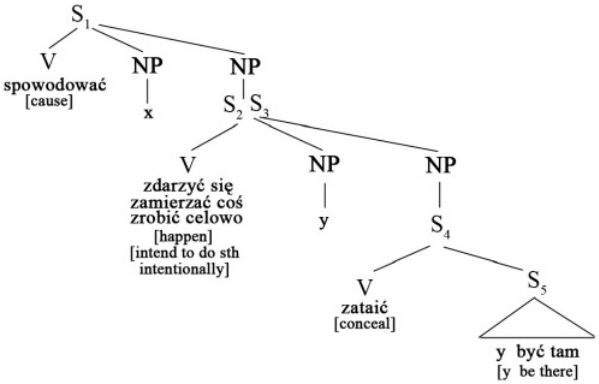
where 'persuade' is decomposed into '(to) cause (that) happens (that) intend (to do something) intentionally'



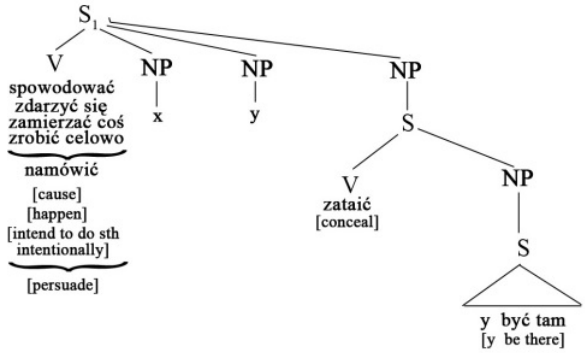
The predicate-raising transformation operating on S_4 derives now:



The same transformation when applied to S_2 and S_3 yields the following structure:



Finally, the transformation applied to the above structure will produce the surface structure of the sentence in (11):

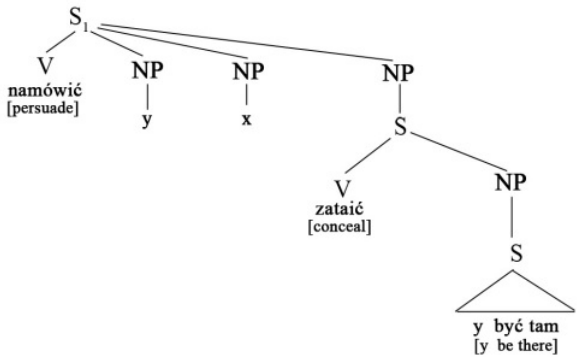


The words 'persuade' and 'conceal' replace now the corresponding predicates.

It should be stressed that in GS the lexical transformation of Predicate Raising transformation applies jointly with other transformations. Thus consider the passive sentence in (12):

(12) 'Robert został namówiony przez Jana, aby skłamał, że on (Robert) tam był.' [Robert has been persuaded by John to lie that he (Robert) was there]

The Passive transformation which applies in this case changes the positions of NPx and NPy under S_1:



5.0. In both models of IS — in the Standard Theory and the Extended Standard Theory — a clear-cut division is drawn between lexical insertion rules and regular transformational rules. In Standard Theory, regular transformations carry out morphological derivations and, ipso facto, change grammatical categories, e.g. 'śpiew' [singing] (noun), 'śpiewać' [to sing] (verb), śpiewny [melodious] (adjective).

5.1. In the Extended Standard Theory, however, there are no derivational transformations[13] and the power of the transformational component is significantly weakened. Nominal compounds, such as 'zburzenie miasta przez nieprzyjaciela' [the destruction of the city by the enemy] will not be produced from structures such as 'nieprzyjaciel zburzył miasto' [the enemy destroyed the city] — these compounds are as such in the deep structure. The assertion that transformations cannot participate in derivational processes is called the Lexicalist Hypothesis.

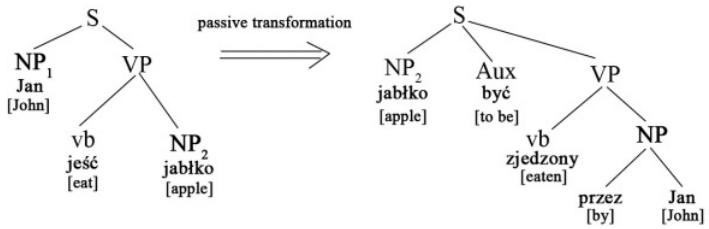
5.2. The adoption of the Lexicalist Hypothesis leads to the extension of the lexicon which must include now all the words that are morphologically complex. Thus in the case of the word 'śpiewać' [to sing], the information in the lexicon is as follows:

[13]The exception being the gerundive derivatives.

śpiew [singing] – root, + process
śpiewać... [to sing] +V (verb), + —NP
śpiew... [singing] +N (noun) common, uncountable, inanimate
śpiewanie... [singing] +S Nom (gerund)
śpiewający... [singing] +A (adjective), + —NP

5.3. The Lexicalist Hypothesis weakens the transformational component further as it allows the elimination of the passive transformation (Freidin 1973). A transitive verb is, in such a case, marked as an adjective in the lexicon (the past participle which creates the passive, e.g. 'śpiewany' [sung], is marked as an adjective). Two semantically equivalent sentences: the active and passive have one abstract representation. Owing to the process of lexicalization, 'śpiewać' [to sing] and 'śpiewany' [sung]are represented by means of abstract features[14] and can be lexicalized in two ways. Choosing the adjective results in a passive sentence, while choosing the verb results in an active sentence. The semantic link between the passive and the active voice is ensured by the application of the rules from the extended semantic component.

6.0. A transformational explanation of the passive voice in the framework of Standard Theory means that the passive transformation changed the positions of nominal phrases NP_1 and NP_2 (when $NP_1 = NP_2$) and introduced the auxiliary word 'be'. In this case two operations take place:

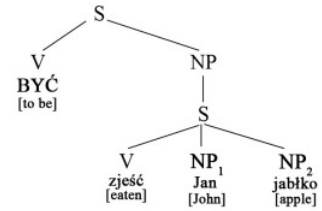


According to Chomsky (1965), the deep structure of an active sentence differs from the deep structure of a passive sentence in that the latter has a verbal phrase with an adverb of manner. Here, the semantic relations between the active and passive voice are not analysed yet as this is the function of the interpretative semantic rules in the extended semantic theory.

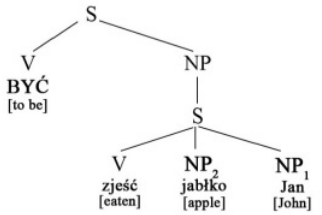
6.1. The operation of the passive transformation is significantly simplified when, as the adherents of GS claim, the semantic representation of the above

[14]Each word in the lexicon is represented as a set of abstract features, e.g. the word 'girl' has the following features: [+animate], [+human], [-male]. The abstract features of the verb 'śpiewać' [to sing] are presented above.

sentence is as follows (McCawley 1970a):



Then the passive transformation makes a single operation — it changes the positions of NP_1 and NP_2:



7.0. In the light of the foregoing discussion, it should be clear that there is some kind of "explanatory trade-off" holding between the particular components of the models of grammars discussed in this paper. Thus if a grammar has a deep structure and its interpreting semantic component, as is the case with EST, then the transformational component is automatically weakened as it performs fewer operations. However, if, as the adherents of GS assume, a grammar has a semantic representation and no deep structure, then the transformational component must be powerful enough to be able to cope with the logical form of sentences and the lexicon must contain a great number of decomposed lexical formatives.

5. ASSESSMENT OF BOTH MODELS

1.0. We can provide now an overall assessment of the two models.

2.0. It seems that GS has a clear advantage over EST in that the semantic representation in GS assumes a logical form. For, if all people are claimed to have the same sense of logic, then it is only one step to assert that all ethnic languages share the semantic representation.

2.1. GS allows for the establishment of the relations between reality and a native speaker's language, a move which is not possible in the case of IS as the analyses pursued in this model are strictly sentence-type analyses.

2.2. Because in GS words and word processes are claimed to be morphologically complex, in this model of grammar restrictions can be stated blocking the derivation of non-words.

2.3. GS introduces a new typology of languages based on the order of sentence elements in the sentence's semantic representation. According to GS, languages are either of the type VSO, SOV or SVO.

2.4. GS allows for the establishment of direct relations between utterances of natural languages and their equivalents in the language of logic.

2.5. Finally, GS is simpler than EST in that GS contains one type of rules, i.e. transformations that link the semantic representation and the surface structure. In contrast, IS has two types of rules: transformations and semantic interpretive rules.

2.6. Yet, GS is not entirely immune to criticism. The very fact that in this theory the semantic representation takes the form of "syntax-like" trees raises doubts whether the choice of this notation is not somewhat arbitrary.

2.7. Secondly, if, as Katz and Bever claim, a grammar is "extended" to incorporate extralinguistic phenomena and concepts such as, for example, truth conditions, there is a distinct possibility that, indeed, such a model may become a "theory of everything." Luckily, there is no indication at this moment that this is going to happen in the nearest future.

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Jerzy Bralczyk

THE HYPOTHESISING ATTITUDE OF THE SPEAKER AS AN ELEMENT OF SENTENCE CONTENT

Originally published as "Hipotetyzująca postawa nadawcy jako składnik treści zdania," Studia Semiotyczne 7 (1977), 173–184. Translated by Klaudyna Michałowicz.

Making some judgment about something is what inheres in all the language acts from the content point of view. This fact has been described many times as the so-called actual division of the utterance. Two basic significative elements have been distinguished and are variously named: the subject and predicate, the theme and rheme, the subiectum and dictum, the datum and novum etc. Those approaches differ from one another and varying qualities are ascribed to different elements of language.

For the following analysis, however, another aspect is important, namely the fact that that judgment is, by nature, a veracity statement — in other words, that the act of ascribing veracity to a given proposition is inherent in every statement. Every language act, if it is an articulation of words that makes sense, is an ascription of veracity to some proposition.

The above assumption may seem inappropriate in relation to commands and questions, and to overtly false utterances, which sentences of literary fiction, lies and jokes can be interpreted to be.

With respect to commands (attempts etc.) and questions, there exists a semantic interpretation of those which makes it possible to treat them in the same way as indicative utterances. Here, the judgment which is made refers to the will of the speaker. Sentences such as *Podaj mi książkę* (*Give me the book*)[1] may, after all, be reformulated as *Chcę, żebyś podał mi książkę* (*I want*

[1]Translation of example sentences is provided for the convenience of the English-

you to give me the book); such sentences as *Która godzina?* (*What time is it?*) as *Chcę, żebyś mi powiedział, która godzina* (*I want you to tell me what time it is*). Utterances that are literary fiction differ from the others only in that they refer to some illusory world, different from the real one, and contain information about some illusory truths which somehow exist in that world. Lies and jokes are conscious reversals of the veracity principle, a procedure possible only because that principle is in force, just as an infringement of the rules of a game can occur only when those rules actually exist.

The fact that we ascribe veracity to something is a result of some act of judging. Can it be assumed that this act is fundamentally identical in all language situations — or are we dealing with a greater or lesser variety of those acts? Most generally, what all acts of speech have in common is the fact of assuming something to be true; at the foundation of that assumption, in turn, lies the speaker's greater or lesser knowledge regarding the given subject. This knowledge is inherent also in the imperative and rogative utterances: *Wiem, że chcę...* (*I know that I want...*). This knowledge, which I here assume as a certain constant value that lies at the basis of every language act, may as well refer either directly to proper content of the utterance, that is to what is being stated about something, or to the act of judging itself. In other words, one can know this or that — but one can also know that one doesn't know (or one does know) whether it is this or that, and speak about it.

So we can say what we know, and we can say that we know it, but not entirely in the same way. The act of judging is a type of reality, too, and just like anything else may be a topic of an utterance.

Knowledge is a constant value that constitutes every utterance. This must be understood in the following way: while uttering some utterance, the sender simultaneously undertakes to suppose that he possessed the relevant knowledge. In this situation, it is good to strictly differentiate between knowledge and certainty. I refer here not so much to abstract terms, detached from the colloquial language and used, for instance, in the scholarly studies of philosophy or sociology (to which terms varying values may be ascribed according to the need), but to the equivalents of the expressions: *wiem* (*I know*) and *jestem pewien* (*I am certain*). We are more willing to accept that it is knowledge, not certainty, that is the equivalent of ascribing veracity to something. Of course, the sentence: *Jan tam był* (*John was there*)

language reader. While every care is taken that the translation reflects the Polish example accurately, considerations found in this essay refer to the Polish sentences and to the grammatical structure of the Polish language (translator's note).

may refer either to the situation in which the speaker (henceforward: *S*) knows that John was there, or to the situation in which he is only certain of it. However, the use of expressions *wiem* (*I know*) and *jestem pewien* (*I am certain*) points to the fact that sentences of the type *Wiem, że Jan tam był* (*I know that John was there*) are closer to sentences of the type *Jan tam był* (*John was there*) than those of the type *Jestem pewien, że Jan tam był* (*I am certain that John was there*). The sentence *Wiem, że Jan tam był* (*I know that John was there*) conveys, among others, the information that John was there, whereas in the sentence *Jestem pewien, że Jan tam był* (*I am certain that John was there*) this information is not conveyed. Let us also compare sentences *Jakub wie, że Jan tam był* (*James knows that John was there*) and *Jakub jest pewien, że Jan tam był* (*James is certain that John was there*). In the first, *S* states, among others, that John was there, whereas the second sentence does not convey that information. *S* may use it when he considers the judgment expressed by *Jan tam był* (*John was there*) to be true, or when he considers it to be untrue, or when he knows nothing about it.

The difference between knowledge and certainty is also pointed to by some expressions of the *nie wiem, ale jestem pewien* (*I don't know, but I am certain*) type, for instance in the utterance: *Nie wiem, czy to było tu, ale jestem pewien, że tak* (*I don't know if it was here, but I am certain it was*). Also, after hearing an utterance which does not contain any information on *S*'s act of judging, it is more natural to ask *Skąd wiesz?* (*How do you know?*) than *Dlaczego jesteś pewien?* (*Why are you certain?*).

Certainty, as opposed to knowledge, is gradable. One can be more or less certain, whereas one cannot more or less know something. Knowledge cannot be greater or lesser, it can just be. The "extent" of knowledge is, of course, an entirely different issue. One can say *Jestem tego bardziej pewien teraz, niż przedtem* (*I am more certain of it now than before*). One cannot say *Teraz wiem to bardziej niż przedtem* (*Now I know it more than before*), although one can say *Teraz wiem na ten temat więcej, niż przedtem* (*Now I know more about this than before*).

On the other hand, a slightly different approach is suggested by the expression *prawie pewien* (*almost certain*), which seems to indicate that certainty, too, can be treated as a definite "point" rather than a gradable quality.

Some of the reflections by Ryle (Ryle 1951: 44-45) referring to the relationship between faith and knowledge can also refer to the relationship between certainty and knowledge. Ryle is of the opinion that knowledge

refers to ability, whereas faith refers to motivation. It is possible to ask *Dlaczego wierzysz?* (*Why do you believe?*), as well as *Dlaczego jesteś pewien?* (*Why are you certain?*), but the question *Dlaczego wiesz?* (*Why do you know?*) is not possible. Faith is a kind of judgment, whereas knowledge is a state of the mind.

Summing up the above considerations, it can be stated that the initial conception of knowledge as the thing that constitutes an utterance remains valid; certainty, in turn, shall henceforward be treated as a type of judgment typical to the sender in the situation when he does not possess definite knowledge about a given topic.

The act of judging is an ordinary element of reality and an utterance may refer to it, may speak about it. On the other hand, all utterances are based on an act of judging. As well, all are certain theorems, because they ascribe veracity to some proposition. Analysing utterances that ascribe veracity to judgments speaking about the act of judging, it is easy to notice that their nature is rather remarkable in this respect. On the one hand, it is possible to single out utterances, whose topic is the proposition on which they are based. In other words: what the *S* knows is what he is saying about something. This happens when an element of the text (henceforward: *E*) informing about the act of judging (a certain state of the sender) is the main predicate of the given utterance (henceforward: *MP*); in speech this is usually the stressed clause. On the other hand, however, there are utterances whose topic is not the proposition that constitutes them, but the subject of judgment, to which the act of judging refers. Then, the *E* referring to the act of judging point to the *MP*. For instance: in the utterance *On na pẃno tam był* (*He was cẃrtainly there*) the thing which is spoken about, and which is known, is the speaker's certainty. In the utterance *On na pẃno tam bḿ ́ł* (*He cẃrtainly wāś there*) what is known is the speaker's assumption, and what is spoken about is "his being there". All utterances can be classified according to the types of information conveyed by the specific types of utterances.

1. Direct information regarding *R'* (The symbol *R'* shall signify that part of reality to which the *MP* of the utterance refers).

This includes both the positive and the negative assertion. Utterances of this type contain information regarding the basis on which the judgment was taken by the sender (this basis is the *S*'s knowledge) and the information regarding *R'*. Examples: *On tam był* (*He was there*); *Nie ̋ wiem, czy on tam był* (*I dőn't know if he was there*); *Jestem pẃewien, że on tam był* (*I am cẃrtain that he was there*).

2. Absence of information regarding *R'* (or: information about the *S*'s

lack of the possibility of sending this information).

Utterances of this type contain information regarding the lack of foundation for accepting a judgment by the *S* (*nie wiem / I don't know*) and the absence of information about *R*'. Example: *Nie wiem, czy on tam bȳ́ł* (*I don't know whether he wāś there*).

3. Indirect information regarding *R'* (information regarding the *S*'s suppositions about *R*').

Utterances of this type contain information regarding the lack of foundation for fully accepting a judgment by the *S*, the existence of certain predispositions in the *S* for accepting a judgment, and what this judgment might be. Examples: *Przypuszczam, że on tam bȳ́ł* (*I suppose he wāś there*); *Jestem pewien, że on tam bȳ́ł* (*I am certain he wāś there*); *On tam chyba bȳ́ł* (*He māý have been there*).

Between the second and third type there is a fundamental affinity. In both cases (and in opposition to the first type) we are dealing with an absence of the unified foundation for accepting a judgment; ascribing veracity to that judgment would constitute real information for the recipient. Compare also the frequently occurring utterances of the type: *Nie wiem, ale myślę, że tak* (*I don't know, but I think it is so*); *Nie wiem, ale chyba tak* (*I don't know, but it may be so*).

Definition of the relationship between an affirmation, negation and utterances of the third type may seem to be a debatable issue.

Currently the dominant approach is the one excluding the topic of negation from the concerns of modality. Yet some approaches include an assumption that the indicators of subjective uncertainty, such as *chyba* (*may/maybe*), can be treated as being in between an indicator of affirmation and an indicator of negation. Such an assumption to a certain extent reflects the commonsensical intuition and is not entirely unfounded. What is being said about the fact expressed in the dictum in utterances with the *chyba* element may suggest that the *chyba E* is situated between the indicators of affirmation and the indicators of negation. As pointed out by Bogusławski (Bogusławski 1971: 127), such *E*'s as *chyba* are predicative expressions, in contrast to such indicators of negation as *nie* (*no/not*).

In the following section, we shall be dealing mainly with utterances containing information on the *S*'s less-than-full conviction regarding the truth of the expressed judgment. These are fundamentally two-part utterances, at least on the surface.

That part of the utterance which contains information regarding the attitude of the speaker to the veracity or probability of some judgment

will henceforward be referred to as the modus, the part of the utterance expressing that judgment will be referred to as the dictum.

Thus, in the utterance: *On tu chyba był* (*He may have been here*), *chyba* has the function of the modus, while *on tu był* is the dictum. In the utterance: *Mam nadzieję, że on tu był* (*I hope that he was here*), *mam nadzieję* is the modus, *on tu był* is the dictum.

The function of the modus can be fulfilled by lexical elements of various types. It is therefore incorrect to introduce an artificial differentiation between utterances in which the modus has a one-word form and those in which it is a phrase; utterances in which the modus is a verb and those where its function is fulfilled by a particle or an adverb.

At this point emerges the problem of content relationships between the modus and the dictum. To what does the modus essentially refer? The issue is quite clear in the case of modal verbs such as *sądzę* (*I suppose*), *przypuszczam* (*I assume*) etc., in the constructions *sądzę, że* (*I suppose that*) + dictum. In the utterance: *Sądzę, że on tu był* (*I suppose that he was here*) the entire modus *sądzę* refers to the phrase *on tu był*. But what is the situation in utterances in which such modus as *chyba*, *przypuszczalnie* or *jak myślę* (*may/maybe*, *possibly*, *as I think*) does not precede the dictum, but is located inside it? It cannot be assumed that the *chyba E* in the utterance *On siedział u mnie chyba do dziesiątej* (*He sat at my place until maybe ten o'clock*) refers directly to the entire utterance outside of *chyba*. In such utterances the element which has the function of the modus (henceforward, for short, E_m) refers to the foreground predicate, i.e. to what the speaker considers most important in the entire utterance and what is accentuated by the logical stress. In the utterance: *Słońce zaszło chyba dawno* (*The sun may have set a long while ago*) what is being said is not that the sun has set, but that its setting happened (presumably) a long while ago. Incidentally, E_m does not have to stand right by the main predicate; for instance, in the utterance: On *chyba to wtedy zrobił przez pomyłkę* (*I suppose he did that then by mistake*) E_m *chyba* refers to the phrase *przez pomyłkę* (*by mistake*), which is accentuated as the *MP* by the logical stress. In order to emphasise semantic relationships occurring in utterances with E_m placed inside the dictum, it is possible to paraphrase them as utterances with a nominal predicate:

Słońce zaszło chyba dawno. (*The sun may have set a long while ago.*)

→ *Zajście słońca było chyba dawno.* (*The sunset may have been a long while ago.*)

Jan czytał, jak sądzę, niewiele. (*John, I think, read very little.*)

→ *Tego, co Jan czytał, było jak sądzę niewiele.* (*There was, I think, very little of what John read.*)

Such utterances as the paraphrases above are not usually used in the language; they are cited here exclusively in order to emphasise the semantic relationships under discussion.

Examples of sentences with more complicated relationships can easily be found, however. The utterance: *Przyszedł do mnie Stefan ze swoim chyba najstarszym synem* (*Steven came to me with his son, the eldest, I think*) may be uttered with the emphasis on *Stefan* as the main predicate, while *chyba*, serving here as the modus, indisputably refers to *najstarszym*: this is indicated by its position. Also, this utterance cannot be paraphrased thus:

Przyszedł do mnie Stefan ze swoim chyba najstarszym synem (*Steven came to me with his son, the oldest, I think*)

→ *Ten syn Stefana, z którym on do mnie przyszedł, jest jego najstarszym synem* (*That son of Steven's, with whom he came to me, is his eldest*)

One solution is to assume that we are dealing here with two messages: one that Steven came to me with his son, and the other that this son was Steven's eldest. This approach may be supported for instance by the way stresses are placed. It must be noted that although *Stefan* may be the main predicate of the whole, a stronger stress falls also on *najstarszym* (*eldest*) — at least it is definitely a stronger stress than on *swoim* (his) or on *synem* (*son*).

Generally, therefore, it can be assumed that in such utterances as those cited above, the element serving as the modus refers to the main predicate of the utterance and, in concert with the logical stress, points to which section of that utterance is its main predicate.

We would, therefore, be dealing with the following situation: E_m may refer to either the entire utterance outside it, or to the main predicate of that utterance. In reference to this, two types of modality have been distinguished: sentential modality and segmental modality (cf. e.g. Adamec 1971; Ermolaeva 1963; Svoboda 1966 and others[2]). It seems, however, that there is no essential difference between the two. If a given E_m (or any other E) refers to entire utterance outside it, as for instance in:

Myślę, że on tu był wczoraj (*I think he was here yesterday*),

it refers mainly to this part of that utterance which can be shown to be the main predicate by stressing it in speech, and by using word order or through the broad context in writing. If, in turn, an E_m(or other E) refers

[2]Terms used by those authors differ, but their opinions are similar.

directly to that main predicate, as in:

On tu był chyba wczoraj

Chyba on tu był wczoraj

On chyba tu był wczoraj[3]

then through the main predicate it refers to the entire utterance. There is no essential difference in meaning between the following utterances:

Myślę, że on tu był wczoraj (*I think he was here yesterday*)

On tu był chyba wczoraj (*He may have been here yesterday*)

The only difference is that in utterances with such E_m as *myślę*, *sądzę* etc. only the logical stress or the word order indicate which part is the main predicate (cf. *Myślę, że on tu wczoraj był*), while in utterances with E_m of the *chyba* type the *MP* is indicated, to a certain extent, also by the position of that E_m.

From the above classification it transpires that utterances containing E_m may be included in two of the groups distinguished earlier: the first and the third one. Let us consider the differences between those two types of E_m usage.

1. E_m are present in utterances whose topic is the proposition that constitutes them (E_m are the *MP*).

These utterances are about the speaker. They tell us mostly about the attitude of the speaker to the veracity of the judgment expressed in the dictum. Here E_m's occupy the position of main predicates, in speech they are most often emphasised with sentence stress. The following utterances are examples of that:

Jestem absolutnie pēwien, że on tam był. (*I am absolutely cērtain that he was there.*)

Ja wātpię, czy on to potrafi zrobić. (*I dōubt that he can do it.*)

Mōim zdaniem było to trochę inaczej. (*In mȳopinion it happened a bit differently.*)

Możlīwe jest małe opóźnienie. (*A small delay is pōssible.*)

Utterances of this type are used when the *S* expresses either a strong certainty or a strong doubtfulness, emphasises the subjectivity of the judgment, or concedes its objectivity. The last circumstance is not contradictory to the proposition that we are dealing with utterances about the *S*. Both in the sentence: *Możlīwe jest małe opóźnienie* (*A small delay is pēssible*) and the sentences of the *Ona na pēwno była ładna* (*She was cērtainly lovely*) type (as opposed to sentences of the *Ona na pewno była łādna* (*She was certainly*

[3]All these sentences signify *He may have been here yesterday*, with different meanings possible due to stress variation (translator's note).

lévely) type) tell us about the S and about the fact that he considers some judgment as close to the truth or far from it, and only later about what that judgment may have been.

Not all the E_m's may be used in those situations. Those E_m's which express the relatively low level of the speaker's certainty regarding the truth of the judgment (such as *przypuszczam*, *chyba*, *może*, *prawdopodobnie*, *pewnie* (*I suppose*, *maybe*, *possibly*, *presumably*, *certainly* etc.) may become the *MP* only when the recipient's attention is directed to the fact of this and not any other E being used, as for instance in the following utterances:

Nie mówię, że wiém, ale przypūszczam, że on przyjdzie. (*I am not saying I knéw, but I presūḿe he will come.*)

(*— Czy on przyjdzie?*) *— Méże przyjdzie.* (*— Will he come? — Māýbe he will come.*)

In the second example, the sentence may be interpreted as: *Nie mówię „przyjdzie", ale „może przyjdzie"* (I am not saying "he will come" but "maybe he will come").

2. E_m are present in utterances whose topic is the subject of the judgment (E_m are not the *MP*).

The E_m's are not the main predicates here, they are not emphasised by sentence stress. The main predicates of such sentences are the main predicates of the sentences that function as the dictum. Let us compare two sentences:

Jestem péwien , że Jan tam był (*I am cértain that John was there*)

Jestem pewien, że Jan tam bȳ́ł (*I am certain that John wāś there*).

The first is an utterance about the speaker. It tells us that he is certain of the veracity of the sentence *Jan tam był* (*John was there*): E_m is the main predicate here.

The second is about John. It tells us that the speaker is certain that John was there. E_m is not the main predicate here. Utterances of this type tell us mainly about what judgment the speaker is expressing his attitude to (one way or another).

A special type of E_m usage is involved in situations when the subjective uncertainty of the speaker does not refer to the veracity of the occurrence or non-occurrence of the fact described in the dictum, or to the true state of affairs that the dictum states, but to the aptness of some expression that the S had used. This E_m usage may be described as meta-lingual. It does not speak of any extra-lingual reality, but only expresses doubt as to the adequacy of the description of reality by a given expression or expressions. The described reality itself is very well known to the speaker, but he is not

certain whether he has been able to describe it aptly, or he is not certain whether the inclusion (by naming) of something among the phenomena of this or that type is justified. The following sentences are examples of utterances with E_m in this function:

To jest chyba zielone (*This is green, I think*)

(the S knows what it is like, but is not sure whether it can be called green).

Myślę, że on jest przystojny (*I think he is handsome*)

this sentence can be interpreted as:

Myślę, że mogę go nazwać przystojnym (*I think I can call him handsome*).

The sentence: (*— Co to jest?*) *— To chyba antylopa gnu.* (*— What is this? — Perhaps it's a wildebeest*) should, in my opinion, be interpreted as:

To zwierzę nazywa się chyba „antylopa gnu" (*Perhaps this animal is called "wildebeest"*).

Usages of this type occur particularly frequently in sentences with a nominal predicate, because they usually involve the possibility of naming something in some way. Other utterances are also possible, however, e.g.:

On chyba się czołga, a nie pełza (*I think he is creeping, not crawling*),

which means: *To, co on teraz robi, nazwałbym raczej czołganiem się, a nie pełzaniem* (*What he is doing now I would call creeping rather than crawling*). That last sentence can be used in a situation when the S is very well able to see what the person in question is doing, but is unsure how to call that action. If, seeing a silhouette moving in the distance, we say: *On chyba biegnie* (*I think he is running*), our uncertainty refers not to the designation of its way of moving, but to what that person is really doing.

The E's whose usage is limited to these types of situations are, for instance, (*to*) *mi wygląda* (*na*)*...* (*it seems to me to be...*), *można to nazwać* (*it can be called*), *można powiedzieć* (*it can be said*) etc. The last E here is used mainly in sentences with a nominal predicate (*Można powiedzieć, że to jest wspaniałe — This can be said to be wonderful*). E_m's frequently used in this situation are *chyba* (*may/maybe/perhaps*) and *raczej* (*rather*).

Clarification is necessary here, however. All applications of E_m may, theoretically, be one way or another reduced to hesitation regarding the choice of expression. For instance, in the sentence: *On chyba tam był* (*I think he was there*), hesitation between *był* (*was*) and *nie był* (*wasn't*) can be discerned. Nevertheless, in those cases, that hesitation as to the choice of expression is accompanied by hesitation as to the choice of judgment. When an utterance of the *to jest chyba zielone* (*this is green, I think*) type is used, it seems that hesitation as to the choice of expression is identical to

hesitation as to the choice of judgment.

Intuitively, we are apt to divide all the expressions informing on S's less-than-full conviction regarding the veracity of the dictum into those which express a supposition that the judgment expressed in the dictum is true, and those which express a supposition that the judgment expressed in the dictum is false. These expressions may be called, respectively, E's expressing supposition (E_s for short) and E's expressing doubt (E_d).

It may seem that, fundamentally, E_s and E_d have a similar nature. If the sender neither affirms nor negates some judgment, he may have a two-fold attitude to it: he may be leaning towards considering it true or towards considering it false. In both cases, however, the judgment in question will be the same (regardless of whether this judgment contains a negation or no). Thus, the utterance: *Przypuszczam, że on nie przyjdzie* (*I assume he will not come*) and *Wątpię, czy on przyjdzie* (*I doubt he will come*) refer to the same judgment, *on przyjdzie* (*he will come*), and express the same content. What is different is only the manner of expressing that content; but perhaps there is no need to suggest here the existence of any particularly essential differences between supposing and doubting.

Yet the difference between supposing and doubting is indicated by the following facts.

From the psychological point of view, supposing something is linked with a certain "positive" state of the mind, whereas doubting — with a "negative" one. In my opinion, Peirce's reflections on the nature of conviction and doubt (cf. Dobrosielski 1967: 103) and their mutual relationship may be applied (with some reservations) also to the nature of the relationship between supposing and doubting.

In the case of a supposition, we are usually speaking of some reality — we suppose that something is this or that way; in any case, we are referring to some facts (or at least we can refer to them). In the case of doubt, we are expressing our (negative) attitude only to the possibility of accepting some already-formulated judgment as true, even if that judgment were not verbally expressed. In other words, we are then not speaking directly about reality, to which some judgment refers, but about the judgment, and often even about a concrete utterance. Of course, using the *E przypuszczam* (*I suppose*) we may also speak about an utterance, but we may "suppose" anything, whereas we may "doubt" only something that has been in some way formulated.

When a sentence: *Wątpię, czy Piotr był na koncercie* (*I doubt Peter was at the concert*) opens some larger text, this sentence contains the

suggestion that it was possible to suppose, or that someone is supposing, that Peter did attend the concert. If, however, this text begins with the sentence: *Przypuszczam, że Piotr był na koncercie* (*I suppose Peter was at the concert*), it is not thereby suggested that there exists, or may exist, some judgment opposite to that contained in the dictum. To compare: it is not usual to begin an "independent" text (that is one not referring to other texts) from such sentences as *Nieprawda, że pociąg odszedł* (*It is not true the train had gone*).

The inventory of E's expressing supposition cannot be broadened to include E's expressing doubt; yet if an E_s is negated, we may obtain an E_d.

Let us compare the following utterances:

Wątpię, żeby mu się to udało (*I doubt he will be able to achieve this*)

Nie przypuszczam, żeby mu się to udało (*I don't suppose he will be able to achieve this*).

In the first utterance, the sender is aware of some "active" approach to the veracity of the judgment contained in the dictum (henceforward this will be shortened to *DJV* — dictum judgment veracity) which springs from the attitude of doubt.

In the second utterance, the sender does not speak directly of his having any active approach to the *DJV*, but he does speak of not having a certain active approach to the absence of supposition. The fact that the sender does not have the attitude of "supposing" towards the *DJV* may, for instance, signify that he has no basis for making a supposition. Essentially, however, the S is informing us about some attitude of his towards the *DJV* — he is formulating a dictum and he does not consider whatever the dictum expresses to be probable or possible. In practice, this means that he considers that which the dictum expresses to be impossible or not very probable. "Not supposing" is a similarly (if perhaps slightly more weakly) active approach to the *DJV* as supposing — or doubting. In other words, *nie przypuszczam* (*I don't suppose*) can be substituted in utterances with *wątpię* (*I doubt*) rather than with *nie jest tak, że przypuszczam* (*it is not so that I suppose*)[4].

A certain differentiation has to be made, however. The *E nie przypuszczam* and similar E's may appear in the construction of the *nie przypuszczam, żeby* + dictum type, as well as in the construction of the *nie przypuszczam, że* + dictum. There is a difference between the meaning of those two constructions. Let us compare the following utterances:

[4]This does not refer to past tense forms. *Nie przypuszczałem* (*I did not suppose*) will never mean *wątpiłem* (*I doubted*); it means: *nie jest tak, że przypuszczałem* (*it is not so that I supposed*).

Nie sądzę, że to był on (*I don't think that it was he*)

Nie sądzę, żeby to był on (*I don't think that it could have been he*)

Nie przypuszczam, że to było tak (*I don't suppose that it happened thus*)

Nie przypuszczam, żeby to było tak (*I don't suppose that it could have happened thus*)

All those utterances refer to the situation of doubting. However, the utterances *Nie sądzę, że to był on* and *Nie przypuszczam, że to było tak* intuitively seem closer to negation than the other two utterances.

Let us, in turn, compare the following:

Przypuszczam, że mu się to uda (*I suppose he will manage to achieve this*)

Nie wątpię, że mu się to uda (*I have no doubt that he will manage to achieve this*)

Here, the relationship is slightly different. We immediately notice a fundamental distinction between the two utterances. The second, it is true, does not speak about the existence of some attitude $S : DJV$, but about its absence; yet this absence is an absence of doubt. The absence of doubt means certainty. Such an E as *nie wątpię* (*I don't doubt*), when with the logical stress, emphasises an affirmation of the judgment contained in the dictum to which it refers. The fact ~~of~~ that using this E without the logical stress indicates that this attitude is not "purely affirmative". Then, the situation is the same as in utterances with the non-stressed *na pewno* (*certainly*), which, contrary to appearances, contain some suggestion of uncertainty. Usually, however, such *E*'s as *nie wątpię* occur with the logical stress.

Generally, it may be stated that $\sim E_s$'s (negated *E*'s expressing supposition) are semantically similar to E_d's, whereas utterances with negated *E*'s expressing doubt are close to categorical utterances. *Nie wątpię*, *nie mam wątpliwości*, *nie ulega wątpliwości* (*I don't doubt*, *I have no doubt*, *undoubtedly*) can be included among such $\sim E_d$'s.

However, negatives of stressed *E*'s of the *jestem pewien*, *jestem przekonany* (*I am sure*, *I am convinced*) etc. type cannot be included among the E_d's. This is because, essentially, *nie jestem pewien, czy tak a tak* (*I am not sure whether this or that*) does not express supposition that it is not so that this or that, but often quite the opposite, cf.:

Nie jestem pewien, czy przyjdzie, ale przypuszczam, że tak (*I am not sure whether he will come, but I suppose he will*)

and also: *Nie jestem pewien, czy jest tak, czy inaczej* (*I am not sure if it is thus or otherwise*). The expression *nie jestem pewien, czy* (*I am not sure whether*) opens both the possibilities. This expressions is, in a sense,

analogous to *Nie wiem, czy jest tak a tak* (*I don't know whether this or that*).

Certain symmetrical relationships can be observed between some E's expressing stressed affirmation, stressed negation, supposition and doubt (i.e., respectively: certain, inconceivable, possible/probable and doubtful) and their negations (i.e. uncertain, conceivable, impossible/improbable and undoubted). With respect to meaning, there are the following pairs of counterparts:

stressed affirmation (±): negation of doubt (∼ d)
stressed negation (=): negation of supposition (∼ s)
negation of stressed affirmation (∼ ±): doubt (d)
negation of stressed negation (∼ =): supposition (s)

The following table illustrates those relationships:

	(±)	(—)	
(∼ d)	certain = undoubted a)	inconceivable = impossible/improbable c)	(∼ s)
(d)	uncertain = doubtful b)	conceivable = possible/probable d)	(s)
	(∼ ±)	(∼ =)	

a) *Jego powrót jest pewny.* (*His return is certain.*)
Jego dobra wola jest niewątpliwa. (*His goodwill is undoubted.*)
b) *Wątpliwe, czy on przyjdzie.* (*It is doubtful that he will come.*)
Jego powrót jest niepewny. (*His return is not certain.*)
c) *Wykluczone, żeby on to zrobił.* (*It is inconceivable that he would do this.*)
Niemożliwe, żeby to było tak. (*It is impossible to have happened thus.*)
d) *Niewykluczone, że on się jeszcze namyśli.* (*It is conceivable that he changes his mind.*)
Możliwe, że jeszcze przyjdzie. (*It is still possible that he comes.*)

When we are dealing with such modal particles as *chyba*, *może*, *zapewne*, *pewnie*, *na pewno* (*maybe*, *perhaps*, *surely*, *certainly*, *for certain*) etc., establishing the supposition/doubt relationship brings about many reservations.

Generally, such E_m's cannot appear in their negated form, or, more precisely, if we encounter those E_m's with a negation that precedes them and refers to them (i.e. such expressions as *nie chyba*, *nie może*, *nie pewnie* etc.),

then *chyba*, *może* etc. are names of expressions, not expressions themselves. After all, the following utterances are acceptable:

(— *On chyba już tu był.*) — *Nie „chyba", ale na pewno.* (— *Maybe he has been here before. — Not "maybe", but for certain.*)

(— *On pewnie zaspał.*) — *Nie „pewnie" zaspał, ale nie ma najmniejszej wątpliwości, że zaspał.* (— *Perhaps he overslept. — It's not that he "perhaps" overslept, there is no doubt at all that he did.*)

The problem arises whether such utterances as:

On chyba już nie przyjdzie (*Maybe he will not come*)

Chyba nie wiedział, o czym mówiliśmy (*Maybe he didn't know what we were speaking about*)

should be treated as equivalent to:

Przypuszczam, że on już nie przyjdzie (*I suppose he will not come*)

Przypuszczam, że nie wiedział, o czym mówiliśmy (*I suppose he didn't know what we were speaking about*)

or rather equivalent to:

Nie przypuszczam, żeby on jeszcze przyszedł (*I don't suppose he will come*)

(*Wątpię, żeby on jeszcze przyszedł — I doubt he will come*)

Nie przypuszczam, żeby on wiedział, o czym mówiliśmy (*I don't suppose he knew what we were speaking about*)

(Wątpię, żeby on wiedział, o czym mówiliśmy — *I doubt he knew what we were speaking about*)

In other words, the question is whether such utterances may be broken up thus: *chyba* + dictum (with negation), e.g.:

Chyba: nie wiedział, o czym mówiliśmy (*Maybe: he didn't know what we were speaking about*)

or: *chyba nie* + dictum (without negation), e.g.:

Chyba nie: wiedział, o czym mówiliśmy (*Maybe not: he knew what we were speaking about*).

It is difficult to propose any conclusion to this question that would be final, non-arbitrary and supported with appropriate reasoning.

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AN ATTEMPT AT FORMALISING A DEFINITION OF THE NOTION OF A 'SUMMARY'[1]

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The notion of a summary is universally known and used by documentalists, yet it does not seem to have a precise definition, let alone one that would comply with formal requirements. Which is not to mean that, due to its intuitive character, the interpretation of the term 'summary' or its use causes major confusion. To the contrary — the relevant literature suggests that there is a considerable degree of agreement in this respect. Nevertheless, an attempt to formulate a definition of the concept seems justified, at least from a theoretical point of view.

In all likelihood, the lack of a formal definition may be explained by two factors. Firstly, despite the growing number of academic works on the subject, scientific documentation and information is still, to a large degree, a practical field of study, with a very modest theoretical basis. There is a significant discrepancy between the interests and the theoretical background of the practitioners and that of the scholars. Secondly, the way of understanding a summary as a text which in a brief form conveys all the most important information (the meaning) of the work it summarises has caused problems. Any person with a rudimentary knowledge of semiotics perceives the difficulties related to understanding the message of a text. Moreover, the abovementioned intuitive description of the term 'summary'

[1]The author would like to thank Dr. Witold Marciszewski for reading and commenting on the first version the present work; owing to his remarks it was possible to supplement the current version of the article with comments on the possible objections to the (disputable) solution presented here.

does not simply pertain to any summary, but to a 'good' one. Thus, it adds new requirements for making an appropriate definition, namely the necessity to determine the criterion for comparing and evaluating various summaries of the same document. Such requirements seem justified from the practical point of view, and should therefore be taken into account in the process of formulating a proper definition.

The present attempt complies with the latter condition. It appears that — provided that the definitions proposed here prove acceptable — the problem can be solved by comparing the content of the documents without analysing the details about the matters discussed in the texts or determining the absolute scope of the content of a given document.

Understood as scientific information, documents are texts; thus, the present examination pertains to the set T, containing all texts. The elements of this set shall be labelled as t_i, t_j, t_k, etc. The set should also contain an element t_0, which shall be described as an empty text (i.e. a non-existing one). The necessity to include such a seemingly strange element was discussed elsewhere (Wojtasiewicz 1974).[2]

Each text may be described as a set of sentences; in this light, text t_0 is an empty set of sentences. The consideration does not have to be relativised to a single language, since the set includes texts in various languages; in practice, the summary of a given document is often written in a different language.

Furthermore, each text may be understood as a type, i.e. a class of tokens sharing the same form. This is the view implicitly adopted in practice, as it is entirely irrelevant which one of the 1000 copies of a given text shall become the subject of documentalists' work.

Let us consider the function D, which assigns a certain natural number to each text. The number is interpreted as the measure of the length of the text. We arrive at the following formula:

(1) $D\colon T \rightarrow N.$

Naturally:

(2) $D(t_i) \geqslant 0,$

[2]The concept of an empty text was introduced because legislative documents often contain references to specific regulations in executive decrees, etc., which may not yet exist at the time when the given legislative text is written — and are therefore empty texts.

(3) $(D(t_i) = 0) \Leftrightarrow (t_i = t_0)$.

(The length of any given text is not a negative number, and equals zero only in the case of an empty text).

The manner of calculating this measure is of secondary importance, yet some reservations must be made. Measuring the length of the text (i.e. the cardinality of the set) by the number of its sentences may initially seem the obvious choice (as mentioned above, a text is understood as a set of sentences). We would then arrive at the following formula:

(4) $D(t_i) = \bar{\bar{t}}_i$

It is, however, more advisable to measure the length of the text by different criteria, e.g. by the number of words it contains. An intuitive understanding of the term 'summary' implies that such a document should be shorter than the source text. The number of sentences would only be a valid criterion for comparison if the summary was composed solely of sentences taken from the source document. If even a single sentence is introduced to the summary by its author, the 'number of sentences' criterion would, at least from the theoretical point of view, prove unreliable: such a sentence could be so long that the summary would be longer than the actual text (if measured with criteria other than the number of sentences). A summary of this kind would probably be hard to find in real life, yet theoretical considerations ought to include precautions against such cases. Thus, a sentence (in a purely superficial understanding of the term) fails as a measure of the length of a text, at least for this particular task. Moreover, converting sentences (understood as surface structures) into some smaller semantic units, which would then be used as a criterion for evaluating the length of a text, would create more problems than it would solve.[3]

For this reason it might be more advisable to measure the length of a text on the basis of the number of words it is composed of. In the case of a written document (which is the form of most texts), a word should be understood as a sequence of letters preceded and followed by spaces or a non-letter symbol — with the possible exception of a hyphen, yet this issue is disputable and of secondary importance. This tentative definition may cause problems if, for instance, a Japanese document is summarised in the English language. In such cases the text written in a non-alphabetic

[3]A rather extreme example is Jerzy Andrzejewski's novella *Bramy raju*, which is formally composed of two sentences. The first stretches for several dozen pages, while the second only contains a few words.

script should first be translated into the language used for the summary (in alphabetic notation). In cases of comparing text in two non-alphabetic scripts (e.g. a Chinese document and a Japanese summary), both texts ought to be translated into a third language — one that uses alphabetic writing. In any case, such considerations are rather marginal in nature. From the theoretical point of view it might be assumed that it is always possible to compare the length of a source document with the length of its summary, performing certain auxiliary operations if need be.

Secondly, the measurement of the length of the text may, to a certain specified degree, be an approximation. This may also be considered a purely practical issue irrelevant for theoretical considerations. In this case the text could be measured with units, consisting e.g. of 10 words. The length of the text could then be presented as either the number of complete units or as the total number of units (including the incomplete ones). In the former case, the length measure '10' would apply to text consisting of 100—109 words; in the latter, to documents composed of 91—100 words. From a theoretical point of view, the matter may be of secondary importance — it could, however, have a degree of importance in practice.

To consider the issue further, we need to introduce the notion of a set of the closures of a given set of sentences, which shall be represented as $C(t_i)$ (i.e. the set if the closures of a given text); the notion of a set of logical tautologies, represented as L; and the notion of the set of all sentences, represented as S (Kotarbiński, Marciszewski, Czarnota 1970, entry: *Konsekwencja*).

It shall be assumed as obvious that the same text may have many differing summaries, including many different summaries of the same length.

The terms and premises specified above enables us to formulate a suggestion for a definition, with the proviso that it pertains only to a summary *sensu stricto*, excluding the bibliographical description of the summarised text (such a description is often a part of a summary *sensu largo*, sometimes referred to as an 'abstract'),

(5) $(t_j \in A(t_j)) \Leftrightarrow ((t_9 \neq t_0) \wedge \neg (t_j \subset L) \wedge (C(t_i) \neq S) \wedge (D(t_i)) \wedge (C(t_j) \subset C(t_i)))$.

The above definition should be interpreted as follows: $t_j$is a summary of t_i(or, to be more precise, an element of the set of summaries of t_i, i.e. one of the possible summaries of the text) if and only if: (a) $t_j$is not an empty text, (b) $t_j$is not composed exclusively of logical tautologies, (c) the set of closures of text $t_i$is not equal to the set of all sentences, (d) the length of $t_j$is less than that of t_i, (e) the set of closures of $t_j$is included in the set of closures of t_i.

The interpretation might need further explanation. From the practical perspective, requirements specified in (a), (b) and (c) may not only seem redundant, but even funny. They must, however, be included in order to eliminate eventualities which are theoretically possible, yet do not occur in real life (though precondition (c) may raise some doubts in this respect). A summary cannot be an empty text, because the set of closures of an empty text is included in the set of closures of all texts, and so, theoretically, if requirement (a) was not added to the formula, an empty text could serve as a summary to all existing documents (naturally, in practice an empty text is a non-existing one and, as such, cannot be treated as a summary).

Logical tautologies are closures of any given set of sentences — including an empty one. Thus, it is necessary to supplement the formula with requirement (b), stating that $t_j$cannot only comprise tautologies. Otherwise such a text would also serve as a summary for all documents.

Requirement (c) would not be fulfilled if $t_i$included contradictory sentences, since in this case the set of closures of text t_i would be equal to the set of all sentences, and would therefore incorporate the set of closures of every text. Be that as it may, many doubts arise at this point, since it is often impossible to determine whether a text that is being summarised complies with this requirement. There is no proof for the non-contradictoriness of arithmetics, and so all texts employing the apparatus of this branch of science are at risk of not being compliant with (c). It appears that the requirement should be included for the sake of theoretical accuracy, even though one has to bear in mind that it may often remain unfulfilled.

Requirements (d) and (e) pertain to matters significant from the practical point of view: (d) specifies that a summary must be shorter than the source texts, whereas (e) postulates that the content of a summary cannot exceed the content of the source document (it would then cease to be merely a summary, but would acquire the features of e.g. a commentary).

It is not necessary to supplement the *definiens* with a requirement specifying that $t_i$may not be an empty text. This prerequisite is implied in other elements of the definition and the previous assumptions: if t_j is not an empty text, its length must exceed 0; and given that the length of $t_i$is more than that of t_i, it must also exceed 0 and thus $t_j$is not an empty text.

Another obvious fact implied in the above definition is that no text can act as its own summary, because a summary must be shorter than the source document. Therefore:

(6) $\neg\ (t_i \in\ A(t_i))$.

Certain issues have been disregarded in formula (5): it is not relativised with regard to the reader of the text and their ability or capability to identify the closures of a given text. The reader is assumed to be if not ideal then at least possessing enough intellectual skill to arrive at the correct closures of a given text. This may certainly be viewed as a major simplification of the matter, yet in practice the users of documents are also assumed to have attained a certain level of intellectual competence. Furthermore, the definition could be expanded so that the last element of the *definiens* specifies that "for every user compliant with certain requirements the set of closures of $t_j$is incorporated in the set of closures of t_i."

The definition presented above contains one more controversial simplification. It disregards the fact that, in practice, the user arrives at its closure not only on the basis of a given text, but also by using their empirical knowledge relevant to a given issue. This constitutes a major complication, since it is often difficult to specify what knowledge may be considered relevant for a given issue, and many discoveries have been made precisely because someone noticed a connection where others had not. The final element of the *definiens* in (5) may be modified e.g. to:

(7) $(C(t_j \cup E) \subset C(t_i \cup E))$,

where E would signify a certain set of sentences representing empirical knowledge. Such an addition would not, however, constitute a valuable contribution for the purposes of the present analysis.

A more paradoxical consequence of definition (5) is that according to this formula each sentence taken from the text may be regarded as a summary of the said text, as it complies with all the requirements specified in (5). This is because (5) determines only the formal conditions that must be fulfilled for a given text to serve as a summary of a certain other text. Intuition dictates that a summary needs to be 'good', i.e. contain all elements included in the content of the text and considered 'important'. Thus, a definition of a 'good' summary would have to refer to a definition of an 'important' element of the content. Formulating such a definition appears to be a near impossible task, which would, at the very least, require extensive analysis. Perhaps somewhat surprisingly, it appears that it is possible to formulate a definition of an optimal summary of a given text with the proviso that only summaries of a certain specified length are taken into account. The suggested definition takes the following form:

(8) $(t_j \in A^n{}_{opt}(t_i)) \Leftrightarrow$

$$((t_j \in A)\ t_i)) \wedge$$
$$(D(t_j) = n) \wedge$$
$$\bigwedge_k((t_k \in A(t_i)) \wedge (D(t_k) \leqslant n)) \Rightarrow (C(t_k) \subset C(t_j))).$$

In this case the first requirement specifies that $t_j$is a summary of t_i, the second one determines that the length of the summary is n, and the third postulates that the set of closures of any summary of text t_i is included in the set of closures of t_i, if the length of such a summary does not exceed n. (Inclusion is understood in accordance with the tradition of set theory, as improper inclusion in the sense that every set is included in itself, i.e. constitutes its own subset.)

The above definition does not imply that for a given text there exists only one optimal summary the length of which does not exceed a certain specified n. Such an assumption seems intuitive: it is easy to imagine two summaries of the same document, both identical in length, but slightly different in content — i.e. formally differing summaries that would include the same content.

Definitions (5) and (8) appear to at least partially fill the gap in the theoretical representation of the term 'summary'. In spite of all the limitations of the method presented above, the possibility of comparing the extent of the content may be worthy of further consideration.

The notion of closure and a set of closures in research on natural languages was most probably introduced by Carnap. As regards Polish scholars, the terms were referred to by Irena Bellert (1972), but in a rather intuitive manner; Bellert appears to have disregarded the situations that might, in practice, be of little interest to a linguist. If the definition suggested above proves useful in theory (if in nothing more), it will be possible to employ the method in future research.

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SENTENCES WITH THE PREDICATE *ZALEŻY* [depend (on)] AND TWO INDIRECT-QUESTION ARGUMENTS

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0. The title of the present article refers to an issue so specific that we ought to start with a justification.

In many descriptive works on the grammar of the Polish language indirect questions are identified with reported questions, i.e. questions in reported speech (cf. Świdziński 1975: 209-210). However, the material presented by the authors of such publications usually includes sentences with predicates which are never used to introduce a question (such as, e.g., powie*dzieć [tell*], napis*ać [writ*e], dać z*nać [let* ... know], wyczy*tać [read* sth from], myśle*ć [thin*k], wiedz*ieć [kno*w], wątpi*ć [doub*t], chodz*i o to, czy (kto) ... [*the thing is whether (who) ...], jest *obojętne, czy (kto) ... [*it makes no difference whether (who)...], etc.). The defective verb zależ*y [depe*nd (on)] (which does not conjugate for person) should be included in the last group of predicates. It is hope that the analysis of sentences with this predicate will lead to more general conclusions, which, moreover, are not connected with the issue of reported speech.

1. Here are some examples of sentences with this predicate:

(1) *Od decyzji Janka zależy koniec afery.* [The end of the scandal depends on Janek's decision.]

(2) *Wynik meczu będzie zależeć od tego, co postanowi sędzia.* [The result of the match will depend on what the referee will decide.]
(3) (*Czy kupisz tę książkę?*) — *To będzie zależało od tego, kiedy nauczę się angielskiego.* [(Will you buy this book?) This will depend on when I master English.]
(4) *To, czy pojedziemy do Krakowa, zależy od pieniędzy.* [Whether we'll go to Cracow (or not) depends on the money.]
(5) *To, czy pojedziemy do Krakowa, zależy od tego, czy dostaniemy pieniądze.* [Whether we'll go to Cracow (or not) depends on whether we'll get the money.]
(6) *To, czy pojadę do Krakowa, czy nad morze, czy też wybiorę się do Bułgarii, zależy od tego, czy szef zwolni mnie w czerwcu, czy w ogóle nie dostanę urlopu.* [Whether I'll go to Cracow, to the seaside or to Bulgaria depends on whether the boss will fire me in June or whether I'll get any leave at all.]
(7) *To, dokąd Jan pojedzie, zależy od tego, kto go zaprosi.* [Where Jan will go to depends on who will invite him.]
(8) *To, dokąd Jan pojedzie, zależy od tego, czy ktoś go zaprosi.* [Where Jan will go to depends on whether anyone will invite him.]
9) *To, czy Jan gdzieś pojedzie, zależy od tego, kto go zaprosi.* [Whether Jan will go anywhere depends on who will invite him.]

As we see, *zależy* is a predicate that takes two arguments, which are either (a) two nouns (one in the nominative case; the other in the genitive, accompanied by the preposition *od* (cf. (1)), or (b) two clauses (cf. (5), (7)—(9)) or sequences of clauses (i.e. a coordinated clause; cf. (6)), or (c) a noun and a clause; in this case the clause either takes the position of the noun in nominative (cf. (4)) or of the noun in genitive (cf. (2), (3)). The question arises which of those construction types is semantically primary.

Consider the following pair of utterances:

(10) *Jan kupił książkę.* [Jan bought a book.]
(11) *Jan kupił (to), co miał kupić.*[1] [Jan bought what he was supposed to buy.]

It is clear that the former example represents the basic form of the structure, while the latter being the result of substituting the nominal complement by a clause. Such is the view of traditional and early generative grammarians. However, in case of (1)—(9), semantic analysis leads to the opposite conclusion. There are many ways in which (1) can be interpreted,

[1]The pronoun *to* introducing the subordinate clause can be omitted.

e.g.:

(12) *To, czy afera się skończy, zależy od tego, czy Jan podejmie decyzję.* [Whether the scandal will end depends on whether Jan will make a decision or not.]
(13) *To, jak afera się skończy, zależy od tego, czy Jan podejmie decyzję.* [How the scandal will end depends on whether Jan will make a decision or not.]
(14) *To, czy afera się skończy, zależy od tego, jaką decyzję Jan podejmie.* [Whether the scandal will end depends on what decision Jan will make.]
(15) *To, jak afera się skończy, zależy od tego, jaką decyzję Jan podejmie.* [How the scandal will end depends on what decision Jan will make.]

This suggests it is sentences with the clausal component (i.e. (5)—(9)) that are (semantically) primary. It should also be added that the following sentences are not acceptable:

(16) **Stół zależy od okna.* [*The table depends on the window.]
(17) **Jan zależał od czekolady.* [*Jan depended on chocolate.]

Let us consider the following utterances:

(18) *Wszystko zależy od ciebie.* [Everything depends on you.]
(19) *Wszystko będzie zależało od koloru krzeseł.* [Everything will depend on the colour of the chairs.]
(20) *Jan zależy od Piotra.* [Jan is dependent on Piotr.]
(21) *Janowi zależy, żeby Piotr przyszedł.* [It matters to Jan that Piotr should come.]
(22) *Janowi zależy na Piotrze.* [Jan cares for Piotr.

It is easy to see that (18) and (19) are elliptical, which means that they cannot be interpreted when examined in isolation, as would be required by the principles of semantic analysis. Sentence (20) involves a regular verb *zależeć*, synonymous to *podlegać (komu)* [be subordinate to (someone)]. The analysis of this predicate lies beyond the scope of the present work. The defective verb *zależy* used in (21) and (22) has a completely different syntax and meaning — it is equivalent to *nie jest obojętne* [is not indifferent to] (Doroszewski 1971: 594). Examples like (21), (22) will not be discussed in this paper.

It appears therefore that the noun phrases in (1)—(4) are not semantically primary. In fact, they are nominalisations of some sentences, which in most cases cannot be determined or guessed beyond doubt. Examples (16) and (17) seem unacceptable precisely due to the fact that the elements they contain cannot be interpreted as nominalisations (except for very specific contexts or situations).

Since the following sentences are incorrect:

(23) **To, że pojedziemy do Krakowa, zależy od tego, czy dostaniemy pieniądze.*
[*That we'll go to Cracow depends on whether we will get the money.]
(24) **To, czy pojedziemy do Krakowa, zależy od tego, że dostaniemy pieniądze.*
[*Whether we will go to Cracow (or not) depends on that we will get the money.]
(25) **To, że pojedziemy do Krakowa, zależy od tego, że dostaniemy pieniądze.*
[*That we'll go to Cracow depends on that we will get the money.]

the minimal function (Bellert, Saloni 1972: 226) for such sentences is as follows:

(26) PZ_1 — *zależy (od tego)* — PZ_2. [PZ_1 — *depends (on)* — PZ_2]

where *PZ* stands for an indirect question, i.e. a clause homographic with a direct question.[2] In (5), (6) the PZ_1 and PZ_2 are homographic with whether-questions, the PZ_1 and PZ_2 in (7) are WH-questions, wher[3]eas (8) and (9) containing both types thereof.

2. It is easy to show that the predicate *zależy* is not its own converse. The following examples are not equivalent to (5) and (7), respectively:

[2]The concept of 'homography' (used instead of 'homonymy') allows us to avoid the prosodic opposition between direct and indirect questions. Naturally, in the written language direct questions begin with a capital letter and end in a question mark. It must be added that we will not discuss the formal distinction between indirect questions and relative clauses. A comprehensive though hardly conclusive analysis of the differences between these structures are to be found in Carl LeRoy Baker's dissertation *Indirect Questions in English* (1968: 7-30). Perhaps there exists a prosodic difference (cf. section 5); some utterances undoubtedly are ambiguous in this respect, e.g. the second argument in utterance (7) is to be understood as either an indirect-question, or relative clause. Section 5 of the present article will present some prosodic features.

[3]The term is clarified in: Świdziński 1973: 229, 236-241.

(27) *To, czy dostaniemy pieniądze, zależy od tego, czy pojedziemy do Krakowa.* [Whether we'll get the money depends on whether we'll go to Cracow.]
(28) *To, kto Jana zaprosi, zależy od tego, dokąd Jan pojedzie.* [Who will invite Jan depends on where he will go.]

Consider now the example (5):

(5) *To, czy pojedziemy do Krakowa, zależy od tego, czy dostaniemy pieniądze.* [Whether we'll go to Cracow (or not) depends on whether we'll get the money.]

The addressee of (5) can understand it in one of those ways:

(29) (a) *Jeśli dostaniecie pieniądze, to pojedziecie do Krakowa.* [If you'll get the money, you will go to Cracow.]
(b) *Jeśli dostaniecie pieniądze, to nie pojedziecie do Krakowa.* [If you'll get the money, you will not go to Cracow.]
(c) *Jeśli nie dostaniecie pieniędzy, to pojedziecie do Krakowa.* [If you won't get the money, you will go to Cracow.]
(d) *Jeśli nie dostaniecie pieniędzy, to nie pojedziecie do Krakowa.* [If you don't get the money, you will not go to Cracow.]

Note that the following sentences are semantically deviant:

(30) **To, czy pojedziemy do Krakowa, zależy od tego, czy dostaniemy pieniądze, bo jeśli dostaniemy, to albo pojedziemy, albo nie, i jeśli nie dostaniemy, to też albo pojedziemy, albo nie.* [*Whether we'll go to Cracow (or not) depends on whether we'll get the money, because if we do get it, then we'll either go or not, and if we don't get it, then we'll either go or not, as well.]

(31) **To, czy pojedziemy do Krakowa, zależy od tego, czy dostaniemy pieniądze, bo jeśli dostaniemy, to pojedziemy, a jeśli nie dostaniemy, to też pojedziemy.* [*Whether we'll go to Cracow (or not) depends on whether we'll get the money, because if we do get it, then we'll go, and if we don't get it, then we'll go too.]
(32) **To, czy pojedziemy do Krakowa, zależy od tego, czy dostaniemy pieniądze, bo nie ma żadnego związku między dostaniem przez nas pieniędzy a pojechaniem do Krakowa.* [*Whether we'll go to Cracow (or not) depends on whether we'll get the money, because there is no connection between us

getting the money and us going to Cracow.]

Examples (33) — (35), in turn, are perfectly appropriate:

(33) *To, czy pojedziemy do Krakowa, zależy od tego, czy dostaniemy pieniądze, bo jeśli nie dostaniemy, to albo pojedziemy, albo nie, a jeśli dostaniemy, to pojedziemy.* [Whether we'll go to Cracow (or not) depends on whether we'll get the money, because if we don't get it, then we'll either go or not, and if we do get it, then we'll go.]
(34) *To, czy pojedziemy do Krakowa, zależy od tego, czy dostaniemy pieniądze, bo jeśli dostaniemy, to nie pojedziemy, a jeśli nie dostaniemy, to pojedziemy.* [Whether we'll go to Cracow (or not) depends on whether we'll get the money, because if we do get it, then we will not go, and if we don't get it, then we'll go.]
(35) *To, czy pojedziemy do Krakowa, zależy od tego, czy dostaniemy pieniądze, bo jeśli dostaniemy, to nie pojedziemy.* [Whether we'll go to Cracow (or not) depends on whether we'll get the money, because if we do get it, then we will not go.]

As easy to see, each indirect question in (5) has two propositions, an affirmative and a negative one. Examples (30)—(32) rules out the following options: that both propositions of PZ_2 imply both propositions of PZ_1 (cf. (30)); that each of the propositions of PZ_2 implies one and the same proposition of PZ_1 (cf. (31)); and that none of the propositions of PZ_2 implies any of the propositions of PZ_1 (cf. (32)). One of the propositions of PZ_2 simply must be a marked proposition: the one that implies a sentence (or sentences) other than the other proposition (cf. (33), (34)). As for (35), it seems ambiguous. The addressee of (35) may be asked a further question:

(26) *A co będzie, jeśli nie dostaniecie pieniędzy?* [And what will happen if you don't get the money?]

to which the addresser might reply:

(37) (a) *Jeśli nie dostaniemy, to albo pojedziemy, albo nie.* [If we don't get it, then we'll either go or not.] (cf. (33))
(b) *Jeśli nie dostaniemy, to pojedziemy.* [If we don't get it, then we'll go.] (cf. (34))
(c) *Nie wiem.* [I don't know.]

(d) *Nie powiem.* [I won't tell (you).]

Let us recall what follows from our analises of examples like (5), (30)—(35). Given that:

i. the examples (33)—(35) which differ in the explanatory component (*because...*) are not equivalent;

ii. none of them is a tautology of the type *x is a driver because x is a chauffeur*; and

iii. the sentence (5) works properly without the explanatory part,

we can see that the addresser of those sentences does not specify (intentionally or due to ignorance) what is the implication of which proposition and whether a given proposition implies anything. What the addresser of (5) says is that there are at least two different propositions of PZ_2, which have different sets of consequents (i.e. the propositions of PZ_1 they imply; in some cases this set can be empty; see below). Let p stand for a proposition of PZ_2, and q for a proposition of PZ_1. We get the following formulæ:

(38) (a) *For* $k = 1, 2, \ldots$ $Q(k) \stackrel{df}{=} \{q : p_k \Rightarrow q\}$
(b) $\bigvee_i \bigvee_{j \neq i} Q(i) \neq Q(j)$

The formula (38a) defines the set of consequents of the proposition p_k in PZ_2; (38b) defines the consequence (in Irena Bellert's sense; cf. Bellert (1971: 157-158) of sentences like (5). Deviant utterances such as (30)—(32) do not fulfill (38b), which is due to their explanatory components (hence the contradiction): in (30), $Q(i) = Q(j) =$ *pojedziemy do Krakowa albo nie* [we will go to Cracow or not]; in (31), $Q(i) = Q(j) =$ *pojedziemy do Krakowa* [we will go to Cracow]; in (32), $Q(i) = Q(j) = \emptyset$. Note that the negated versions of (30)—(32) (those with *nie zależy* [It does not depend...]) are correct, while negation of correct examples (33)—(35) makes them unacceptable.

3. Consider now the example (6), in which PZ_1 and PZ_2 are homographic to disjunctive questions:

(6) *To, czy pojadę do Krakowa, czy nad morze, czy też wybiorę się do Bułgarii, zależy od tego, czy szef zwolni mnie w czerwcu, czy w ogóle nie dostanę urlopu.* [Whether I'll go to Cracow, to the seaside, or to Bulgaria depends

on whether the boss will fire me in June or whether I'll get any leave at all.]

The possible implications are so numerous that it would be senseless to mention all of them. It should be noted that the examples given below, analogous to (33)—(35), are perfectly acceptable:

(39) *To, czy pojadę do Krakowa, czy nad morze, czy też wybiorę się do Bułgarii, zależy od tego, czy szef zwolni mnie w czerwcu, czy w ogóle nie dostanę urlopu, bo jeśli mnie zwolni w czerwcu, to nie pojadę do Bułgarii.* [Whether I'll go to Cracow, to the seaside, or to Bulgaria depends on whether the boss will fire me in June or whether I'll get any leave at all, because if he fires me in June, then I will not go to Bulgaria.]
(40) *To, czy pojadę do Krakowa, czy nad morze, czy też wybiorę się do Bułgarii, zależy od tego, czy szef zwolni mnie w czerwcu, czy w ogóle nie dostanę urlopu, bo jeśli dostanę urlop, ale nie w czerwcu, to pojadę do Bułgarii, albo do Krakowa, w każdym razie nie nad morze.* [Whether I'll go to Cracow, to the seaside, or to Bulgaria depends on whether the boss will fire me in June or whether I'll get any leave at all, because if I do get some leave, but not in June, then I will go to Bulgaria or to Cracow, but definitely not to the seaside.]
(41) *To, czy pojadę do Krakowa, czy nad morze, czy też wybiorę się do Bułgarii, zależy od tego, czy szef zwolni mnie w czerwcu, czy w ogóle nie dostanę urlopu, bo jeśli szef zwolni mnie w czerwcu i w ogóle nie dostanę urlopu, to pojadę do Krakowa i nad morze.*[4] [Whether I'll go to Cracow, to the seaside, or to Bulgaria depends on whether the boss will fire me in June or whether I'll get any leave at all, because if he fires me in June and I won't get any leave at all, then I will go to Cracow and to the seaside.]

As it is easy to see PZ_1 in (6) contains six propositions ($q_1 = q$', $q_2 = \sim q$', $q_3 = q$", $q_4 = \sim q$", $q_5 = q$"', $q_6 = \sim q$"'), while PZ_2 has four ($p_1 = p$', p_2

[4]According to Jerrold J. Katz each disjunctive question presupposes that at least one of the propositions of a given interrogative is true (Katz 1972). Katz defines 'the proposition of a question' as each of its component sentences. In the present article we treat also negative counterparts of component sentences of a disjunctive question as propositions. As a matter of fact, the issue is more than a terminological detail; our understanding of the term 'proposition' seems closer to the way language users understand questions. Technically, propositions are candidates for the proper answer, and negated explicit propositions can freely be used by the addressee of a given direct disjunctive question. As (41) witnesses, the proposed understanding of the term works properly for indirect disjunctive questions as well.

$= \sim p$', $p_3 = p$", $p_4 = \sim p$").[5] It should be added that not only q, but also p can be a combination (disjunction or conjunction) of respective propositions. In any case, (6) fulfils all conditions specified by formula (38b).

4. Let us now analyse exmple (7) in which the indirect questions are homographic to WH-questions:

(7) *To, dokąd Jan pojedzie, zależy od tego, kto go zaprosi.* [Where Jan will go depends on who will invite him.]

The propositions of the indirect questions in (7) are sentential or propositional functions. We can, however, regard the propositions of PZ_1 and PZ_2 as sentences created by substituting the variables specified by the WH-pronouns with respective constants. Of course, sets of such propositions would be infinite; what is shown below are but examples thereof:

(42) PZ_1:

(a) *Jan pojedzie do Koluszek.* [Jan will go to Koluszki.]

(b) *Jan pojedzie za granicę.* [Jan will go abroad.]

(c) *Jan pojedzie do Koluszek lub za granicę.* [Jan will go to Koluszki or abroad.]

(d) *Jan pojedzie tam, gdzie sprzedają piwo.* [Jan will go where beer is sold.]

.....

(43) PZ_2:

(a) *Marysia zaprosi Jana.* [Marysia will invite Jan.]

(b) *Kuzyn zaprosi Jana.* [A cousin will invite Jan.]

(c) *Marysia i kuzyn zaproszą Jana.* [Marysia and a cousin will invite Jan.]

(d) *Każdy, kto będzie mógł, zaprosi Jana.* [Everyone who will be able to will invite Jan.]

.....

As in case of (6), the p_k in PZ_1 or PZ_2 in (7) may be a sentence or a combination of sentences (disjunction; conjunction). Let us check if formula (38b) is also valid for (7).

All examples below are deviant:

[5]The superscripts correspond to subsequent component sentences.

(44) **To, dokąd Jan pojedzie, zależy od tego, kto go zaprosi, bo nikt go nie zaprosi.* [*Where Jan will go depends on who will invite him, because nobody will invite him.]
(45) **To, dokąd Jan pojedzie, zależy od tego, kto go zaprosi, bo nigdzie nie pojedzie.* [*Where Jan will go depends on who will invite him, because he'll go nowhere.]
(46) **To, dokąd Jan pojedzie, zależy od tego, kto go zaprosi, bo sądzę, że nikt go nie zaprosi.* [*Where Jan will go depends on who will invite him, because I suppose that nobody will invite him.]
(47) **To, dokąd Jan pojedzie, zależy od tego, kto go zaprosi, bo sądzę, że nigdzie nie pojedzie.* [*Where Jan will go depends on who will invite him, because I suppose he'll go nowhere.]
(48) **To, dokąd Jan pojedzie, zależy od tego, kto go zaprosi, bo nikt go nie zaprosi i nigdzie nie pojedzie.* [*Where Jan will go depends on who will invite him, because nobody will invite him and he'll go nowhere.]
(49) **To, dokąd Jan pojedzie, zależy od tego, kto go zaprosi, bo sądzę, że nikt go nie zaprosi i nigdzie nie pojedzie.* [*Where Jan will go depends on who will invite him, because I suppose nobody will invite him and he'll go nowhere.]

They are deviant because their explanatory components question the existence of objects satisfying the respective propositional functions in PZ_1 and PZ_2.

The next examples are also deviant, i.e. contradictory sentences:

(50) **To, dokąd Jan pojedzie, zależy od tego, kto go zaprosi, bo jeśli Andrzej zaprosi Jana, to Jan pojedzie za granicę, a jeśli nikt, to za granicę.* [*Where Jan will go depends on who will invite him, because if Andrzej invites Jan, then Jan will go abroad, and if nobody invites him, then he'll go abroad.]
(51) **To, dokąd Jan pojedzie, zależy od tego, kto go zaprosi, bo jeśli Marysia go zaprosi, to pojedzie do Koluszek lub za granicę, a jeśli kuzyn, to nigdzie.* [*Where Jan will go depends on who will invite him, because if Marysia invites him, then he'll go to Koluszki or abroad, and if his cousin invites him, then he'll go nowhere.]

though they obviously fulfill (38b). Thus, (7) seems to imply (52a, b):

(52) (a) *Ktoś zaprosi Jana.* [Someone will invite Jan.]
(b) *Jan gdzieś pojedzie.* [Jan will go somewhere.]

which are contradictory to sentences (53a, b) appearing in the explanatory components of (44)—(51):

(53) (a) *Nikt nie zaprosi Jana.* [Nobody will invite Jan.]
(b) *Jan nigdzie nie pojedzie.* [Jan will go nowhere.]

In the next section we will revise the thesis that (7) implies (52a, b). Even including this proviso, it seems that (38b) works for sentences of that type. Naturally, the explanatory components which make sentences (50) and (51) incorrect can be freely added to sentences (8) or (9), each of which containing one indirect WHETHER-question:

(54) *To, dokąd Jan pojedzie, zależy od tego, czy ktoś go zaprosi, bo jeśli Andrzej zaprosi Jana, to Jan pojedzie za granicę, a jeśli nikt, to do Koluszek.* [Where Jan will go depends on whether anyone will invite him, because if Andrzej invites Jan, then Jan will go abroad, and if nobody invites him, then he'll go to Koluszki.]
(55) *To, czy Jan gdzieś pojedzie, zależy od tego, kto go zaprosi, bo jeśli Marysia go zaprosi, to pojedzie do Koluszek lub za granicę, a jeśli kuzyn, to nigdzie.* [Whether Jan will go anywhere depends on who will invite him, because if Marysia invites him, then he'll go to Koluszki or abroad, and if his cousin invites him, then he'll go nowhere.]

5. The negated version of (7):

(56) *To, dokąd Jan pojedzie, nie zależy od tego, kto go zaprosi.* [Where Jan will go does not depend on who will invite him.]

is to be used in the following situations: (a) if there is exactly one person to invite John; (b) if there is only one place to which Jan might go; or (c) Jan will go anywhere if invited by anyone. The following examples are correct:

(57) *To, dokąd Jan pojedzie, nie zależy od tego, kto go zaprosi, bo pojedzie wszędzie, byle tylko zaprosiła go Marysia.* [Where Jan will go does not depend on who will invite him, because he will go anywhere if it's Marysia who will invite him.]
(58) *To, dokąd Jan pojedzie, nie zależy od tego, kto go zaprosi, bo Jan i tak pojedzie do Koluszek, ktokolwiek go zaprosi.* [Where Jan will goes does not depend on who will invite him, because Jan will go to Koluszki anyway,

regardless of who will invite him.]
(59) *To, dokąd Jan pojedzie, nie zależy od tego, kto go zaprosi, bo Jan pojedzie w dowolne miejsce, ktokolwiek go zaprosi.* [Where Jan will go does not depend on who will invite him, because whoever invites him Jan will go to any place.]
same as negated versions of deviant sentences (30)—(32) (cf. final remarks in section 2).

On the other hand, sentences whose explanatory components question the existential sentences (52 a, b) are unacceptable:

(60) **To, dokąd Jan pojedzie, nie zależy od tego, kto go zaprosi, bo nikt go nie zaprosi.* [*Where Jan will go does not depend on who will invite him, because nobody will invite him.]
(61) **To, dokąd Jan pojedzie, nie zależy od tego, kto go zaprosi, bo nigdzie nie pojedzie.* [*Where Jan will go does not depend on who will invite him, because he won't go anywhere.]

The following utterances are also incorrect:

(62) **Nikt Jana nie zaprosi, więc to, dokąd Jan pojedzie, nie zależy od tego, kto go zaprosi.* [*Nobody will invite Jan; so, where Jan will does not depend on who will invite him.]
(63) **Nikt Jana nie zaprosi, więc od tego, kto Jana zaprosi, nie zależy to, dokąd Jan pojedzie.* [*Nobody will invite Jan; so, who invites Jan has no influence on where Jan will go.]
(64) **Jan nigdzie nie pojedzie, więc to, dokąd Jan pojedzie, nie zależy od tego, kto go zaprosi.* [*Jan will not go anywhere; so, where Jan will go does not depend on who will invite him.]
(65) **Jan nigdzie nie pojedzie; więc od tego, kto Jana zaprosi, nie zależy to, dokąd Jan pojedzie.* [*Jan will not go anywhere; so, who invites Jan has no influence on where Jan will go.]

Interestingly, the following utterances containing sentences with unreal conditional are acceptable:

(66) *Nikt Jana nie zaprosi, a zresztą gdyby nawet ktoś miał go zaprosić, to i tak to, dokąd pojedzie, nie zależałoby od tego, kto go zaprosi.* [Nobody will invite Jan and even if someone was to invite him, where he will go would

not depend on who would invite him.]
(67) *Jan nigdzie nie pojedzie, a zresztą nawet gdyby miał gdzieś pojechać, to i tak to, dokąd pojedzie, nie zależałoby od tego, kto go zaprosi.* [Jan will not go anywhere and even if he was to go somewhere, where he will go would not depend on who would invite him.]

Thus, we must say that (7) presupposes (52a, b), rather than implies it (as we have suggested in the preceding section). Intuitively speaking, this means that a language user is able to deduce existential sentences (52a, b) both from (7) and from its negated version (56). Sentences whose truthfulness is the necessary condition for a given utterance to be sensible are called 'presuppositions' of this utterance. Examples (52a, b) are the presuppositions of (7).[6]

Actually, what has just been said can be questioned. First, the question below:

(68) *Czy to, dokąd Jan pojedzie, zależy od tego, kto go zaprosi?* [Does the fact where Jan will go depend on who will invite him?]

is to be answered the following way:

(69) *Nie, nikt Jana nie zaprosi.* [No, nobody will invite Jan.]
(70) *Nie, Jan nigdzie nie pojedzie.* [No, Jan will not go anywhere.]

Second, it is doubtful whether examples (60)—(65) are really unacceptable.

Everybody is likely to agree that answering (68) simply with '*No*' does not prevent the addresser of (68) from asking further questions, such as:

(71) *A kto go zaprosi?* [And who will invite him?]
(72) *A dokąd Jan ma właściwie pojechać?* [And where exactly is Jan supposed to go?]
(73) *A ty jak sądzisz, kto go zaprosi?* [And who do you think will invite him?]

[6]Cf. Baker (1968: 33-34); Keenan, Hull (1974). On the general theory of presupposition see e.g. Austin (1971); Bellert (1974); Karttunen (1973); Karttunen (1974); Keenan (1973); van Fraassen (1968).

(74) *A według ciebie to dokąd Jan pojedzie?* [And where do you think Jan will go?]

If the answer '*No*' ruled out the possibility of asking questions such as (71)—(74), i.e. if it ended the conversation, this would mean that adding negation to (7), as in (56), cancels its existential presuppositions (52a, b); in other words, if the answer '*No*' suggested to the addressee of (56) that there is no substitution which would fulfil the propositional function of the respective interrogatives, then there would be no sense in asking (74)—(77).[7] The fact that such interrogatives can be posed proves that (7) presupposes (52a, b).

As for sentences (69) and (70), they should perhaps be treated as unacceptable. What *is* acceptable are their homographic equivalents in which the negation is emphasised (emphasis is represented below by capital letters):

(75) *NIE, nikt go nie zaprosi.* [NO, nobody will invite him.]
(76) *NIE, Jan nigdzie nie pojedzie.* [NO, Jan will not go anywhere.]

These sentences are equivalent to (77), (79) and (78), respectively:

(77) *Przecież nikt go nie zaprosi!* [But nobody will invite him!]
(78) *Coś ty, on nigdzie nie jedzie!* [Why, but he won't be going anywhere!]
(79) *Jakże to, dokąd pojedzie, może zależeć od tego, kto go zaprosi, skoro nikt go nie zaprosi?*

[How could the fact where Jan will go depend on who will invite him, since nobody is going to invite him?]

Such emphatic negation seems to cancel the presupposition.[8]

Of course, none of the sentences (75)—(79) can be regarded as a

[7]This is the basis for Ajdukiewicz's classic notion of answers canceling the assumption of a question (Ajdukiewicz 1974).

[8]In the author's idiolect the following dialogue seems perfectly acceptable: (Q) *Czy obecny król Francji jest łysy?* [Is the current king of France bald?] — (A) *NIE, Francja nie ma króla!* [NO, France does not have a king!]. The emphatic NO cancels the presupposition of the question (P) (namely that there exists a current king of France). Irena Bellert's article (1974) throws some light on the issues discussed in the present article. Bellert suggests that the concept of presupposition can be formalized with the use of the necessity operator. The particle of emphatic negation *NIE* described in the present article seems to state that a given sentence cannot be true if its presupposition is false.

proper answer to (68). Such reactions to (68) move it to the category of wrongly posed questions.

As for the other of the two arguments against the existential presupposition of (7) which questions the legitimacy of treating (60)—(65) as semantically deviant, it seems possible to accept utterances homographic to (60) and (61) but with emphatic negation:

(80) *To, dokąd Jan pojedzie, NIE zależy od tego, kto go zaprosi, bo nikt go nie zaprosi.* [Where Jan will go does NOT depend on who will invite him, because nobody will invite him.]
(81) *To, dokąd Jan pojedzie, NIE zależy od tego, kto go zaprosi, bo nigdzie nie pojedzie.* [Where Jan will go does NOT depend on who will invite him, because he won't go anywhere.]

It is also possible to accept sentences homographic to (62)—(65) with the emphasis on the expression *od tego* that introduces the subordinate clause. This emphasis means that the clause following *od tego* is not an indirect question; rather, it is a relative clause (cf. footnote 2), e.g.:

(82) *Nikt Jana nie zaprosi i (więc) to, dokąd Jan pojedzie, nie zależy OD TEGO, kto go zaprosi.* [*Nobody will invite Jan and (so) where Jan will go does not depend ON THE ONE who will invite him.][9]

Thus, the problem of presuppositions of sentences like (7) has been definitely solved.

The issue of presuppositions in utterances containing indirect questions is crucial for the semantic interpretation of indirect question as a clause type (cf. Świdziński (1993)). It is important that the semantic properties of sentences containing an indirect question as their complement partly follow from the general properties of this type of constituent, and partly from the predicate that introduces such a clause. Predicates like *kłócić się* [quarrel about], *pytać* [ask], *zastanawiać się* [wonder] that have, *inter alia*, an indirect-question argument are "plugs," as they block the existential presupposition. On the contrary, sentences with the predicate *zależy* discussed in this paper do presuppose existence of objects satisfying the respective

[9]Placing the emphasis on the element introducing the subordinate clause in fact transforms the "sentential" negation in (82) into "phrasal" negation (cf. *Jan nie kupił KSIĄŻKI.* [Jan didn't buy a BOOK.] = *Jan kupił nieksiążkę.* [Jan bought a non-book.]).

propositional function; we can call them "holes" (cf. Baker 1968).

6. The present analysis has resulted in the following conclusions:

1) In sentences of the structure PZ_1 — *zależy (od tego)* — PZ_2 the predicate is a relation between two sets of sentences — propositions of the indirect questions.

2) Such sentences imply that there are at least two different sets $Q(i)$ and $Q(j)$ of propositions of PZ_1 which are the consequents of the implications whose antecedents are two sentences p_i and p_j — the propositions of PZ_2.

3) The addresser of such sentence does not say anything about the network of implications between the propositions of PZ_1 and PZ_2, i.e. he or she does not specify which propositions imply which and whether a given proposition implies anything at all.

4) In sentences with the predicate *zależy* all indirect questions homographic with WH-questions have the existential presupposition that leaks onto the whole sentence.

5) The analysis of sentences with the predicate *zależy* like (1)—(9) leads to the conclusion that it is not only sentences with the reported speech that can be explicated by disjunction. The formula (38b) stands for a sequence of possible implications (in special cases, the sequence is infinite; cf. (7)), where but three options do not work: 'every p implies every q', 'no p implies any q' and 'every p implies one and the same q'. It appears that paraphraseability by disjunctive sentences is the definitional feature of most structures with indirect questions.

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Witold Marciszewski

SYNTACTIC DESCRIPTION OF REPORTED SPEECH IN CATEGORIAL GRAMMAR

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1. The main ideas of categorial grammar

1.1. The word "grammar" shall be understood here as a synonym to "syntax," thus more narrowly than it is understood by some linguists (Levelt 1974: 2-3). Categorial grammar is one of the alternative grammars which are within the interest of linguists; It comes from K. Ajdukiewicz (1935) who referred to Husserl's ideas and some results of Leśniewski and Łukaszewicz. Husserl originated the conception of syntactic categories, Leśniewski applied categorial grammar to languages of logic, and Łukaszewicz created the positional language which is used in logic under the name Łukaszewicz's notation or Polish notation.

What turned out to be an important achievement was Ajdukiewicz's algorithm which allows us to settle for any expression of a given language (for which categorial grammar is given) if this expression is built correctly, that is if it is grammatical, that is — as Ajdukiewicz put it — syntactically coherent (Ajdukiewicz 1935). This conception was a quarter of a century ahead of the currently vivid idea of language as a decidable system (Bar-Hillel 1970).

The result mentioned above was obtained before the Second World War and gained interest among philosophers and logicians of that time. The merit of popularizing the results among linguists after the war and supplementing the results with new ones belongs to Y. Bar-Hillel. Had it not been for his activity, such a development of categorial grammar, observable in recent years, most probably would not have been taking place (Levelt 1974: 96).

1.2. The concept of syntactic category is defined by abstraction. The definition follows that of Ajdukiewicz, the only difference being the change of "semantic category," present in the original text, to "syntactic category."

"The word or expression *A*, taken in sense x, and the word or **e**xpression B, taken in sense y, belong to the same syntactic category if and only if there is a sentence (or sentential function) S_A in which A occurs with meaning x, and which has the property that if S_A is transformed into S_B upon replacing A by B (with meaning y), then S_B is also a sentence (or sentential function" (Ajdukiewicz 1967c: 208).

Categories divide into basic categories, which include sentences and names, and functor categories. The term "functor" (funktor) comes from T. Kotarbiński and is common in Polish logical texts; it covers function symbols, predicates, sentential connectives, but also adverbs, prepositions, etc. Thus, it corresponds to what was called syncategorematic expressions in medieval logic, while basic categories overlap with the class of categorematic expressions. The expressions of basic categories either occur as independent units of text (e.g. constituting the text of a sentence), or are arguments of functors. And the functor, having always one or more arguments, can itself be sometimes an argument of a higher-order functor. For there is a hierarchy among functors, which has some analogies to Russell's hierarchy of types (here it is worth mentioning Leśniewski's contribution to the method of preventing antinomies which was an alternative to the theory of types).

1.3. There are three methods of characterizing relationships between functors and their arguments within the analyzed expression: a) the traditional system of brackets, b) the so-called quasi-arithmetical notation, c) the method of numbering syntactic positions which shares its underlying idea with Łukaszewicz's bracket-free notation. The two latter methods come from Ajdukiewicz, however only the quasi-arithmetical notation was studied further and improved by other authors (Bar-Hillel 1970).[1] It shall be applied here in Ajdukiewicz's original version, because the mentioned improvements are useful only when a positional language is not used, and the present considerations shall use this language significantly.

1.4. Here follow examples of syntactic analyses that employ the three mentioned notational methods.

(S) John eats sour apples.

Distinguishing arguments by means of brackets will result in:

(S_1) (John) eats [sour (apples)],

[1]This notation was used in notational systems in P. Geach (1970) and M. J. Croswell (1973).

or

(S_2) (John) {eats [sour (apples)]}.

The difference between the two depends on what is assumed to be the sentence-forming functor for (S) — the two-argument predicate "eats," or a one-argument complex predicate "eats sour apples." The latter could be further analyzed as the functor-forming functor "eats" and the argument "sour apples," which in turn is a complex name formed by means of the name-forming functor "sour."

1.5. In quasi-arithmetical notation, named so because indicators of functor categories look like common fractions, the category of functor is characterized in such a way that what is put in the numerator is the category of expression formed by a particular functor, while in the denominator — categories of arguments of this functor. Let the letter s stand for the category of sentences, and n the category of names. The components of (S) get the following indicators of categories. According to the analysis in (S_1):

John: n, eats: s/nn, sour apples: n;
apples: n, sour: n/n.

According to the analysis in (S_2):

John: n, eats sour apples: s/n;
sour apples: n, eats: s/n//n;
apples: n, sour: n/n.

Note: the expression s/n//n is a linear equivalent of a complex fraction: $\frac{\frac{s}{n}}{n}$.

For typographical reasons, linear equivalents shall be used here. A bigger number of slashes reflects what is conveyed by a greater length of the line in complex fractions.

1.6. The third method of syntactic description refers to the idea of positional language, that is, such in which the position of an expression indicates its syntactic role, just as it is in Łukaszewicz's bracket-free notation. An expression, let's say W, can be notated by means of positional notation because it has a main functor which, together with its arguments, forms the whole of expression W; these components are called first-order elements (of expression W). If any of the first-order elements are complex expressions, they are further decomposed into second-order functor and arguments, etc.[2]

[2]This method also comes from K. Ajdukiewicz (1967a, 1967b).

(S_1)	John	eats	|sour apples;|	sour	apples.	
	1	0	2	2.0	2.1	
(S_2)	John	|eats sour apples;|		eats	|sour apples;|	sour; apples
	1	0		0.0	0.1	0.1.0 0.1.1

Let first-order elements be marked with one-position numbers, for example let's mark the functor with 0, and its consecutive arguments from 1 up. Second-order elements are characterized by numerical expressions composed of two digits. The first digit indicates that the component belongs to a particular element of the former order (e.g. first-order), while the other digit indicates the position o this component in the analyzed element, etc. Application of this method to the considered examples results in:

The result of the analysis of (S_1) can be presented as a linearly ordered set by means of a relation which could be defined as a relation of syntactic subordination (or dependence). Here follows the set:

0, 1, 2.0, 2.1.

By analogy, the expression (S_2) is assigned with the following sequence of indicators of syntactic positions:

0.0, 0.1.0, 0.1.1, 1.

If we ordered individual words in the expressions (S_1) and (S_2) according to the sequence of indicators of syntactic positions that correspond to these words, then we would translate these expressions into a positional language (such a translation could be called a syntactic translation). The language of logic provides simple illustrations of the translation of this type. For example, the expression:

$$CApqCNpq$$

is a positional equivalent of the expression:

$$(p \vee q) \rightarrow (\sim p \rightarrow q).$$

The possibility of employing positional notation to any expression is an important feature of categorial grammar. It shows that there is a linear

order in the set of simple expressions that are components of any complex expression.

1.7. A synthesis of the two approaches discussed above, namely that of assigning expressions with indicators of categories and linear ordering of a sequence of expressions, is the algorithmic method of testing the syntactic cohesion of expression, also coming from Ajdukiewicz (1935). This algorithm consists of the following rules: 1° when testing the cohesion of expression W, begin with ordering the set of indicators assigned to particular elements of W, according to the order of expressions which would occur in a linear version, that is in the positional notation. 2° Going from left to right, observe if there is in the sequence a pair of neighboring indicators in which the first element is a fraction indicator and the following indicator is such as the denominator of this first fraction indicator. 3° Whenever you find such a pair, cross both identical elements out but leave the numerator. 4° Continue the procedure described under 2° and 3° as long as the sequence can no longer undergo reduction. 5° If this final result is a one-element sequence, that is a single indicator, then the analysed expression is syntactically cohesive and has the category of this final indicator; if the final sequence has more elements, then the analyzed expression needs to be regarded as syntactically incohesive, that is grammatically incorrect.

Examples of such a procedure, widely known and much popularized, shall be provided further in the article.

2. The combinatorial method of syntactic description of reported speech

2.1. If one and the same expression (in terms of shape) can have more than one syntactic structure, then a question arises about how many such structures can be assigned to expressions belonging to the structure called reported speech. It needs to be highlighted that such a "pluralistic" approach to the problem is not common among authors dealing with the subject of reported speech. Most of them take the stance that reported speech can have only one structure and only this one, which is believed to be appropriate, is analyzed. There are a few such "monistic" approaches; let's focus on three of them as they are the most widespread.

The view initiated by Frege (1892; see also Church 1956) can be reconstructed in categorial grammar in the following way: the word "that" functions as a name-forming functor of one sentential argument: "that (it) rains" is the name of the proposition which, in direct speech, is expressed by "(it) rains;" "that (it) rains" can be also interpreted as the name of a state of raining. This approach is significantly supported by grammatical properties of the German language, where the structure "dass p" (with p

standing for a sentence) not only can function as grammatical subject (as is also the case in English), but can also naturally occur with a preposition, for example in the structure of the type "ohne dass p...;" thus, it occurs in all functions characteristic of names. Contemporary authors who postulate such an analysis of reported speech are, among others, R. Jeffrey and Y. Bar-Hillel (Bar-Hillel 1965, 1970; Jeffrey 1965).

A different approach, present in certain comments of Bar-Hillel (in writings other than the ones quoted above), is taken by K. Ajdukiewicz who treats "that" as a constituent of the functor "says that," "thinks that," etc., and not as a part of the construction "that p" (Ajdukiewicz 1967a) It is, then, a functor of one name argument and of one sentential argument. Ajdukiewicz does not comment on the internal structure of this functor: namely, if it is one simple word in which "that" functions as a sort of a syllable devoid of its own syntactic function, or if it is a complex expression in which "that" plays the role of a functor-forming functor of one functor argument. It is worth noticing that in both, the former and the latter variant of Ajdukiewicz's approach, there is no sense in putting a comma between "that" and the preceding verb;[3] it would be a syntactic error that requires disapproval, whereas — so far — our linguists and editors-purists disapprove of those who occasionally drop the comma in this position. Let's add here that if we accept that one and the same expression (in its graphic shape) can have many syntactic structures, and that punctuation is, similarly to accent in speech, treated as a means to express the author's intention with regard to the syntactic structure, then this controversial comma should be treated as optional in reported speech: let it be used by those who want to give their utterance the Fregean structure in reported speech, let it be dropped by those who want to use Ajdukiewicz's structure.

There is, finally, a traditional view of grammarians that the word "that" is a conjunction.[4] A conjunction is usually a sentence-forming functor of two sentential arguments. Here, however, it is not clear if we are dealing with such a classical conjunction, or a special variant in which the first argument is a certain functor for which there is an isomorphic expression which is a sentence but which occurs then outside of the context of reported speech. Indeed, "John says" can be a full sentence, for example, as an answer to "What does John do every day?," yet it is not the component of "John says that it rains," in the latter case, the expression "John says"

[3]As it is required in Polish language — translator's note.

[4]See, among others, S. Szober (1953). This view is further discussed on the grounds of modern formal linguistics (Wojtasiewicz 1972).

is not a full sentence, but rather a two-argument functor that occurs with its first argument and without the other. However, the view assumed in the considerations to follow, is that "that" is a functor of two sentential arguments, which is one of the acceptable descriptions of syntactic structure; whoever does not agree with the view can cross out an appropriate structure from the obtained list, by means of adding one more eliminating assumption to the set of accepted assumptions.

An approach similar to the traditional one was introduced by R. Martin who treats the structure "e That p" as a two-argument relation between an event e, which is an intentional act, and an event described by the sentence p. Admittedly, "that" is not a conjunction, but, similarly to a conjunction, constitutes an "axis of symmetry" of the syntactic construction with one argument on each side (Martin 1979).

2.2. The multitude of approaches on reported speech represented in the literature leads naturally to two questions: what is a criterion of choice between those approaches (if one had to choose), and how can one be sure that no structure that could be assigned to reported speech has been omitted? These questions are mutually independent, however, for the sake of clarity, it will be more convenient to start with the second one. In the first stage, then, we will try to obtain a full set of all structures, which can be obtained by applying combinatorial methods to a set of words that contribute to reported speech, no matter whether the obtained structures satisfy well-formedness conditions of the grammar of our language. The second stage will involve discussing and forming the assumptions which concern well-formedness, in other words, what will be the basis for elimination in the set of all (combinatorially) possible structures.

2.3. Let the sentence below be an example of an expression representing reported speech:

Jan	myśli,	że	pada.
John	thinks	that	it rains.

The Polish sentence is composed of four expressions. If the sentence after "że" was not a single word, then there would be more components. However, since it is not necessary to take the internal structure of this sentence into consideration, it will be always represented by one symbol. Let the four component expressions be represented, accordingly, by the following letters:

Jan — x, myśli — e, że — o, pada — p

John — x, thinks — e, that — o, it rains — p

The letters x, e, p can be regarded as variables of the, accordingly, name, functor and sentence category; the letter o is a constant, a symbolic equivalent to the word "że" (that) (chosen for mnemotechnic reasons, as an association to "oratio obliqua"). What we are dealing with, then, is a set of component elements of reported speech, that is: {x, e, o, p}. As indicated by the notation, the set is not ordered, thus the order of elements does not indicate any structure, and can be freely changed.

How many structures can be obtained from these four elements, taking into consideration all possible ways of ordering? In order to answer that question, let's introduce the notions of a linearly ordered structure and a dendritic structure (that is a certain partial ordering); I shall show that, for the four-element set, there are 24 linear structures, and that each of them is assigned 10 dendritic structures different from one another, which gives 240 as a maximal number of structures. It will be possible to reduce this alarmingly large set, by using the eliminating assumptions of the second stage, which will result in only 11 acceptable structures of reported speech left. Among them will be all structures presented in section 2.2.

2.4. The number of linear structures is 24, for they are obtained by permutations of a four-element set; thus it is 4!. Out of these 24 sequences we can immediately eliminate 12 — 6 starting with x, and 6 starting with p. For it is well known that, in positional notation, the word in the initial position should be zero or a sequence of zeros, thus it should belong to the category of functors without being — in a given expression — an argument of any functor. This category is not met by either the name x, nor the sentence p, for they belong to basic categories.

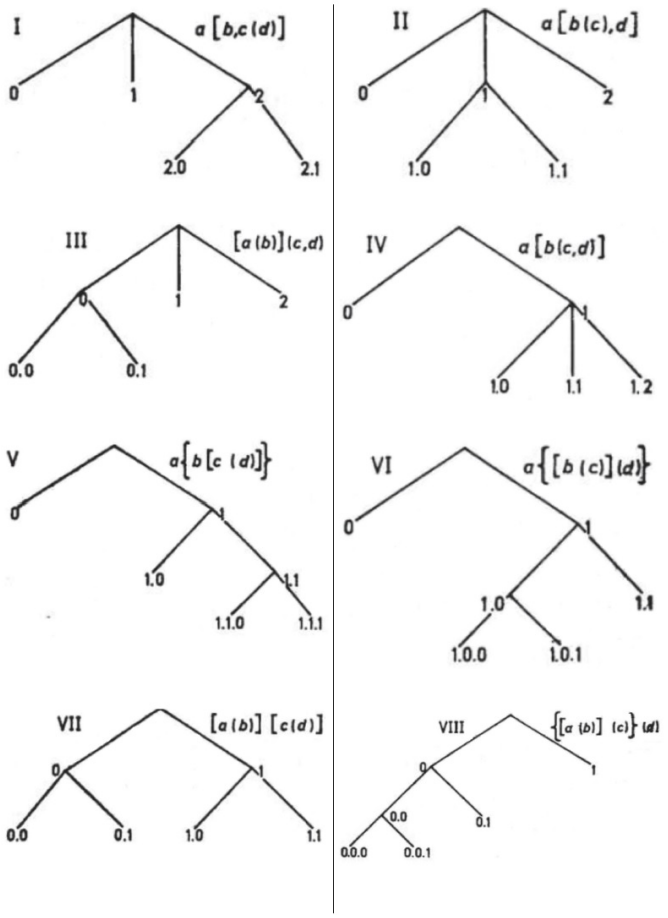
Having eliminated the above mentioned structures, there are still 12 following sequences:

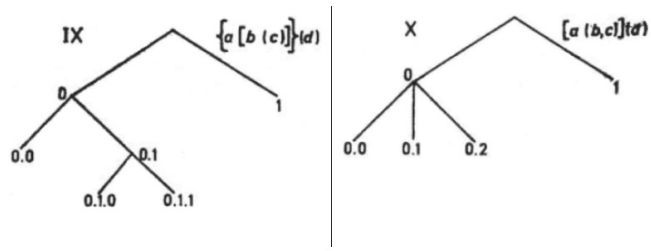
Tab. 1.

(1)	*o e x p*	(7)	*e o x p*
(2)	*o e p x*	(8)	*e o p x*
(3)	*o p e x*	(9)	*e x o p*
(4)	*o p x e*	(10)	*e x p o*
(5)	*o x e p*	(11)	*e p o x*
(6)	*o x p e*	(12)	*e p x o*

2.5. Each of the above linear structures is assigned with ten tree-structures, which I shall call dendritic. This follows on from the considerations below. All four elements of each linear structure can be grouped in various ways that can, in turn, be presented as trees. The number 10 results from the fact that the four-element structures here always split into two or three components, that is a functor with one argument, or a functor with two arguments. Let's consider all such alternatives. Each dendritic structure will be accompanied by a notation with brackets in which the brackets appropriately group the structure's components. The variables a, b, c, d can be substituted with the words from the set {x, e, o, p} in such an order as they appear in the sequence under consideration. If the sequence is e.g. o e x p, then the bracket notation for the first dendritic structure is o[e, x(p)].

Tab. 2.





Thus, each of the 120 structures that is a result of the Cartesian product of the set (1) ... (12) and the set I ... X can be marked with a two-digit symbol indicating a pair of elements in which each comes from a different set: (1)I, (1)II ... (2)I ... (2)X, (3)I ..., etc. By means of such symbols it will become possible to indicate which structures will be rejected as not meeting the syntactic conditions, and which will resist the elimination.

3. Syntactic assumptions adopted as a basis for elimination of wrong structures and the results of elimination

3.1. Categorial grammar of any artificial language, such as the language of logics, is included in its dictionary, in which each word is assigned with one particular syntactic category; a word thus characterized in every context appears in the permanently assigned syntactic category and unequivocally indicates, together with the remaining context elements, its syntactic structure (Levelt 1974: 107). Natural languages are different as along with the phenomenon of polysemy, there is the phenomenon of syntactic ambiguity which consists of one (isomorphically and semantically equivalent) word that can be assigned to more than one category, playing — depending on the context — one or another role. Thus, for example, the word "and" is sometimes a sentence-forming functor of sentence arguments (s/ss), but sometimes a name-forming functor of name arguments (n/nn); we can talk here about semantic equivalence in the sense that both cases concern the same operation of logical multiplication. By analogy, adjectives play the role of names when they function as (subject) complements, or the role of name-forming functors when they function as attributes; semantic equivalence here consists in the connotative equivalence. This syntactic ambiguity has usually been regulated to some extent, that is it has been established that a given word or a class of words has such-and-such syntactic category in one context, and such-and-such syntactic category in other contexts.

There are, however, such words in natural languages that not only are assigned to more than one syntactic category, but also their set of syntactic categories is not sufficiently defined; Thus, what we are dealing with here

is an equivalent of what is called polysemy with reference to meaning, and at the same time an equivalent of vagueness (semantic instability). This is exactly the case of the Polish że "that." It does not mean that interpretation possibilities of such words are unlimited. It is reasonable to assume that the issue of belonging to the basic or the functor category will be resolved (in a particular type of context). However, where there is a multitude of functor categories in a given language, and different functors of functors among them, there is a possibility of linking elements in more than one way, and different ways of linking particular functors with various syntactic categories. In such a situation, in order to define the class of possible syntactic interpretations, it is necessary to clearly state what is assumed about the analyzed complex expression (or a particular class of expressions) and its component elements. These assumptions can even be controversial, but being controversial will not be a drawback if the consequences of each assumption is shown. Then whoever does not accept a questioned assumption does not have to accept its consequences; if one does not accept one of the consequences, however, they have to reject the assumptions which constitute the premises.

3.2. The following assumptions are postulated as a test for all 240 structures obtained here; in practice only 120 will remain since half will be immediately eliminated on the basis of assumptions A.1 and A.2 on the list below:

A.1. An expression represented by variable p is not a functor.
A.2. An expression represented by name variable x is not a functor.
A.3. When p or x is one of the arguments of a two-argument functor, then x is the first and p is the second argument.
A.4. An expression represented by variable e, and also by formula e(x) — if it can be interpreted as a functor, is a predicate, that is a sentence-forming functor of name arguments, and in the case of e there are one or two arguments, and in the case of e(x) there is one argument.
A.5. Expression o (a symbolic equivalent of "that") is never an argument of a functor.
A.6. Expression o never has name arguments.
A.7. If an expression represented by o(p) is a functor, then it has no name arguments.

What can be explained by adopting particular assumptions from the list above? A.1 and A.2. are true ex definitione: variables of basic categories cannot represent functors. The remaining assumptions are based on verdicts

of authority called native speaker; if the author of this article is wrong in assigning this or that judgment to this authority, then of course he can be corrected by anybody who has the right to play the role of a native speaker. The following restrictions seem to be valid for the matters in question.

Ad A.3. The word order in reported speech requires the following order of arguments: 1 — name, 2 — sentence, and a change in this word order, for example "it rains thinks that John," is always felt to be a violation of syntactic rules.

Ad A.4. Expressions e and e(x) are not names, and also e is not a sentence, thus it needs to be a functor. The issue of arguments of this functor is more controversial. On the grounds of the Polish language it could be claimed that the first argument is not necessary as it is not present (at least in the surface representation) in impersonal expressions, e.g. "sądzi się, że" (it is thought that). In languages such as English and German, which always have personal (one, man) or impersonal (it, es) subjects, this claim fails. On the other hand, the second argument in these languages needs not be a name argument; this is at least how it looks like "on the surface." In reported speech, whenever "that" or "dass" is omitted, what immediately follows the functor e is a sentence. The problem whether the finding should be made on the basis of surface structure or rather a default hidden linguistic object that binds e with p will remain open, though such an object could be a zero symbol or a syntactic construction itself. If such solutions are not adapted, then A.4 remains valid only for such languages as Polish, where omitting o before p violates syntactic rules.

Ad A.5 There is no such functor expression with which "że" (that) as an argument would create a coherent whole or at least a coherent piece of a whole. Coherent pieces that include o are always of the form eo or op; in both cases o functions as a functor. By the way, this indicates that there are more than two levels of completeness or incompleteness. It is not only among basic categories that a diversification into the more complete (sentences) and the less complete (names) occurs; the diversification also occurs among functors, though by a different principle: there are such functors that can be arguments of other functors, and such that cannot. The latter have the lowest level of completeness; it seems that except for "że" (that) also the functor "bardzo" (very) is a convincing example.

Ad 6. Again, we refer to the linguistic competence of a native speaker, who would say that no construction of the type "że x" (that John) is a coherent piece of a sentence, thus it cannot make, together with other expressions, a grammatically correct sentence. However, the constructions eo and op are

examples of a coherent piece with ”że” (that).

Ad 7. This assumption concerns a rather special interpretation according to which o(p) is a functor functioning similarly to a post-verb adverb answering the question ”how” (the so called adverbial of manner). For it is possible to consider the content of an intentional act to be one of its property, thus finding this property would answer the question of what this act is, that is (in the adverbial version) how it is represented, what it is about, etc., which is reflected in the following colloquial conversation.

— I think she will not come. And what do you think?
— I think she will, though.

What is claimed in A.7 is not that such an interpretation is (sometimes) accurate, but rather something less: namely, certain restrictions are imposed on this interpretation in case somebody wants to accept it; what is claimed is that even if o(p) is a functor, then it is not a functor of a name argument. Indeed, any native speaker will admit that sentences ”John that (it) rains” or ”(it) rains that John” are nonsensical.

3.3. Let’s apply assumptions A.1 — A.7 to the list of 120 constructions obtained through multiplication of table 1 by table 2. The list of the obtained pairs whose first element is an Arabic number from table 1, and the second — a roman number from table 2, is also most conveniently presented in a table, whose first column contains Arabic numbers, while the first row — roman numbers. The intersections of the two contain the numbers of assumptions on the basis of which a given construction can be rejected if it can be rejected; if a construction does not fail any of the seven tests, then the appropriate intersection is marked with ”+.”

Tab. 3

	I	II	III	IV	V	VI	VII	VIII	IX	X
(1)	2	+	+	4	2	4	2	+	+	6
(2)	1	3	3	6	1	4	1	+	4	+
(3)	3	1	3	1	1	1	+	4	1	3
(4)	2	1	7	1	1	1	2	7	1	6
(5)	6	2	6	2	2	2	4	6	2	6
(6)	1	2	6	2	2	2	1	6	6	6
(7)	2	6	5	6	2	6	2	5	6	5
(8)	1	3	5	6	1	3	1	5	+	5
(9)	+	2	5	2	2	2	+	5	2	5
(10)	1	5	5	5	5	5	5	5	5	5
(11)	6	1	4	1	1	1	6	5	1	5
(12)	5	5	5	5	5	5	5	5	5	5

The reasoning leading to the conclusions of table 3 will not be presented here, since they are so simple that the reader who wants to check the results can easily reconstruct the reasoning, except for the positive results (the variants that survived the elimination tests) which deserve a more detailed treatment. In the list below they are given in three notations: with brackets, with numbers (that indicate the syntactic position and can be easily transformed into a tree), and with indicators ordered according to the principle of positional notation, that is the principle assumed by the bracket-free notation.

(1)II	*o*	*e*	*x*	*p*	*o*[*e*(*x*), *p*]	1
	0	1.0	1.1	2		
	s/*ss*	*s*/*n*	*n*	*s*		
(1)III	*o*	*e*	*x*	*p*	[*o*(*e*)](*x*,*p*)	2
	0.0	0.1	1	2		
	s/*ns*//*s*/*n*	*s*/*n*	*n*	*s*		
(1)VIII	*o*	*e*	*x*	*p*	{[*o*(*e*)](*x*)}(*p*)	3
	0.0.0	0.0.1	0.1	1		
	s/*s*//*n*///*s*/*n*	*s*/*n*	*n*	*s*		
(1)IX	*o*	*e*	*x*	*p*	{*o*[*e*(*x*)]}(*p*)	4
	0.0	0.1.0	0.1.1	1		
	s/*s*//*s*	*s*/*n*	*n*	*s*		
(2)VIII	*o*	*e*	*p*	*x*	{[*o*(*e*)](*p*)}(*x*)	5
	0.0.0	0.0.1	0.1	1		
	s/*n*//*s*///*s*/*n*	*s*/*n*	*s*	*n*		
(2)X	*o*	*e*	*p*	*x*	[*o*(*e*,*p*)](*x*)	6
	0.0	0.1	0.2	1		
	s/*n*//*s*/*n*,*s*	*s*/*n*	*s*	*n*		
(3)VII	*o*	*p*	*e*	*x*	[*o*(*p*)][*e*(*x*)]	7
	0.0	0.1	1.0	1.1		
	s/*s*//*s*	*s*	*s*/*n*	*n*		
(8)IX	*e*	*o*	*p*	*x*	{*e*[*o*(*p*)]}(*x*)	8
	0.0	0.1.0	0.1.1	1		
	s/*n*//*n*	*n*/*s*	*s*	*n*		
(9)I	*e*	*x*	*o*	*p*	*e*[*x*,*o*(*p*)]	9
	0	1	2.0	2.1		
	s/*nn*	*n*	*n*/*s*	*s*		
(9)VII	*e*	*x*	*o*	*p*	[*e*(*x*)][*o*(*p*)]	10
	0.0	0.1	1.0	1.1		
	s/*n*//*n*	*n*	*n*/*s*	*s*		
(1)III*	e_0	*x*	*p*		e_0(*x*,*p*)	11
	0	1	2			
	s/*ns*	*n*	*s*			

The last item on the list is not represented in table 3 because the morpheme "że" (that) does not have the status of an expression but is reduced to the role of a syllable. However, since, in every other respect, it resembles construction (1)III, this variant is marked as (1)III*.

3.4. Among these 11 resultant structures, there are all the familiar structures discussed in written sources, namely:

(1)II — inter alia, traditional grammar
(1)III — K. Ajdukiewicz
(9)I — inter alia, G. Frege.

Most of the remaining structures can be assigned with some intuitive readings. Thus, for example, according to (1)VIII, a sentence of the type "John thinks that it rains" resembles sentence-forming modal functors: this modality of sentence p consists in that it is thought, and it is thought by John. Similarly, (1)IX, though the internal structure (the order of constructing particular elements) of the latter is different in this quasi-modal functor.[5]

(2)VIII and (2)IX predicate about x that x thinks (or says, believes, etc.) this-or-that; the difference between these two variants of structure (2) again consists in the internal structure of this complex predicate. Also, (8)IX represents a predication about x, yet the structure of the predicate is different than in variants (2).

Contrary to this, in construction (9)VII the subject is the expression "że p" (that p) which is a name of a proposition created from the sentence (the proposition is expressed by the sentence), while what is predicated about the proposition is, for example, that John is in the act of thinking about the proposition; instead of a proposition (judgment), it would be also possible to talk here about a proposition (state of affairs).

This review omits (3)VII which seems to be a construction totally devoid of intuitiveness, but has been incorporated into the list according to game rules: it cannot be rejected since it survived the elimination criteria. Whoever wants to cross it out due to the intuitiveness of interpretation, should express their own intuitions in the form of an additional assumption on the list of adopted criteria.

4. Conclusions, hypotheses, problems

[5] An extremely interesting analysis of such constructions of modal expressions, accompanied by a rich bibliography on modal logics and deontic logic, was presented by G. Kalinowski (1973, cf. especially p. 183-190).

4.1. The presented considerations lead to two conclusions: one — more detailed and about the content, concerning reported speech, and the other — more general and about the method, concerning a certain research method of language.

The first conclusion is: there is more than one acceptable structure of reported speech. Whoever does not agree with this carries the burden of proof (onus probandi), that is, needs to supplement the list of assumptions in such a way as to eliminate all syntactic structures except for one. The author of this article does not consider it likely unless some restrictions, which are contrary to linguistic practice and artificial, are imposed on the language. Still the way to such attempts, even while adopting the method presented here, is wide open.

The so-formulated conclusion gives rise to a problem. The structures considered here belong to the sphere of language (la langue) which, in the field of linguistic research, is complemented by the sphere of speech that is utterance (la parole). The question is: do the described syntactic structures and the differences between them correspond to a diversification of phenomena in the sphere of parole, e.g. changes in word-order, pauses, stress. If the answer is affirmative, then another question arises: what is this correspondence? What, for example in the manner of speaking, corresponds to differences between the structures:

(1) II o[e(x), p] ("traditional")
(1) III [o(e)] (x, p) (based on Ajdukiewicz)
(9) I e[x, o(p)] (based on Frege).

The hypothesis posed here, which is an indirect link between the input (in this article) conclusion and the present question, is the affirmative answer to the previously posed question. I claim, namely — hypothetically — that at least in some cases, the differences in speaking or writing can be recognized. In the case of written utterances there are two phenomena that come into play: punctuation and word-order. The punctuation matters include the exciting issue of a comma before "że" (that). Those who advise the use of it in Polish or German sentences, express, at least, that they oppose treating the cluster of words oe (e.g. "mówi, że" (says that)) as one syntactic whole (when the rule that a comma separates is taken seriously). Here I oppose treating this punctuation rule as universal, for it would be contrary to the presented multitude of acceptable structures of reported speech, though the mere fact that some language experts feel that there is a caesura before

”że” (that), seems to be, in relation to a particular language, in favor of ”traditional” structure or the one based on Frege, and those against the structure, among others, based on Ajdukiewicz. What speaks in favor of the view that the approach based on Frege is sometimes executed in speech and writing seems to be the characteristic separation of ”że” (that) in the case when it is followed by a conjunction or a disjunction sentence. It is possible to say ”Jan mówi, że pada i grzmi” (John says that it rains and thunders), but equally it is possible to say ”Jan mówi, że pada i że grzmi” (John says that it rains and that it thunders). The same separation will apply to ”Jan mówi, że pada lub mży” (John says that it rains or drizzles).

In German, combining ”dass” with the sentence that follows results in a more autonomous whole, namely a construction of the nature of a complex name, which is shown in the possibility of combining this construction with prepositions, for example in the sentence: ”Man kann gelernt haben, logisch korrekt zu schliessen, ohne dass man dabei irgendein Gesetz der Logik explizit können müsste.”

Are there also, on the phonetic level, recognizable differences corresponding to e.g. structural differences between (1)I, (1)II and (9)I? As a hypothesis for further study which seems to be a result of common and immediate observations, I would claim that pauses have different distributions in different variants of phonetic representation of reported speech, which results in differences in stress, and can be assigned to the three discussed structures in the following manner:

syntactic structure	phonetic structure
(1)II $o[e(x), p]$	$x\ e \mid o \mid p$
(1)II $[\ o(e)](x, p)$	$x\ e\ o \mid p$
(9)I $e[x, o(p)]$	$x\ e \mid o\ p$

4.2 If the above assumption turned out to be correct, the following question should be raised: What semantic differences are assigned to these syntactic differences that can be represented in different phonetic variants? Solving this issue requires treating the discussed utterances as answers to particular questions; for a question variable determines semantic stress in the answer, and the stress determines pauses that can indicate syntactic split. For example, in the sentence: ”What is John’s (belief) relation to life after death?,” the question variable belongs to the set of possible relations: beliefs, assumptions, doubts, rejections, etc. And the answer could be, for example:

John believes | that life after death exists,

with a strong stress on "believes," which requires a pause before continuing, and in which "that" merges smoothly with the phrase following the pause. If we accept that phonological properties of this type correspond to any of the possible syntactic structures (not necessarily unambiguously), then the most natural candidate in this case seems to be the structure based on Frege.

An informative example of stressed "that" can be found in a particular text by K. Ajdukiewicz, in which stress is marked with italics: "But it does not suffice if he [the teacher] tells the pupil that he [the pupil] committed an error; he also ought to point out where the error is and in what it consists" (Ajdukiewicz 1974: 1). It is visible in the context that when sentences starting with "where" and "in what" are answers to certain open-ended questions, the sentence starting with "that" answers the open-ended question "Did the student make a mistake?" Thus, the context with known or inferred questions determines stress in reported speech, and stress determines (not necessarily unambiguously) the syntactic structure. In the given example, stress indicates that it would be unusual to treat "że" (that) as a dependent syllable in "powiedzieć, że" (say that); because it is unusual for semantic stress to fall on a meaningless morpheme.

4.3. Another conclusion that comes to mind is a certain methodological program for syntactic description; an illustrative (but not necessarily "exemplary") application of this program was presented here with regards to reported speech, and consisted of the following five steps:

1° differentiating the most simple elements in the studied type of utterance; 2° listing all ordered sequences of these elements as well as the variants resulting from different groupings of these elements; 3° formulating assumptions specifying the conditions that a syntactic structure of the given type needs to meet; 4° eliminating sequences that do not meet the criteria; 5° indicating semantic and phonological variants assigned to the remaining syntactic structures.

In the present study on reported speech, the first four steps have been conducted, while the fifth remained in the sphere of hypotheses and questions.

It is beyond doubt that such a program for syntactic description, if considered purposeful, can be applied to all types of complex expressions. A question arises, however, if an analogous method can be applied to units of higher-order than sentences, namely multi-sentence texts. Also to these texts the condition called cohesion is intuitively applied, though it is not the

same cohesion, and it is not as easy to characterize as syntactic cohesion sensu stricto. For convenience, in the first stage of the task, we will restrict the type of text to not too extensive and relatively less complex one, such as a paragraph.

Let's notice that except for the "intra-sentence" conjunctions forming complex sentences, there are "compound-sentence" conjunctions, which can be called text-forming functors. In Polish, these are: "więc" (so), "bowiem" (for), "ponadto" (moreover), etc. They are usually part of the "inside" of one of adjoining sentences, but their function does not hold when the sentence is in isolation; this function is to refer to the preceding sentence. If there are no such linking words between sentences in a text, then the "text-forming" functor is possibly analogous to conjunction; this function is performed as if "in substitution" by the full stop separating sentences.

In more than one case, a multi-sentence text such as a paragraph could be transposed into a single complex sentence, and then the criteria for sentence syntactic cohesion could be undoubtedly applied to it. Let the following text be an illustration of this possibility:

Let's assume that somebody hears or reads the wording: "If Caesar had not fallen victim to Brutus' conspiracy, he would have pronounced himself the absolute emperor of Rome." Even if this somebody does not know who Caesar was or who Brutus was, and even if does not understand the term "absolute emperor," then knowing the rules governing the English language, they can infer that the wording states that this Caesar fell victim to the conspiracy of this Brutus. They may also infer that as a consequence, Caesar did not manage to pronounce himself this absolute emperor of Rome.

Simple stylistic tricks allow us to transform the above paragraph into a single-sentence text, which is as follows:

If somebody hears or reads the wording: "If Caesar had not fallen victim to Brutus' conspiracy, he would have pronounced himself the absolute emperor of Rome," then even if they do not know who Caesar was or who Brutus was, and even if they do not understand the term "absolute emperor" — knowing the rules governing the English language, they can infer that the wording states that this Caesar fell victim to the conspiracy of this Brutus and as a consequence, Caesar did not manage to pronounce himself this absolute emperor of Rome.[6]

[6]The example drawn from O. Wojtasiewicz (1971).

4.4. In such cases as the above, the problem of the difference between sentence cohesion and text cohesion disappears. However, it is worth formulating a further-reaching generalization that would allow us to extend the notion of cohesion to texts that cannot be transposed into one (complex) sentence. The problem can be reduced to whether formal structures, such as trees in table 2, can be interpreted as text structures. These trees have the property that elements of the same-level-splits are in asymmetric, intransitive and irreflexive relation: functor — argument. This additional property is a problem here, since the fact that a text structure can always be represented as a tree is obvious and commonly used in text division, for example, in a table of contents. However, a question arises if such a dendritic structure that characterizes all partial orders, and hence the order of thought-development in the text, will also encompass the equivalent (with the same formal properties) of the specific relation functor — argument.

A hypothesis that the searched equivalent of the syntactic relation functor — argument is the textual relation question — answer is worth consideration. It does not mean that any question that comes into play needs to be explicitly formulated in the text. Questions are most often inferred, but it is not difficult to reconstruct them in such texts that are intuitively recognizable as coherent. Provided that we can present a text structure in the form of a tree in which, except for the characteristic partially ordering relation with an upper bound, there is this "cross" asymmetric, intransitive and irreflexive relation, then the methods of analysing cohesion developed for syntactic description can be transposed into a text structure description.

Since this hypothesis is noted only as a subject for further study, only a certain illustration will be provided together with an assumption that the compared types of structures (syntactic and textual) are interpretations of certain abstract algebra, i.e. the theory of lattice.

Let the first paragraph of Pragmatic Logic by Ajdukiewicz be an example illustrating the above hypothesis. The text division, sentence numbers and questions interpolated in capital letters are mine; the rest is a translation of the text by Ajdukiewicz (1974: 1).

0. WHAT IS THE TASK OF SCHOOL?

1. The task of the school is not only to convey to the pupils information in various fields,

2. but also to develop in them the ability of correctly carrying out cognitive operations. (...)

2.0. IN WHAT WAY CAN ABILITIES TO CORRECTLY PERFORM COGNITIVE OPERATIONS BE TRAINED?

2.1. But to be able to train his pupils in a correct performance of cognitive operations the teacher must himself provide the standard of correct thinking

2.2. This, however, does not suffice: the pupils must carry out the operations themselves, and the teacher must see to it that they do that properly.

2.2.0. IN WHAT WAY SHOULD THE TEACHER CARE ABOUT A CORRECT PERFORMANCE OF THE STUDENTS' COGNITIVE OPERATIONS?

2.2.1. Hence if a pupil, when proving a theorem, or explaining a phenomenon, or defining a concept, commits an error, the teacher must draw his attention to the fact.

2.2.1.0. WHAT DOES CORRECTING ERRORS CONSIST IN?

2.2.1.1. But it does not suffice if he tells the pupil that he committed an error;

2.2.1.2. he also ought to point out where the error is

2.2.1.3. and in what it consists.

2.2.1.1.0. WHAT ABILITY SUFFICES TO NOTICE THE ERROR?

2.2.1.1.1. The practical ability to think correctly, which every teacher should have, will alone suffice for him to notice that the pupil made an error,

2.2.1.2.0. WHAT ABILITY SUFFICES TO INDICATE WHERE THE ERROR OCCURRED?

2.2.1.2.1. it will probably also suffice for him to explain to the pupil where the error is.

2.2.1.3.0. WHAT IS NECESSARY TO BE ABLE TO TELL WHAT THE NATURE OF THE ERROR IS?

2.2.1.3.1. But it need not necessarily suffice for him to be able to tell in what that error consists and what its nature is. To be able to do so he must know those concepts and terms which make it possible to discuss cognitive operations and their types, properties, etc.

2.2.1.3.2. He also must have a theoretical knowledge of the conditions which the various cognitive operations must satisfy in order to be correct.

As can be seen, it turned out to be possible, within the analyzed text, to convey the split analogous to syntactic structure split. Although no split starting from (or ending in) an element with the number 0 (i.e. a "functor" element) occurred, it is not difficult to observe such elements in many other texts whose authors start with a question to raise additional problems which are the equivalents of functor-forming functors. Also, the above text can be

represented by a structure with a split in zero if the questions are formulated "from below," that is starting with the most detailed statements, for example:

0. SHOULD THE TEACHER KNOW THE CONCEPTS AND TERMS TO DISCUSS COGNITIVE OPERATIONS?

0.0. WHAT ARE CONCEPTS AND TERMS ALLOWING TO DISCUSS COGNITIVE OPERATIONS FOR?

0.1. They are for indicating in what the error committed by the pupil consists.

Thus, the analogy to syntactic description encompasses the multitude of acceptable structures, which correspond to different interpretations of a given text. Let's consider one more possible variant. The starting point in the analysed text could be the question:

0. WHAT IS THE TASK OF SCHOOL BESIDES CONVEYING INFORMATION?

1. To develop the ability of correctly carrying out cognitive operations.

In such an approach, question 0 would have one argument, which would express the fact that the person posing the question does not know only one of two things to be known. The choice of one particular structure interpreting the text depends on what knowledge about the described reality and the receiver of the text is attributed to the author (speaker), as well as on the intentions attributed to the author. This interpretation consisting in assigning the text with a particular structure can be expressed to a great extent by means of vocal interpretation, that is on the phonological level.

4.5. The proposed method of text analysis, that is its structure, seems not to be meaningless for such text operations (or text transformations) as a summary or indexing. Having split the text in the form of a tree (with a zero element on each level), it is possible to sum up the text to any degree of detail measured by specifying the last of the considered levels of split. Thus, for example, the most detailed summary of the analyzed paragraph will leave out the information of the last level, marked there by numbers with five positions. Yet, one can approach a summary in a different way, focusing on details rather than general ideas, and arriving at a different type of a summary, namely, by including mostly data of the lowest level (which will be, however, at the top of the structure if just below the tree's upper bound, as a zero point, will be posed a question as detailed as in the example with 0.0 and 0.1). Indeed, either one or the other approach is employed in practice, for example, when the summary gives only the starting assumptions, or only the final conclusions. However, both approaches can be merged, and then the middle levels of the tree will be left out.

Indexing is analogous: the depth of indexing can be characterized by specifying split levels, which determine indexing terms.[7]

These various suggestions resulting from the method of text analysis used here, which could be called a quasi-syntactic method on the basis of formal analogy to semantic description, seem to encourage the use of categorial grammar as a theoretical basis for text analysis. The present article employed categorial grammar to approach one of the most complex syntactic problems — reported speech, which involved designing methods of syntactic description in detail. Formal, that is highly abstract, characteristics of these methods allowed us to notice even further applications for the methods, which were presented here as a material and an inspiration for further research.

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Leon Koj

THINKING AND INNER SPEECH

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INTRODUCTION

a. The most important problem of semiotic research boils down to the attitude of speech and language towards thought. Deciphering this connection shall allow us to understand the impact of speech upon all human actions. Unfortunately the influence of speech and language on thought is a very complex, multilevel and difficult issue. From many possible layers of this problem I would like to analyze one. I wish to cast some light on the hypothesis that one type of human thought is verbal. At the same time I do not wish go into consideration whether there actually exist any other types of thought. I shall also not consider the mechanisms governing verbal thought or what are its functions among all processes of mental activities. My task shall be limited: I wish to more specifically formulate the hypothesis about the verbal character of a type of human thinking, subsequently to draw out certain simple consequences to this hypothesis. These consequences may help to prove the hypothesis.

b. I have the following reason to limit my analysis to making the above described hypothesis more precise. The disputes regarding the thought perceived as internalized speech are very abstruse. The reason behind that is: the said disputes originate from the multitude of information that may influence the outcome of the hypothesis. Some researchers use introspective data to explain the verbal character of some types of thought. Others prefer the data collected with a miograph. Yet another group of researches analyzes the data gathered through observing people with impaired speech and hearing. There are also some who find research on brain damage and the resulting speech and mental function defects to be most valid. Data gathered by

developmental psychology are taken under consideration. The hypothesis is also backed by general preconceptions about the purposefulness of functioning of living organisms: it is more economical to try out the designed action using internalized tools then to act it out thoroughly, wasting both time and energy. Unfortunately, combined data from all these fields is inconclusive. Since each of these fields provide data both in favor and against the hypothesis.

Another thing causing the complexity are misunderstandings. There is no agreement as to how internalization of speech works. Are we considering Watson's micromovements of the organs, or the changes in electric potential of the speech organs? Are only changes in electric potential and chemistry of the brain considered, or maybe undefined physical manifestations of words?

Similar or even greater terminological differences surround the key term "thinking" which is known for its numerous meanings.

The inconclusiveness of certain facts may be caused by misunderstandings. The said facts fit in with one way of understanding the hypothesis, while another way of understanding it may cause the same facts to become irrelevant and prove nothing.

The strong dependency of the connection between thinking, internalized speech and epistemological concepts is another circumstance making it harder to come to less contradictory conclusions. Some of the proposed solutions reference nominalism, others conceptualism. Sometimes epistemological arguments introduce elements that transcend the empirical and have the form of a postulate.

Due to the above described complex theoretical situation it seems appropriate to divide the problem into smaller, simpler and mutually exclusive parts. It also seems that the right thing to do is to more precisely formulate the hypothesis. The possibility to prove the hypothesis shall remain secondary.

c. The notion to specify common statements is often considered dubious. Such specified statements are often accused of transforming the original intent of the utterance so that the final result bears a completely different content than the original. Such issues may also occur herein. The basic method of analyzing statements is through determining the language in which the statements will be again formulated. This language usually has only a limited number of initial concepts which must suffice to express a terminologically richer common utterance.

There is no other way, statements formulated in an isolated, limited language are one-sided and their content is simplified. Despite these limitations, or maybe because of them, specification is so useful. Since there are only

few terms (concepts) present in the isolated language they may assume a symbolic form. This allows for a particular statement to be written down precisely and without any misunderstanding. Any extra comments, interpretations or additions present in the common language lose their influence on the process of identifying the relationship between isolated statements. This last moment seems most crucial: the distillation of language and symbolic recording of statements allow us to disregard the verbal, constantly fluctuating expressions and apparent additions which in fact change the recorded expressions to such an extent that the consequences of statements change drastically. Therefore distilling a part of a language and remaining strictly within its boundaries shall be my primary method of analysis herein.

In the available literature on the subject the hypothesis is justified as follows: numerous different facts are mentioned for and against the connection between thinking and internalized speech. These facts are presented in such a way to prove the said connection or to prove some other positive thesis. Such explanations will always be flawed. It is impossible for a general and unrelated thesis to be based on detailed and particular data. Therefore I shall still analyze the correctness of the hypothesis, however I apply a different approach. I shall begin with making an assumption about a hypothesis (or more precisely a group of hypotheses) and I shall make it my starting point without providing explanations. From there I shall venture to analyze the consequences of these hypotheses. If these consequences prove to be true, then the hypothesis will be confirmed. If the consequences prove to be false than at least a part of the hypothesis will be disproved. The whole argumentation for or against the hypothesis will be limited to determining its logical outcomes. This course of action significantly limits the scope of research, because presupposed and simple hypotheses may not be used to prove everything that could have a connection to the analyzed hypothesis about verbal nature of thoughts. Most of the known data cannot be expressed in the language which I shall use to formulate the hypothesis and its consequences.

FORMULATION OF THE HYPOTHESIS

Contrary to what intuition may suggest the hypothesis about the connection between thought and internalized speech does not consist of one sentence. Several questions need to be answered as a part of this hypothesis. Well, thinking is supposed to, in one way or another, be connected to inner speech. This is one of the elements of the hypothesis. Additionally I need to determine how does internalized speech work — the basic issue here is how similar it is to communicative speech. Only this similarity may give

grounds for calling certain inner processes 'speech'. This, however, requires a proper characteristic of communicative speech. The hypothesis about the connection between thinking and internalized speech consists of three sets of sentences which I shall present in the following order. The first set characterizes communicative speech. One can easily imagine how complicated a full characteristic of communicative speech might be. It is completely impossible to present it here in full. I shall provide a part of it comprising of three simple theorems. The lack of syntactic description of both the surface and deep level of the communicative speech is an obvious limitation that will also influence the characteristic of inner speech to which the second set of sentences will be dedicated. This second set states the similarity between inner and communicative speech. The third set of sentences touches the issue most important for this text: it establishes the connection between inner speech and thinking.

a. Firstly I need to determine the concepts which I shall use hereafter. Choosing these concepts is at the same time a way to more precisely define the scope of analysis. As I previously declared I shall try to limit the subject matter, therefore I shall consider only the necessary concepts without which it would be impossible to formulate the hypothesis. I want to establish the connections between thinking and inner speech, so I need these two concepts symbolized respectively by T and I. Since inner speech ought to resemble communicative speech, the last one therefore requires its own group of concepts. I shall utilize the concept of using an expression (a piece of writing, a sound, a movement or concaveness/convexedness etc.) as a sentence sign or in some cases as a naming sign. Their respective symbols are S_s and S_n.

The basic difference between the signs of communicative speech and inner speech is the fact that we can inter-subjectively, articulately and distinctly create and receive; whereas one cannot say the same about inner speech yet. To underline this difference I shall introduce the concept of noticing N. With inner speech we do not use signs understood in the normal way (that is the inter-subjectively perceived signs), but their respective equivalents. When I will be describing inner speech I shall use the concept of sign equivalents. Therefore I shall introduce yet another concept — sign equivalent — which will be symbolized by a vertical line | on both sides of a symbol.

While formulating a hypothesis about the relationship between thinking and inner speech I need to also consider the time and the person. It is possible that sometimes things happen in a certain way and sometimes in another. Some things always coincide, others occasionally. For example, when we use inner speech we sometimes also notice the signs we create inside.

Therefore our concepts (T, I, S_s, S_n, N) must correspond to time and person. They must assume the predicate form like $T(t, v...)$, $I(t, v...)$, $S_s(t, v...)$, $S_n(t, v...)$, and $N(t, v...)$ — where t is a time variable and v is a person variable. The concept of an equivalent | does not correspond to anything, it is a function. This concept does not have to correspond, because it will occur in the context of the already corresponding concept $I(t, v...)$.

These instruments need to be supplemented with nonspecific tools from the field of logic. It would be convenient to assume that I can use a part of the set theory (the set membership symbol) in addition to the widely understood functional calculus. I shall also borrow two concepts of a part. One concept of a part will be C and it is purely syntactic in character, another, more general is P which I shall use when I will want to underline that one time segment is a part of another time segment. I am not going to characterize these borrowed concepts. Another addition to conceptual instruments are the names of expressions or more precisely type variables for expression sets. Variables $\emptyset$, $\emptyset'$, $\emptyset''$ etc are type variables for a set of sentence names; a, a', a'' etc are type variables for a set of naming expressions' names; finally η, η', η'' etc are type variables for a set of arbitrary expressions' names. Names for types of expressions I shall formulate in a well known way, by listing the variables and using corner quotes.

All theorems included in the analysis of the hypothesis will be formulated only with the use of the above listed concepts. It is clear that limiting the number of instruments results in narrowing the possibility of expressing interesting and important theorems. However, this limited possibility to describe a wide assortment of facts and phenomena may also mean that with use of such a small (compared to the size of the problem) set of instruments it will be possible to precisely say things which are usually formulated in a very sloppy and trivial manner.

b. The goal is to consider the connections between inner statements (whatever they really are) and thinking. If such statements exist they are utilized to think about objects and phenomena. Therefore they are utilized much in the same way as signs in communicative speech. While speaking about signs in the context of thinking I shall refer to their semantic not syntactic aspect. The concept of sentence sign $S_s(t, v...)$ will be complemented by sentence sign's name and an occurrence which draws attention. This means that a full notation of a sentence sign looks as follows: $S_s(t, v, \emptyset, p)$. This symbolic notation will be read like this: in time t for a person v sentence $\emptyset$ is the sign of the occurrence p. For similar reasons the notation of the naming sign needs to be expanded to the following form: $S_n(t, v, a,$

y). This symbolic notation means as much as: in time t for a person v name a is the sign of the object y. In the case of inner statements the notation $I(t,\ v...)$ requires that the name of the innerly expressed creation will be added. Therefore the final form of the concept is $I(t,\ v,\ |\eta|)$ which will be read as: in time t a person v innerly expresses the equivalent of η i.e. $|\eta|$. The concept of noticing is obvious. We notice signs (we do not discuss other things, because they are of no interest to us). Therefore I propose this notation $N(t,\ v,\ \eta)$ which reads: in time t a person v notices an expression η. Finally to the concept of thinking. I make the assumption that we are thinking not about objects but occurrences. About objects we simply think, we assign certain notions to them. Such thought are judgments — sentence equivalents. As a result of that I shall complete $T(t,\ v...)$ with sentence signs: $T(t,\ v,\ p)$ or $T(t,\ v,\ z(x))$ where $z(x)$ is function with the variable x and the predicate z. $T(t,\ v,\ p)$ should be read a follows: in time t a person v thinks that p.

c. Now I shall characterize the concept of a sentence sign and provide similar explanations for inner speech. I shall assume that the concept of sentence signs is extensional. Moreover I shall assume that if the signs are identical and utilized by the same person at the same time then such signs are equal.

A1. $\emptyset = \emptyset' \rightarrow\ [S_s(t,\ v,\ \emptyset,\ p) \equiv\ S_s(t,\ v,\ \emptyset',\ p)]$

I shall also assume that if within the whole time t one expresses $\emptyset$ and at the same time expresses $\emptyset'$, then $\emptyset$ and $\emptyset'$ are identical. To paraphrase: within one time only one sentence can be expressed.

A2. $S_s(t,\ v,\ \emptyset,\ p) \wedge S_s(t,\ v,\ \emptyset',\ p) \rightarrow\ \emptyset = \emptyset'$

The above assumption may be considered true only if the time t, when $\emptyset$ and $\emptyset'$ were used, will be properly comprehended. If this time be too long then it would be obviously possible to use two different signs. Therefore the sentence sign utilization time will be defined as a very short time, so short in fact that the whole time t is the time required to utilize the sign $\emptyset$. It is the time of the actual utilization of the sign without any pauses or moments of consideration, which are not the utilization (by the speaker or recipient) itself. Such a specification of time is given by

A3. $S_s(t,\ v,\ \emptyset,\ p) \rightarrow\ \sim\bigvee_{t_1}[S_s(t,\ v,\ \emptyset,\ p) \wedge\ t_1 \neq\ t \wedge\ t_1\, Pt]$

I shall not describe sentence signs any further. Other theorems might have described the process of communication between a few people. Inner speech, however, does not have a communicative function, and the goal of the three initial theorems was to provide a formula for internalized speaking, so any additional assumptions about sentence signs are not necessary.

Having established certain formulas in A1-A3 I can now describe inner

speech. If it is in fact a type of speech it has to be similar to communicative speech as much as possible, also in the context presented in A1-A3. To ascertain this similarity, at least to some small degree, I shall assume that inner speech will fulfill similar theorems as those described in A1-A3.

Most importantly I shall assume that internalized speech is as extensional as communicative speech.

B1. $\emptyset = \emptyset' \rightarrow [I\ (t,\ v,\ |\emptyset|) \equiv\ I(t,\ v,\ |\emptyset'|)]$

Seemingly B1 is different than A1 — it states that signs are the same, therefore their spoken equivalents are equal. I can make B1 more similar to A1 by making one additional assumption:

B1'. $\eta = \eta' \equiv\ |\eta| = |\eta'|$

B1' states that a signs' equivalents are equal when signs are equal. It is also true for a reverse statement. Since two communicative signs cannot be spoken at the same time I shall assume the same about internalized speaking:

B2. $I\ (t,\ v,\ |\emptyset|) \wedge I(t,\ v,\ |\emptyset'|) \rightarrow\ \emptyset = \emptyset'$

Making inner speech and communicative speech alike may have profound consequences since it may determine the linear character of thinking connected with internalized speaking.

Finally, I shall analogically define time which is necessary to internally express sign equivalents:

B3. $I\ (t,\ v,\ |\emptyset|) \rightarrow\ \sim\bigvee_{t_1}[I\ (t,\ v,\ |\emptyset|) \wedge\ t_1\, Pt \wedge\ t_1 \neq\ t]$

This does not mean, however, that the time of internalized expression should be identified with the time needed to say a sign. At this point in both cases the time in question is the moment necessary to express signs or their equivalents. In the light of the statements made thus far these times may or may not be identical — this is yet to be established.

d. Now I shall analyze the core of the hypothesis in question which links at least one type of thinking to inner speech. The simplest way to formulate this concept is: thinking about something implies innerly saying some sentence:

(a) $T(t,\ v,\ p) \equiv\ I(t,\ v,\ |\emptyset|)$

The above formula is unfortunately unacceptable. It may be, however, divided into two parts which I shall analyze separately:

(b) $T(t,\ v,\ p) \rightarrow\ I(t,\ v,\ |\emptyset|)$

(c) $I(t,\ v,\ |\emptyset|) \rightarrow\ T(t,\ v,\ p)$

(b) states that the consequence of thinking p is speaking the sentence equivalent $\emptyset$. In this case the letter "p" is a variable, so according to the simple rules governing variables it can be substituted with any sentence and

nothing besides p will change. This would mean that the consequence of thinking would always be expressing the same sentence equivalent Ø. If Ø type sentences were a part of the common language then each and every person thinking about anything would have to speak Ø type sentences of the Polish language. For instance each Hindu person would have to speak Polish sentences if Ø would be Polish sentences. Such consequences of (b) are unacceptable. The difficulty lies in the lack of any connection between the innerly spoken sentence and the occurrence that is thought about at that moment. A similar thing will happen in (c) when Ø is substituted with a sentence. This leads to the following consequence: inner expression of the equivalent Ø allows for thinking about anything. Moreover (c) prompts further subjects for consideration. According to (c) inner speech always leads to thinking. Therefore there is a postulate hidden in (c) that inner speaking (which is the issue herein) is not just some random internalized speech that may happen while learning some meaningless syllables, as Ebbinghaus did. Formula (c) demands that inner speech results in thinking. As a result (c) implicitly requires a division of inner speech into a different type where only one of them is relevant to the subject of this article. This part of (c) seems to be correct and it should reappear in the analysis below.

Regardless of the above mentioned problems to establish the connection between internalized speaking and thinking I need to establish the connection between the occurrence that is thought about and the sentence referencing it. One can assume that when Ø is a sign of p then a sufficient equivalence occurs between thinking and inner expressing of the equivalent Ø, thus:

C(1) $S_s\,(t,\ v,\ \text{Ø},\ p) \rightarrow [I(t,\ v,\ |\text{Ø}|) \equiv\ T(t,\ v,\ p)]$

It should be noted that the equivalence in (1) occurs under the condition that in a given moment t person v (as the speaker or the recipient) uses the sentence Ø as a sign of p. This condition is relatively rarely fulfilled. We often think without speaking at the same time, nor listening to or reading anything. Therefore C1 does not give much information about internalized speech and thinking. We have no idea what are relations between speech and thinking in cases when no sign is being used. One may consider the following additions of rather limited importance:

C1' $\bigvee\limits_{p}\,[T(t,\ v,\ p)] \equiv\ V\text{Ø}\ [I(t,\ v,\ |\text{Ø}|)]$[1]

C1" $I(t,\ v,\ |\text{Ø}|) \rightarrow \bigvee\limits_{pt_1}[T(t,\ v,\ p) \wedge S_s\,(t_1,\ v,\ \text{Ø},\ p)]$

At the same time the following version is unacceptable:

[1]Hypotheses which numbers are followed by an apostrophe are partial hypotheses which I shall not use in the course of further analysis.

(d) $V_i S_s(t,\ v,\ \emptyset,\ p) \rightarrow \bigwedge_{t_1}[I(t_1\ v,\ |\emptyset|) \equiv\ T(t_1,\ v,\ p)]^2$

The above states that if Ø was used as a sign of p, then innerly uttering an equivalent of Ø always leads to thinking about p. This would introduce the postulate of synonymy of all sentences. Such a postulate would be very far removed from reality.

C1 may be a source of numerous doubts. These arise mostly when it comes to the time necessary to think and to utter a sign. While writing about B3 I showed that times necessary to think (innerly verbalize) and to utilize a sign do not have to be equal. This matter was settled in C1. Statements made by numerous physiologists allow me to assume that thinking and inner verbalization takes less time than a communicative expression of a given thought. It may be assumed that often the thought precedes the utterance. This, however, does not completely exclude situations when we think as slowly as we speak. Taking the above into account it can be concluded that C1 informs us about this equivalence of thinking and inner speech which occurs when appropriate signs are utilized. The condition of equivalence is not fulfilled as often as I have suspected. For the time being it is impossible to acknowledge more frequently occurring conditions of the equivalence introduced by C1.

Assumption C1 states that under some conditions thinking is accompanied by inner speech. C1 does not, however, straightforwardly connect inner utterances with thinking. C1 allows for a situation when one inner utterance is accompanied by numerous thoughts. In such a case the relationship between internalized speech and thoughts would be rather accidental and loose. If some type of thought is to have a verbalized character then a straightforward attribution of thought to the appropriate innerly spoken statement must be assumed. C2 is such an assumption (definition of $\overline{\overline{t1'v}}$ will be provided below):

C2. $I(t,\ v,\ |\emptyset|) \rightarrow\ (T(t,\ v,\ p) \wedge T(t,\ v,\ q) \rightarrow$
$\rightarrow\ [T(t,\ v,\ p) \underset{t'_1 v}{=} T(t,\ v,\ q)]) \wedge$
$\wedge\ \{[T(t,\ v,\ p) \underset{t'_1 v}{=} T(t,\ v,\ q)] \rightarrow\ [T(t,\ v,\ p) \equiv\ T(t,\ v,\ q)]\} \wedge$
$\wedge\ \{[T(t,\ v,\ p) \equiv\ T(t,\ v,\ q)] \rightarrow\ (p \equiv\ q)\}$

C2 has the following meaning: when v innerly utters Ø and at the same time thinks about p and about q then those thoughts about p and about q are identical. The fact that these thoughts are identical results in their equivalence, equivalence of thoughts means that the thought about occur-

[2]Sentences enumerated with the use of letters only (ex. (a)) have been rejected.

rences coincided. The two last statements describe the identical character more precisely, that is there are no differences between them, there is also no difference in their subject.

In C2 there is the symbol "$\underset{t'_1 v}{=}$" meaning that thoughts are exactly identical. I define this symbol as follows:

D1. $p \underset{t'_1 v}{=} q \equiv [T(t_1, v, p) \equiv T(t_1, v, q)]$

D1 comes from certain intuitive conclusions: one perceives two occurrences as identical when one thinks about them at the same time. This definition is based on cognitive realism.

It is impossible to tightly connect thinking to internalized speaking. Many expressions have synonyms. I shall assume that synonyms — being equivalents — are connected to the same thoughts. In case of a full identification of thinking with internalized uttering of equivalents of synonymous sentences thoughts on one hand should be identical (because of synonyms), and different on the other (because they would be identical with inner utterances of different form). Such full identification combined with the theory of the existence of synonyms would lead to contradiction. It is hard to reject the existence of synonyms. There are also no grounds to reject the conclusion that synonyms evoke the same thoughts. The only thing left is to reject the theorem that thinking and inner speech are identical. This solution has another advantage, it allows for other inner speech internalized activities within the boundaries of thinking. It is widely known that one aspect of Piaget's psychological theory is based on the conviction that internalized motions are a part of thinking. Therefore acknowledging the existence of synonyms I must assume that thinking and inner speech are equivalent but not identical. This assumption must be true for both the whole internally uttered sentence and for its parts and elements. The context of innerly spoken sentences works in a similar way. The reason behind this generalization is simple: not only might whole sentences have synonyms, but also parts of a sentence, its context and generally every utterance. Therefore the following is correct:

C3. $S_s(t, v, \emptyset, p) \rightarrow \{(\eta C \emptyset \vee \emptyset C \eta \vee \emptyset \in \eta \vee \eta \in \emptyset) \rightarrow$
$\rightarrow \sim[T(t, v, p) \underset{t'_1 v}{=} I(t, v, |\eta|)]$

So an inner utterance is not identical to the thought about a respective occurrence. These loose relations between thinking and inner speech have also another aspect. One thought may be expressed through different utterances. Moreover, interchanging between synonymous utterances should not in any way lead to a change of the original thought. This last conviction cannot be

expressed in our language thus I can only accept its consequences formulated in C5. Unfortunately C5, which will be analyzed hereafter, is far less obvious than the conviction written above.

The assumption C3 together with C1 lead to interesting problems which, however, will not be analyzed herein. But they do need to be at least mentioned. Since inner speech (due to the existence of synonyms) cannot be identified with thinking, it therefore only accompanies discursive (verbal) thinking, a question arises: what is discursive thinking and why is it always accompanied by inner speech? What part does this speech play in thinking? If I identified thinking with internalized nonverbal reactions to events (for instance the tensing of relevant muscles) then what is the part of inner speech in thus understood thinking? I shall not answer these questions herein.

Internalized speaking should be an equivalent of communicative speaking. I have given a few theorems which emphasize their similarity. But I have not expanded upon the subject. Now I shall complement the hypotheses B1 to B3 by attributing inner speech to communicative speech. I shall assume that while one talks out loud, listens or reads certain inner processes take place which I shall call inner speech. In the case of people who have the knowledge of the given language, inner speech governs communicative speech. The opposite happens when one receives a message. Additionally, when one uses signs (as a speaker or recipient) then one notices those signs. This is obvious in the case of reception. Less so in the case of speaking, but true nevertheless. We control the statements we utter and upon making a mistake we correct ourselves. All above observations allow for the following sentence:

C4. $S_s(t,\ v,\ \emptyset,\ p) \rightarrow\ I(t,\ v,\ |\emptyset|) \wedge N(t,\ v,\ \emptyset)$

Theorem C4 conclusively settles that the time necessary to utilize a sign is the same as the time necessary to innerly utter an equivalent of a relevant sentence. This equivalence of times may cause doubt to arise. I want to also add in reference to what I have already remarked upon in the context of C1, that due to A3 and B3 the time necessary to utilize a communicative sign and the time required for an inner utterance of that sign's equivalent is the shortest period possible which allows these two things to happen. For example: if a person uses 30 seconds to utter a statement, but from these 30 seconds 20 seconds are used for a pause (the person is silent) then I shall conclude that this person actually uses 10 seconds to utter the sentence. In a such perceived short time in which a sign is used, according to C4, I always refer to the denotement of a sign. This does not exclude the possibility that within the described pauses one once again speaks about the denotements

or thinks about something completely different.[3]

Seemingly C4 is an assumption that does not provide much new information about the connection between communicative speech and inner utterances (and consequently thinking). However, the truth is that many elements of C4 should be considered. One perceives a sentence on the level of the surface structure. It is not certain, however, that the same structure is innerly verbalized and not for instance the deep structure. To avoid discussing this difficult subject I shall assume that that sentences Ø are governed by the rules of logical syntax. I shall also assume, as Lakoff did, that deep structures are logical by nature. Therefore in the analysis herein I shall discuss a simplified variant, where deep structure is identical with the surface structure.

Another concern brought about by C4 is of the philosophical kind. C4 is not philosophically neutral, it shows preference towards the negation of nominalism. One of the variants of nominalism says that the only realities are things and reactions to these things. Mental reactions are limited to verbal reactions. $C4_1$ and C_1 postulate that beside the fragments of reality, signs and verbal reaction there is also thinking about a given fragment of reality. I made the assumption that thinking and verbal reactions are not one and the same thing, therefore C4 does not work in favor of nominalism (in one of its variants).

One other noteworthy aspect is the fact that C4 requires a proper definition of the concept of the sign. According to C4 thinking p is a prerequirement for Ø to become the sign of the occurrence p. In light of C4 as a child, who reacts to p by uttering Ø and who has yet to internalize speech, it does not utilize signs in the way understood herein. Because using signs in the way that is specified in this article requires verbal thinking which is equal to internalized speech. The latter is unavailable to a child. A child cannot utilize a song in the sense described in C4. According to C4, internalized speech is required to fully master signs.

Coming back to the issue of time necessary to innerly utter sentence equivalents I must make one more assumption. The time necessary for communicative and inner speech has been assumed as equal, which is the biggest simplification introduced herein. This simplification may raise objections. Without much doubt, however, I can assume the following: provided that discursive thinking lasts shorter than uttering a communicative sentence

[3]More precisely this does not refer to redundant sentences. The analysis in this article concentrates on utterances made in a language with a low redundancy ratio (see information about deep and surface structures).

then similarly less time would also pass for an inner utterance of the same sentence:

C5. $S_s(t,\ v,\ \emptyset,\ p) \wedge t_1\, Pt \wedge T(t_1,\ v,\ p) \rightarrow\ I(t_1,\ v,\ |\emptyset|)$

It is generally known that we cannot perform a certain action and at the same time refrain from performing it. It is also impossible for people to be excited about something and at the same time completely emotionally restrained in respect to one and the same thing. When the processes of excitement and restraint in relation to a performed activity are beginning to reach a similar level, then a person starts to experience that as a discomfort. People call it a problematic situation, a dissonance or a lack of balance. And they feel like Buridan's ass.

This antagonism between excitement and restraint is of crucial importance to this analysis. Signs evoke various reactions. Some of them are reactions to the signs themselves. Reactions of people who do not know the given language are limited . People who know the given language have those kinds of reactions and additional reactions to the phenomenon or thing to which the sign refers. Among these reactions to the denotation there is also the one of interest to me that is a discursive thought reaction which is closely connected with inner speech. The moment one reacts to a denotation with inner speech, according to A3 and B3, one is incapable of any other verbal reaction at the same time, i.e. is incapable of reacting to the sign itself. Therefore if one reacts both to the denotation and the sign, the reactions to the sign should be nonverbal which can be often observed. Moreover, if one reacts with discoursive thinking to the denotation of the sign then verbal reactions to the sign itself are blocked. This blocking mechanism is more general than the previously described inability to produce two different inner utterances at the same time. The previous mechanisms allowed a situation where the sign in use was the denotation and that this sign referred itself.

In this borderline situation there would be no separate reaction for the denotation and for the sign. The denotation and the sign would merge together. But the most usual situation is when the denotation and the sign differ. In these usual situations a pattern emerges — the verbal reaction to the sign is being blocked. This common reflex in relation to signs and the antagonism between blocking and stimulation leads to the lack of verbal reaction to a sign (the reaction is to the denotation) while it is utilized, even if the sign itself is the denotation.

The conclusion is that one cannot at the same time react with inner speech (or thinking) to the sign or its denotation. Other reactions also lead to this conclusion. Every sign has its equivalent — ex. proper circumduction,

proper definiens — which has a different structure than the sign itself. Now I shall describe a particular situation: a person thinks simultaneously about the sign and the denotation of this sign — that means the sign and the denotation are identical, or the denotation is a part of the sign or its context. However, if a sign has a non-identical synonym (and it has already been assumed here that it must have one) than there should be a possibility to insert this synonym in place of the original sign. The thought connected with the inner utterance of a statement changed through replacement should be identical to the one connected with the original statement. According to the provisionally made assumption the original statement was the denotation and something was thought about it (ex. about its shape), so after the statement gets replaced the thought should stay the same (replacing of synonyms). This, however, is impossible because the change of the statement causes the change of the subject of thought. The change in the subject of thought changes the thought itself (see C2). So now I have reached a contradiction. Therefore the assumption is wrong: I cannot assume that one ever reacts verbally to a sign when this sign is being utilized.

In the herein used restricted language I cannot formulate the above described notions about the antagonism between blocking and stimulation, and about the inability to replace synonyms. So the results of these deliberations cannot serve me as assumptions for further analysis. In this case I shall use the conclusions from the previous paragraph as my assumption:

C6. $T(t,\ v,\ p) \wedge I(t,\ v,\ |\emptyset|) \wedge (\eta \in \emptyset \vee \emptyset \in \eta \vee \eta C \emptyset \vee \emptyset C \eta) \rightarrow$
$\rightarrow\ \sim\{I(t,\ v,\ |\emptyset\,'|) \wedge [I(t,\ v,\ |\emptyset\,'|) \equiv\ T(t,\ v,\ z(\eta))]\}$

According to C6 when one thinks about p and utter $|\emptyset|$ one does not determine anything about $\emptyset$, neither its parts nor its elements nor its context. One does not verbally react to $\emptyset$, or any of its parts, when one utilizes $\emptyset$. In short C6 is the conclusion of the deliberations written down above.

In the assumption C3 I have introduced the concepts of identical occurrences which were defined in D1. That definition states that two thoughts are identical when and only when thinking one of those thoughts must lead to the thinking of the other and vice versa. In D1 one I referenced a possibility of thinking about some other thought. I shall secure this possibility with a separate assumption which will confirm that thinking about thinking is accompanied by inner speech. This will be written down as follows:

C7. $S_s(t,\ v,\ \emptyset,\ p) \rightarrow \bigvee\limits_{t_1}[T(t_1,\ v,\ T(t,\ v,\ p) \wedge \bigvee\limits_{\emptyset} I(t,\ v,\ |\emptyset\,'|))]$

Lastly I will point out a certain obvious thing. Noticing a sign does not always lead to inner speech. One may thoughtlessly look at a piece of writing or listen to someone speaking and not have any inner utterances or thoughts

on that matter:

C7'. $\sim \bigwedge_t [N(t,\ v,\ \eta) \rightarrow\ I(t,\ v,\ |\eta|)]$

I shall not use C7' in my further deliberations. Its sole purpose is to illustrate that in such a restricted language one is able to formulate further theorems unrelated to the already accepted theorems. They shall not be expanded upon because my analysis has a finely declared purpose.

The above defined assumptions provide the general characteristics of the use of signs (A1-A3), they show that inner speech is similar to the use of signs (B1-B3), and finally in C1 to C7' they assign inner speech to thinking and also establish the relationships between these actions and the utilization of the sentence sign and the noticing of a sign. The provided characteristics — in the light of the richness and vastness of the subject matter — are very limited and present a simplified version of only these aspects which are absolutely crucial in describing the relations between inner speech and thinking.

THE CONSEQUENCES OF THE HYPOTHESIS

At this point it is difficult to say how probable are the assumed theorems. I did try to choose them in such a way that they seem least suspicious. Such care does not guarantee that they are actually true, however, efforts to explain them usually do not go beyond such care. To establish their worth I need to derive at least a few of their consequences. Maybe some of them will allow me to connect the subject of this article with other issues, maybe the conclusions reached will be viable for an empirical verification.

C1 and C4 lead to:

(1) $S_s(t,\ v,\ \emptyset,\ p) \rightarrow\ T(t,\ v,\ p)$

If I use C1 and B3 I can derive:

(2) $S_s(t,\ v,\ \emptyset,\ p) \rightarrow\ \{T(t,\ v,\ p) \rightarrow\ \sim[t_1 \neq\ t \wedge\ t_1\, Pt \wedge\ I(t_1,\ v,\ |\emptyset|)]\}$

The result of C5 and (2):

(3) $S_s(t,\ v,\ \emptyset,\ p) \rightarrow\ \{T(t,\ v,\ p) \rightarrow\ \sim[t_1 \neq\ t \wedge\ t_1\, Pt \wedge\ T(t_1,\ v,\ p)]\}$

The theorems C4 and C2 lead to:

(4) $S_s(t,\ v,\ \emptyset,\ p) \rightarrow\ \{T(t,\ v,\ p) \wedge\ T(t,\ v,\ q) \rightarrow$
$\rightarrow\ [T(t,\ v,\ p) \underset{t'_1 v}{=} T(t,\ v,\ q)]\}$

The consequence of C2 is:

(5) $I_1(t,\ v,\ |\emptyset\,'|) \rightarrow\ \{[T(t_1,\ v,\ p) \equiv\ \ T(t_1,\ v,\ q)] \rightarrow\ (p \equiv\ \ q)\}$

C4 and (5) result in:

(6) $S_s(t,\ v,\ \emptyset,\ p) \rightarrow\ \{[T(t_1,\ v,\ T(t,\ v,\ p) \equiv\ \ T(t_1,\ v,\ T(t,\ v,\ q))] \rightarrow$
$\rightarrow\ [T(t,\ v,\ p) \equiv\ \ T(t,\ v,\ q)]\}$

Based on (6), (1), C4, C1, C6 and D1 I can assume that:

(7) $S_s(t,\ v,\ \emptyset,\ p) \wedge (\eta C \emptyset \vee \emptyset C \eta \vee \eta \in \emptyset \vee \emptyset \in \eta) \rightarrow$
$\rightarrow\ \sim[T(t,\ v,\ p) \underset{t'_1 v}{=} T(t,\ v,\ z(\eta))]$

Conclusions (1), (3), (4) and (7) are identical with the assumptions I made in another essay *Semantics and pragmatics* (see pages 36-37, theorems 7.1, 7.2, 7.3 and 7.5). Since these assumptions lead to the transparency of signs and the theorem of the psychological inability to reach semantic antonymies, the hypothesis presented herein results in various theorems which have not previously been analyzed together. This is a rather interesting result and it may lead to a joint analysis of other subjects which have only been considered separately so far. The above deliberations also help to better understand the rule of transparency.

COMMENTS ON THE GENERALIZATION OF ACHIEVED RESULTS

Throughout the article I have analyzed the internalized uttering of statements which were expressed through the variable Ø present in all theorems I have presented herein so far. It also happens that a person utters names or other lexical classes. It seems that the above results may be easily adjusted to describe the uttering of names. The reasoning behind this line of thought is simple: it is agreed that name — like sentences — form semantic relationships with fragments of reality. In case of other utterances, for instance logical connectives, the situation is not that obvious. For utterances other than statements and names it would be difficult to formulate an equivalent of the assumption C1, that is the equivalent of the condition which establishes the semantic connection between the utterance and object serving as the subject of thinking.

While establishing the connection between the inner uttering of a name and thinking I will not consider the specific characteristics which differentiate a name from a sentence. So the A1-A3, B1-B3, C1-C7 may be repeated without any significant changes, because they do not provide any characteristic of sentences. Unfortunately some changes must be made, I shall present them in example A1:

A1. $\emptyset = \emptyset' \rightarrow\ [S_s(t,\ v,\ \emptyset,\ p) \equiv\ S_s(t,\ v,\ \emptyset',\ p)]$

A1 is easy to grasp: the same sentence in a given time relates to the same occurrence.

Now let's try to do the same with a name:

(a) $a = a' \rightarrow\ [S_n(t,\ v,\ a,\ y) \equiv\ S_n(t,\ v,\ a',\ y)]$

In case of (a) a difficulty arises which I shall illustrate with the following paronomasia:

(b) A diamond is not always a diamond.

In (b) the word "diamond" is used in two different meanings, the first one as a gem, the other as a figure having four sides of equal length forming two acute angles and two obtuse angles. If a makes the assumption that the time of utilizing a name is the time of utilizing a sentence then a at the same time means y and y' and $y \neq y'$, where y is a gem and y' is a figure. In light of the assumption I have made about the time of utilization of names an attempt to use A1 for names turns out to be false. But is this assumption necessary? There is a lot in favor of this assumption. A name does not perform a fully independent function (apart from in rather unusual situations when it constitutes a sentence fragment). This lack of independence can be seen in the fact that when utilizing the name the speaker directs the recipients attention towards an object, the recipient is then forced to think something about the object. The recipient must at least think that this object exists, is placed somewhere or the speaker wants to draw attention to it. However, when one thinks about something then this thought is in a form of a sentence which might have only been uttered innerly. Therefore one should and probably must treat a name as a part of a sentence. This leads to the conclusion that the name means something as long as the sentence it belongs to is being utilized. So my assumption seems to be correct and it does not — so it seems — cause any major problems. Names described in $A1^n$ — the equivalent to A1 — must be additionally relativized by their place in the sentence. In such a case the equivalent of A1 does not raise doubt.

$A1^n$. $a_{\varnothing i} = a'_{\varnothing i} \rightarrow [S_n(t, v, a_{\varnothing i}, y) \equiv S_n(t, v, a'_{\varnothing i} y)]$

In $A1^n{}_n$ the lower index next to a and a' means that these both expressions are positioned on the i-th place in the sentence. According to $A1^n$ expressions positioned in the same place, in the same sentence and designate the same object.

A real problem arises when I try to formulate an equivalent for C1. If I were to leave the relativization introduced by $A1^n{}_n$ the equivalent of C1 would look like this:

$C1^n{}_n$. $S_n(t, v, a_{\varnothing i}, y) \rightarrow [I(t_1\ v, |a_{\varnothing i}|) \equiv \bigvee_s (t, v, s(y))]$

According to $C1_n$ the time in which a means y is the same with the time of uttering $a_{\varnothing i}$ and the time of thinking about y.

In $C1_n$ the time necessary to think y which is the same as the one necessary to internally utter Ø would be identical with the time necessary to

innerly say $a_{\varnothing i}$. That would lead to a situation when the time necessary to innerly utter the whole sentence Ø would be the same as the time necessary to utter a part of Ø i.e. the name $a_{\varnothing i}$. This short reasoning shows that the time relations in C1 are far more complex than in $C1^n$.

The difficulty highlighted above repeats in several other places therefore it is impossible to simply transfer onto names the rules I have set for sentences. This problem is too complicated to be dealt with herein and I shall leave it for some other article.

PROSODY AND TRANSPARENCY OF SIGNS

a. The rule of transparency is very often mentioned while deliberating signs. However, it is formulated in various ways. The core idea of the rule remains the same: when one uses a sign one thinks about its denotation; however when one thinks about the sign one does not consider the sign's denotation and the sign loses its denotative character. Herein I use the following way of formulating this rule:

(8) $S_s(t,\ v,\ \varnothing,\ p) \rightarrow\ T(t,\ v,\ p)$

(9) $S_s(t,\ v,\ \varnothing,\ p) \wedge (\eta C \varnothing \vee \varnothing C \eta \vee \eta \in\ \varnothing \vee \varnothing \in\ \eta) \rightarrow\ \sim\bigvee_s [T(t,\ v,\ s(\eta))]$

In light of the above presented analyses it seems appropriate to consider the rule of transparency and certain objections that are being held against it. Giving the rule more thought seems important, because transparency is not some marginal trait of signs. For instance, Ajdukiewicz uses this rule to differentiate the associative theory of sign from the intentional theory of sign. Morris uses it to define what a sign is. Husserl also values this rule.

b. A group of facts which seem to contradict the rule may be the situations described in stylistics, meaning the influence of prosodic elements on the meaning of an expression. It is generally accepted that raising one's voice may change the meaning of an expression. The way one interprets and perceives a poem is strongly influenced by homophony which is created through rhythm, momentum and onomatopoeias. These common truths may be used against the transparency of signs. Primarily I may discard all definitions of the rule which state that while using a sign one does not notice it at all, as if one did not see it (Schaff). Still there is the possible contradiction between the less radical versions of the rule and the above described prosodic phenomena. I shall present now the doubts raised against the rule of transparency which arise from the effects of the external form of a sign on the user of the sign. While utilizing a sign (as the speaker or

recipient) a person reacts to the denotation of the sign, but also to the length of the sign, its homophonic quality, the tone of voice and so on. Some of these reactions are internalized like microtensing of muscle etc. The said reactions may influence human behavior, for example how a person will solve a problem which has been signalized by the sign. Therefore, the way a statement is formulated, its prosodic qualities among others, may impact on the attitude and the inner and outer actions of the recipient. One does not react merely to the denotation but also to the sign itself, one type of the reaction to the sign itself are the changes in the trail of thought. In this situation is it not so that reactions to the sign itself (with the exception of the reactions to the sign which replace the reactions to the denotation of the sign) should be described as thinking about the sign? If this was the case then the transparency rule would be false: one would be thinking about the sign and its denotation at the same time. This may be the cause of why Jakobson lists the metalanguage function among the functions of a language. In light of the analysis herein the correctness of the transparency issue boils down to the question: can thoughts about the sign itself, which are not equivalents of thoughts about the denotation of a sign, be seen as thoughts according to the line of reasoning presented in this article? That is thoughts accompanied by internalized utterances about the sign. Only in such a case one can reject the rule of transparency. In short: the rule of transparency excludes the possibility of verbal thought about a sign when the said sign is being utilized.

c. The premise of the rule of transparency — subsequent elements of the hypothesis of the connection between inner speech and thinking — were chosen in such a way that they were not to be dismissed at the very start. This care for initial probability should not be the only reason behind accepting a hypothesis. If that was the case proving a hypothesis would be pure speculation. Therefore it would be useful if it was possible, while analyzing the hypotheses, to reach such conclusions which could be later proved or disproved through experiments.

It seems that just with a few additional assumptions the rule of transparency can be proved with an experiment. The rule states that while using a sign one thinks about its denotation. These thoughts are accompanied by inner speech. At the same time while utilizing the sign one does not think about the sign itself and does not innerly say anything about it. The way to prove this would be to create a situation where a person needs to simultaneously think about the sign and its denotation. However, it is hard to determine what people are actually thinking. I would have to assume that

it is possible to determine what people are thinking by assessing their visible reactions. Uttering of unknown sentences may serve as a way of measuring thoughts. Similarly performing actions according to verbal orders — a person must understand the order to perform the task so that a person must have thought about the content of the order. To disprove the rule of transparency in an experiment the test subject must be provoked into thinking two things at the same time. The problem is that the person in question is not capable of simultaneously saying two sentences which would be reactions to the two thoughts. That would be physically impossible (see A3). This person may only be asked to produce one sentence which would refer to one thought. But the test subject may have nonverbal reactions to a spoken stimulus. Appropriate reactions would be to prove that this person understood the order (verbal stimulus) i.e. prove a second thought. If the person would be able to simultaneously speak about the order and carry it out, it would disprove the rule of transparency. This is how I imagine an experiment could look like.

The test subject receives several orders to perform some nonverbal actions like pressing buttons. When the person performs these tasks t (the time of performing them correctly) is being recorded. Later the person receives other instructions: the person must describe in a formalized way the characteristics of pieces of text that he sees. The content of these texts are previously received instructions (about pushing the buttons). The person must perform the second set of orders as fast as possible — again the time t_1 would be measured. The third part of the experiment would be: the person has to verbally describe and at the same time perform the orders. The time t_2 of performing both tasks at once would also be measured.

There are two possible outcomes: 1) time t_2 would be the same length as times t and t_1; or 2) time t_2 would be longer than one or both t and t_1. What would the first option mean? I think that it would only mean that in the shortest possible time of understanding an instruction (and thinking about what this instruction informs about) people can also think about the content of the instruction, of course, if they can describe it properly. In short if t_2 and t or t_1 are identical then it is possible to think about the sign and its denotation at the same time. Thus the rule of transparency would be disproved and with it the premise for the hypothesis about the connection between thinking and inner speech.

The other possible outcome (if t_2 is longer than t or t_1) is less obvious. On one hand this result would be in line with the following consequence of the rule of transparency:

$$S_s(t,\ v,\ \emptyset,\ p) \wedge T(t,\ v,\ p) \wedge T(t_1,\ v,\ z(\emptyset)) \rightarrow\ t \neq t_1,$$

because if t is not the same as t_1 and does not even partially coincide then t together with t_1 creates a period of time longer than t_2. However this result would not be very valuable as proof for the hypothesis, because there is no way to determine (on the basis of the rule of transparency) how much longer t_2 should be from t or t_1.

There are various ways of looking at the lengths of times t_2. The most obvious way is to treat t and t_1 separately and consider t_2 to their sum. This is a very natural line of reasoning and it also provides a hint as to the length of the periods t_2. According to A3 and B3 t and t_1 are very short periods of time, so short in fact that they are fully "occupied" by the action of formulating thoughts. No other mental verbal action may be fitted into periods of time devoted to formulating thoughts.

The other way to consider this issue is to assume that periods t_2 are shorter than the sum of t and t_1, but are longer than t or t_1 themselves. I have already established that the time of uttering a sentence and the time of formulating an appropriate thought are identical when:

a) the surface structure of a sentence and the deep structure are identical,

b) the sentence is not redundant (at least not very redundant) (see the comments on C4).

Orders given to the test subject would be formulated in a natural language. The redundancy level in such languages is about 70%. The above presented rule of transparency does not apply to natural languages. Therefore I must make more assumptions, which will allow me to prove it with the help of natural languages. I shall assume that thinking is not redundant and it takes seven times less time to think something than to utter it. This would mean that $t_2 = t + (t_1 - 0.7t_1)$. I shall also point out that t_2 also encompasses the time of latency. Similar latency periods are hidden within t and t_1. By adding t to $(t_1 - 0.7t_1)$ I also add two periods of latency (expressing the exposition to instructions) which is unnecessary. I need to subtract one of those periods. If t_{lat} is the time of latency then the whole time of performing both actions should not be shorter than:

$$t_2 = t + [(t_1 - t_{lat}) - 0.7(t_1 - t_{lat})]$$

The above presented assumption is rather imprecise. It allows me, however, to determine that the true time t_2 should fulfil the following condition:

$$\{t + [(t_1 - t_{lat}) - 0.7(t_1 - t_{lat})]\} \leqslant\ t_2 \leqslant\ (t + t_1)$$

The remarks I have made outline a path which could lead to proving the rule of transparency and its premises which form the hypothesis about the connection between a certain type of thinking and inner speech.

I believe that my approach to proving the rule of transparency goes beyond previously conducted research (see Maruszewski and Nowkowska, *Próba eksperymentalnego badania "przeźroczystości słowa dla znaczenia"*, Studia Psycholog. 1970, 10). On the other hand, it is not free from omissions and simplifications. These are connected to the redundancy of language and its supposed consequence — the shorter period of verbal thinking. This requires further research.

Jerzy Pelc

SOME OBESERVATIONS ON THE CONNECTIONS BETWEEN SEMIOTICS, LOGIC AND LINGUISTICS

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The right manner of describing the relations: a) between semiotics and logic, b) between semiotics and linguistics would be to distinguish various meanings of the words 'semiotics', 'logic' and 'linguistics' and then to consider, separately for each of those meanings, the mutual relations between the three disciplines. I cannot do this, however, for more than one reason. Firstly, this would require much more space than I have at my disposal here. Secondly, at least with regard to 'semiotics', it would not be easy to define the term. Thirdly, even if this was done, it might soon turn out that the obtained results have become obsolete. Semiotics, in particular, although rooted in Antiquity and vigorously developed during the Middle Ages, has recently undergone changes so considerable that it can be perceived as a discipline *in statu nascendi*. The same applies to linguistics, which actually finds expression in terminological differentiations, for instance in the juxtaposition of traditional to modern (or, according to some, theoretical) linguistics, or in the discrimination, occasionally observed in the Polish language, between *językoznawstwo* and *lingwistyka*. Finally, with regard to logic, several phenomena crucial to the issue discussed herein have recently been noted, for instance the vigorous development of systems of non-standard logic; the steadily growing interest in pragmatic logic; the constant influx of important research results in the field of modal logic; developments in the fields of epistemic logic, deontic logic or tense logic, which are all crucial

to the logical analysis of natural language, and many others. In short, for nearly two decades we have witnessed striking changes in the disciplines concerned with language and sign. After a long, a very long, break, the time has come when logicians and linguists, representatives of the two sciences most closely concerned with investigating language, have begun to bridge the gap. The first period of such rapprochement in European culture occurred in Antiquity and, discounting some rare exceptions, the last big change before the present one took place in the Middle Ages.

When the idea of unified science was developing in the 1930s, Charles Morris perceived that the significance of semiotics lies "in the fact that it is a step in the unification of science, since it supplies the foundations for any special science of signs, such as linguistics, logic, mathematics, rhetoric, and [...] (aesthetics)" (Morris 1938). Today, when linguists regularly and on a massive scale apply the techniques and conclusions of contemporary mathematical logic in their research, while logicians have broadened their interests to include natural language, one could say, not entirely in jest, that the current predicament of semiotics is to watch out that linguists and the logicians do not completely swap their roles; because then the previous, inauspicious state of affairs: the separation of interests, would return and again a *sui generis* no-man's land would stretch between the fields cultivated by each of the sides.

In the history of logic, the already-mentioned development of non-standard inquiries, which has occurred in recent decades, is not the first opportunity for linguists to revise their traditional views on language. The first such opportunity occurred much earlier: it was during the birth of mathematical logic. The model was provided first by the conceptions of Leibniz, later by De Morgan and Boole. From these grew the study of the foundations of arithmetic from the point of view of logic, especially logical analysis of the concept of number, and the target that emerged afterwards was to discover and solve the antinomy of the set theory. To fulfil those research aims was a work of more than one generation: the first steps were made by Frege, Peano and Schröder, the next by Whitehead and Russell. Others who must also be mentioned are members of the Polish school, including Łukasiewicz, Leśniewski, Chwistek, Ajdukiewicz, Kotarbiński and Tarski, and members of the Göttingen school: Hilbert, Ackerman, Bernays and Behmann.

Within the scope of this then-new logic, that opportunity for a revision and amendment of the theory of language — an opportunity not seized by linguists at that juncture — was provided by two issues. The first of

those was symbolic, that is, the formal, character of logic, which made it possible to carry out inferences by means of arithmetical operations; this was a method of calculus which guaranteed that unobserved assumptions would not sneak into the deduction. This opportunity was grasped by linguists much later, only in the 1950s, as a call to formulate rules clearly and explicitly. The second opportunity was provided, in logic, by the theory of relational sentences initiated by De Morgan and Ch. S. Peirce under the influence of Leibniz's conceptions, and the theory of propositional functions. This opportunity was grasped even later than the first, for instance in the works of generative semanticians, McCawley, George Lakoff and others, e.g. in the form of sentence (S) parsing into a predicate and arguments.

In 1924, Russell (Russell 1924), commenting upon the implications of his theory of logical types within the theory of natural language, pointed out that the scheme of a subject-predicate sentence and the suggestions of traditional semantics, according to which one word denoted one object, a proper name — an individual entity and an abstract name — a universal, were misleading. He maintained that not every abstract name denoted a single universal and not every judgement consisted of a subject, copula and predicate. Words, according to Russell, belong to the same logical type, but their meaning may belong to various logical types; not every type can have its meaning represented by means of an isolated symbol. For instance, the attribute YELLOW, in natural language denoted by an isolated word *yellow*, should be, in Russell's view, represented by means of a propositional function "x is yellow;" in the case of symbols representing relations it is similar. It is easy to notice that Russell made a differentiation here between the surface structure and the deep structure of a linguistic expression, and that all those many years ago he was already doing it in a similar manner as it is done now in the transformational generative grammar (we may forgive him for not using the now-fashionable terms "surface structure" and "deep structure"). This example of a delayed influence of research in logic on a linguistic theory is not an isolated case; the limitations on the meaningfulness of sentences put by Russell on the theory of types echoed in some of Chomsky's observations on the so-called deviant sentences, illustrated, for instance, by the sentence *Sincerity may admire the boy.*

Semiotics is an interdisciplinary field based mainly on the twin foundations of logic and linguistics. However, it does not adopt all the aims of these two particular sciences. For instance, unlike logic at a certain time, it is not too interested in constructing the concept of number or analysing logical foundations of mathematics; and in the same way, it is not interested

— again: unlike linguistics of a certain period — in developing practical techniques for recording the languages of vanishing tribes as fast as possible. What it does adopt are common features of logic and linguistics, as well as psychology, sociology, philosophy and many other sciences, as ones interested in studying, most generally, language in itself and sign in itself. (Parenthetically: if, following Hahn (1987), logic is considered to be a science concerned with the ways we speak, then logic is a part of semiotics; if semiotics is treated as broadly as in Morris's program, it encompasses not only logic, but also many other sciences; if, following Carnap (1934) in his *Logische Syntax der Sprache*, philosophy is considered to be a logical analysis of concepts and sentences of the language of science, then philosophy becomes a part of semiotics. Of course, the relations between the denotations of the concept of semiotics and the concepts of logic, linguistics, philosophy, psychology etc. fluctuate depending on the current issues and aims of each of those sciences.)

Let us, however, close this parenthesis, in order to realise that what is really important is quite another thing: semiotics constitutes a *sui generis* round table, at which representatives of diverse disciplines may gather to debate whatever is shared by all these disciplines with regard to the issues of language and sign. This offers semiotics an important opportunity. It is on these very grounds that the levelling-out of divergences may occur, and indeed has occurred before. Cases in point are the already-mentioned retardation of linguistics in relation to logic or the opposite situation, when the development of intensional logic, modal logic or tense logic lagged behind the linguistic theory in considering the problems and offering solutions; yet when logic finally took up these issues, it created and still creates a theory which fulfils higher requirements of precision and adequacy than those managed by the linguistic theory.

What I have in mind is the example of the logical theory of PRAGMATICS and its comparison with the relevant findings of the linguistic theory, which are much earlier and belong to its mundane and generally accepted conclusions. Practically the first more precise analysis of the key concept of pragmatics, the so-called token-reflexive expressions, was given by Reichenbach (1947). The next analysis, constituting a considerable step forward in the explication of the same concept (although here called "indexical expressions") was given by Bar-Hillel (1954). Three years later, Prior (1957), concerned with modal logic and tense logic, brought in a lasting contribution to the theory of pragmatics. Outstanding scholars that could also be cited here are Von Wright, Hintikka, Kripke and others. Yet the first complete and only precise theory of pragmatics was proposed by Richard Montague

(1972). He constructed a system of pragmatics which, similarly to the model theory (the modern version of semantics), uses the concepts of truth and satisfaction, but not only with regard to a given interpretation, i.e. in a given model, but also with regard to the so-called context of use, i.e. the pragmatic situation. In order to interpret the language he had constructed, Montague defines the so-called points of reference, i.e. a set of all the complexes of relevant aspects of those contexts of use. If, for instance, in some language the sole marks of the token-reflexive character, i.e., indexical features, are the occurrence of the operator of grammatical tense and of the first person singular, then the point of reference will be an ordered pair comprising a person and a real number, understood as a speaker in the process of saying a given utterance. Secondly, for each point of reference Montague defines a set of objects existing with regard to that point of reference. Thirdly, he defines the meaning, i.e. the intension, of each predicate and individual constant of that language. In order to do this for constant c, for each point of reference it is necessary to define a denotation, i.e., extension of that constant with regard to the given point of reference, for instance for the expression "it is green" with regard to the moments of time it is necessary to define the set of objects which at the given moment are considered to be green. Fourthly, the interpretation of the language's operators is given, ascribing to each operator a relation between points of reference and sets of points of reference. The individual constant shall denote the possible individual object, and the one-argument predicate constant — the set of possible individuals with regard to the given point of reference. The concepts of truth and satisfaction, which are central to pragmatics, are expressed by Montague by means of the expressions: "a sentence (i.e. a formula with no free variables) is true with regard to the given point with such-and-such interpretation" and "a possible individual object satisfies the above formula with regard to the given point of reference with the same interpretation." The possible individual objects are also quantified at the same time. An extension of the formula at a given point of reference is the set of sequences satisfying this formula at this point, and the extension of an individual constant or an individual variable at a given point of reference is a function ascribing the possible individual object to each sequence in the given domain.

I do not want to take up my Readers' attention with the second issue presented by Montague, which is the structure of intensional language. Montague's predecessors in that domain were Church (1951), Carnap, Kaplan (1964), Howard, Scott and others, but their systems, unlike Montague's, did not make unlimited quantification of ordinary individuals possible, whereas

the applicability of a system for a theory of natural language is very limited without it. On the other hand, almost all the above authors use the concept of possible worlds.

Yet Montague's research, although praiseworthy in itself, has been mentioned here because in two aspects it provides an excellent illustration of a situation at the crossroads of semiotics, logic and linguistics.

One of the central concepts, the concept of the context of use, was already a leading semiotic concept in Morris and in the so-called Oxford ordinary language school, and much earlier, although under a different name, in medieval semiotics, in the reflections upon the so-called suppositions. It is true that before Montague, it did not find a precise formal explication in the framework of the theory which developed the model-theory semantic techniques so as to include all the possible contexts of use. Nevertheless, even in those earlier semiotic theories the concept of the context of use was explicated in such a way that it was possible, by applying it, to point out many crucial relationships between very old concepts — that is between what is now called "surface structure" and what is now called "deep structure." (I am aware that here I am arguing against the zealots who believe only in science's newest fads and think that, for instance, the ordinary language school did not even have a presentiment of the existence of underlying deep structure, because they think it was discovered only by the proponents of transformational generative grammar or of generative semantics.)

I hope that this example has demonstrated one of the areas that falls into the domain of semiotics. It constructs key concepts and formulates crucial problems pertaining to the theory of language and sign; the former explains and the latter attempts to solve, often descriptively and informally, in an introductory manner so to speak. Seeking those concepts and problems, semiotics often reaches out to the neighbouring areas, those of logic, philosophy, linguistics, psychology and other sciences. Its aim is to extract the core: all that pertains to the nature of language and sign, from the shell of ontological or epistemological reflections in logic or philosophy, or, in traditional linguistics, from the crust of technical and particular reflections upon the informal description of language. In exchange, semiotics highlights some concepts and problems pertaining to the theory of sign and the theory of the most broadly understood language, and suggests them to other sciences — which, in turn, sometimes focus on only a section of the issue, for instance constructions of artificial language as an idealisation of the language of science or grammatical description of natural language. Thus, semiotic interpretations constitute a bridge between the discussion

upon linguistic issues on the grounds of, for instance, logic and linguistics. They also provide an impulse for further consideration of those issues on the grounds of every science interested, for whatever reasons, in language. This is because semiotics turns the attention of other disciplines to important common issues in this area.

I think (this is actually my personal hypothesis, which I do not feel able to substantiate here) that if it were not for the earlier semiotic analysis of the role of the context of use, the formal theory of this concept would not have emerged in logic, and even if it did, like Athena leaping out of Zeus's head, its influence on the formulated, modern linguistic theory would probably be limited. This, by analogy, seems to be suggested by, for instance, the fact that the main theme that percolated from Montague's studies to linguistic works was the conception of possible worlds (which, incidentally, were conceived by Chwistek a long time before Church or Hintikka), whereas ideas which were absolutely the most crucial in Montague's system found very little response among linguists. Experience teaches us, however, that at some time in the future, linguistics will probably focus on those issues, too — this is suggested by the striking parallelism in the order in which certain tendencies appear in linguistics and in logical semiotics. For instance, generative semantics, and with it the postulation of the predominance of semantics over syntax or of the inseparability of the two, evolved in contemporary linguistics after a very long period of the primacy of syntax. Similarly, until Tarski's (1933) discovery, Carnap (1934) and many other logicians and philosophers had been of the opinion that logical syntax of language constitutes the entire logic of language; afterwards, semantics regained its rights in logic and philosophy. This happened over thirty years before the renaissance of semantics in theoretical linguistics, before the studies by McCawley (1972), G. Lakoff (1970) or D. Lewis (1972) were published. The question is whether this interval of three decades could be something of a rule. In Lewis's article *General Semantics*, a fundamental role is played by a conception published by Ajdukiewicz (1935) in his "Die syntaktische Konnexität" — a study which, in my opinion, was much ahead of the then-current state of knowledge. Ajdukiewicz wrote, among others, that the sequence of arguments played a significant role in the structure of a compound expression, of which a particular example was the difference between the grammatical subject and predicative; but that this sequence was not identical with the external order in which those arguments appeared in a given expression — that, generally speaking, it was not a purely external quality — but was based on the features of the entire expression derived from

its meaning. Ajdukiewicz added that only in symbolic languages and in some natural ones was the purely external order of arguments responsible for their sequence. No wonder that a proponent of generative semantics responded to these thoughts, containing as they do the differentiation between the surface structure and deep structure, as well as views regarding the importance of the semantic factor. What is surprising, and a matter for discussion, is that Lewis selected this particular conception, not the later one, proposed by Ajdukiewicz in 1958 in his paper at the International Linguistic Symposium in Erfurt (1959). Ajdukiewicz himself underlined that his earlier conception of syntactic coherence referred to an artificial, purely positional language he had constructed; this resulted in obvious limitations in the applicability of his theory. Moreover, in that later work Ajdukiewicz proposed a formal notation of semantic categories, whereas in the earlier one he had used only the concept of syntactic category, which might seem less useful to Lewis, who was, after all, constructing "general semantics."

I am mentioning this not in order to argue with this particular work by Lewis, but for two other, more general reasons. Firstly, a timely (or not much delayed) transfer of ideas from one discipline to the other is, in my opinion, one of the roles fulfilled by semiotics in reference to other disciplines concerned with language; in the above case, such transfer occurred from logic to linguistics. Secondly, the other role of semiotics is to analyse concepts used by various disciplines from the meta-scientific point of view, and to show the way towards a unification of the meaning of those concepts; in this particular case, those are the concepts of 'semantic category' and 'syntactic category'.

Husserl was the one to introduce the term 'semantic category', but he defined it with regard to the syntactic role of an expression in a sentence; so in fact what he meant was a syntactic category. Semantic categories, however, need to be distinguished with regard to what the expressions denote. Ajdukiewicz notes those differences as follows: from the syntactic point of view, the sentence connective 'or' is a functor which serves to construct a sentence by means of two sentences $\frac{S}{SS}$, whereas from the semantic point of view it is a functor which denotes a one- or two-argument function which ascribes logical values as correlates to the logical values: $\frac{V}{VV}$. Syntactic categories are a different thing than semantic categories, and the meta-language of syntax differs from the meta-language of semantics. The first does not encompass the object language as its part, while the latter does. An adequate definition of truth and denotation can be given only in the meta-language of semantics, and only in semantics is it possible to move

from sentences about expressions to sentences about objects referred to by those expressions. This is also possible in pragmatics, whose language, apart from the names of expressions and their designates, contains the names of the users of language. I am afraid that Husserl's terminology in the semiotic part of his reflections bred some later misunderstandings, and I think the semiotics should mend the damage it did. Regrettably, this very important issue can only be signalised here.

I have a feeling that the difference between the views of transformational-generative syntacticians and transformational-generative semanticians (Chomsky 1957, 1964, 1965) is not as deep as they themselves seem to think. Even if we accept the assumption that in the tree diagrams, or phrase markers, their terminal elements — that is particular words — are names of expressions and not names of broadly understood extra-lingual objects, and that as a result the language of analysis used by the syntacticians is, formally speaking, a syntactic meta-language — the concepts of 'functional labels' and 'categorial labels', like all concepts derived from traditional grammar, decidedly evoke semantic associations as well, because in fact these are semantc-syntactic categories. The same applies to the concept of competence. I agree with Strawson, who observes that it would be difficult to assume that familiarity with meanings might have no influence on the native speaker's ability to grasp those "underlying grammatical functions and relations of elements in sentences" (Strawson 1969-1970). In short, linguistic theory advanced by syntacticians seems to be mixed, syntactic-semantic, in nature while, for parallel reasons, the theory proposed by generative semanticians is semantc-syntactic. The difference consists, among others, in where the emphasis is placed, which is why I reversed the components of the above terms. And finally, since pragmatic aspects cannot be eliminated from either of these theories, in essence they are both semiotic theories; and there is nothing surprising in this, considering that they are grammars of natural language.

The words "generative semantics" evoke associations — because, after all, the theory of associationism does explain some linguistic phenomena — with the concept of logical form. The great misfortune of contemporary linguistic theories were that they reached for concepts as ambiguous and long surrounded with confusion as 'structure' and 'form', the latter sister of the concept of the so-called 'internal form of a concept' recurring from time to time in philosophy. At the same time, those theories indiscriminately used metaphors and personifications ("the rules generate") and failed to avoid hypostases ("logical form"). One gets the impression that the language of contemporary linguistic theories emerged at the crossroads of varying

intentions and, as a result, of differing terminological conventions. It seems to have grown from the desire to describe the structure and contents of the thoughts of the speaker who utters a sentence; the desire to describe the phases of discovering the meaning of a sentence, that is the process of understanding it by the recipient; the desire to graphically present relationships between the elements of the surface structure of a sentence, and also elements of a sentence which is a paraphrase of the former and represents its deep structure; the desire to graphically present relationships between the elements of the first and second sequence, and between each of them and the intermediary sequences; finally, from the desire to describe a certain technical scheme of computer operations. It is an ugly language, and a misleading language. At least some of the blame must be laid on mathematicians and formal logicians, who, ordinarily forced to yield to unrelenting formal discipline, upon leaving the domain of the language of strict symbols feel entitled to liberty and nonchalance — and so express their longing for poetry and life's beauty by allowing themselves free rein in recklessly using metaphors. Semiotics ought to tackle the linguistic theory's most important concepts. As to the concept of logical form — on the one hand, it is hard not to sympathise emotionally with its promoters; yet on the other hand, it is equally hard not to agree with Quine (1972), who rightly noted that logical analysis does not consist in bringing the logical form, that is the logical structure concealed in a sentence, to the surface. To formalise this we apply one of the many possible symbolic notations and we select the one which is best suited to the present aim: we paraphrase the given expression in a manner most convenient under the given circumstances. The one and only paraphrase does not exist — the point is which of the possible ones to select. Yet it might seem that the adherents of the so-called natural logic assume that all synonymous sentences have a single, identical logical form ascribed to them (incidentally, according to some formulations, logical form is supposed to be identical with meaning, according to others it represents the meaning, and according to yet another formulation, it is a part of the meaning together with meaning postulates and other logical apparatus). Whatever the logical form actually is — it is supposed to be just one. Yet if this were the case, it might be expected that an English sentence which is ungrammatical — for instance the sentence *It is possible that Sam will find a girl and he will kiss her* (Lakoff 1970: 621-622) — as a result of the incorrectness of its logical form will be ungrammatical, deviant, in other languages too, and for the same reason: the faultiness of its logical form. However, in Polish an exact translation of this sentence is a perfectly

grammatical expression. This is an empirical argument against a section of the theory of logical form, and an argument in support of further improving this concept. Following Quine, I therefore declare myself against absolutism and subscribe to the view of J. D. Fodor (1970) that we do not possess satisfactory rules of translation from the natural to the formal language.

In connection with the above, semiotics faces the task of further analysing the concepts of paraphrase and translation. The latter was the topic of a noteworthy analysis by Ajdukiewicz (1934, 1958, 1967a), among others in one of his two studies published posthumously, containing a very interesting syntactic-semantic interpretation of sentences in a purely inflecting language, based on the conception of a syntactic position. Ajdukiewicz was not familiar with works in the area of contemporary transformational-generative grammar; hence it is very striking indeed that he arrived at similar ideas along a different path. He developed a system (1959, 1961, 1967a, 1967b), in which to show the syntactic structure of a sentence or other compound expression not having operators or bound variables, it is enough to mark syntactic positions of particular words by means of numerical indicators, regardless of the order in which those words are written. It is then possible to determine and write symbolically, to which semantic category each of those words belongs, and thus to determine such relations as, for instance, subject — predicate, by giving the numerical indicator of the syntactic position and the symbolic indicator of the semantic category for each of those expressions. Further on, Ajdukiewicz defined the concept of a connotation of an expression as a function defined for the final syntactic positions of this expression, defining the unequivocal ascription between those positions and denotations of words occupying those positions. For instance, connotation of the expressions "round and red" is a finite class of ordered pairs: <(1,1) — round; (1,0) — and; (1,2) — red>. The connotation unequivocally defines the denotation; the name of the denotation is, in this case, the symbolic notation:

round	and	red
(1,1)	(1,0)	(1,2)

Ajdukiewicz also gave the definition of the relationship of the main operator to its arguments. This definition implies that syntactic structure of a correctly constructed expression is unequivocally defined already by semantic categories of its first-order elements.

In the 1930s, Ajdukiewicz formulated another theory of natural language as a deductive system with axiomatic, deductive and empirical rules. It was

then that he noted the creative character of this language ('creativity' in the terminology of transformational-generative grammars).

I have mentioned the theory of language based on the concept of syntactic position for several reasons: it is interesting in itself; it satisfies theoretical inclinations of both the syntacticians and the semanticians from the transformational-generative grammar camp; it is an example of an extensionally equivalent theory of language alternative to transformational-generative grammar; it avoids undesirable semantic associations in the area of its syntactic concepts, as well as syntactic associations in the area of its semantic concepts; finally, it is an example of connections between logic and semiotics. This is because the central idea of Ajdukiewicz's theory originated from logical reflection on the topic of artificial language, language in the logical sense, language treated as an idealisation of natural language, whereas the development of this idea refers to language in the linguistic sense.

Connections between semiotics and logic are close and undeniable, but the boundaries are fluid and hard to delineate clearly. I include the area of logic known as the logic of language to semiotics and call it logical semiotics; the latter includes also some parts of logical methodology. Which, if any, parts of formal logic, sentential calculus, logic of induction etc. ought to be included in semiotics is a topic for debate; perhaps those would be only some meta-logical considerations upon the topic of one or another part of the so-called logistics. The debate could also be broadened to include non-standard logical systems. Yet in my opinion this debate would be futile, as it always is when a conflict of competences has arisen; and in the meantime the field would lay untilled and there would be work to do. Hence I have limited myself to underlining, out of superficial necessity only, the connections between logic, semiotics and theoretical linguistics, and to pointing out some of their shared tasks, upon a few examples; all this to demonstrate that semiotics offers the followers of diverse disciplines an opportunity to come out of the tight compartments of classifications according to occupation or specialism.

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