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TOWARDS A METHOD OF CROSS-LINGUISTIC COMPARISON OF MOTION-EMOTION METAPHORS

The paper offers a critical outlook on the taxonomy of motion situations proposed by Zlatev et al. (2007, 2010) and its application to cross-linguistic comparison of motion-emotion metaphors (Zlatev et al. 2012). The critique is then applied, together with the results of a corpus-based analysis of motion metaphors by Woźny (2013), to creating a new, language independent taxonomy of motion situations, reflecting the naive physics – a linguistically coded, widespread set of intuitive beliefs concerning motion, proven to be resistant to the passage of time or the achievements of modern physics, extensively described by the body of literature collectively known as Disaster Studies (e.g., Champagne et al. (1980), Larkin et al. (1980), McCloskey (1983), Halloun et al. (1985), Hammer (1995), diSess a (1988, 1993, 1996)).

1. Cross-linguistic comparison of motion-emotion metaphors, theoretical implications

The connection of the domains of motion and emotion in human experience is manifested across languages by a multitude of conventional motion-emotion metaphors, for example:

(1) *He fell in love.*
(2) *She flew into a rage.*
(3) *Wpadł a w panikę.* ‚She fell into panic'
(4) *Doprowadził mnie do szału.* 'He brought me to rage,' etc.

The following two lists of 'emotional' complements of 'fall into' ('wpaść w') from the British National Corpus and Polish National Corpus illustrate it further. The number of occurrences in random samples of 500 concordance lines and some modifiers of the head noun in the complement NP are given in brackets.

List 1. British National Corpus[1], 'emotional' complements of *fall into*.
(her customary) trance (7)/ (enjoyable) reverie (5)/ (his own post-natal) depression (3)/ (musing) mood (of unqualified enjoyment) (3)/ despair (2)/ fit (of giggling) (2)/ (further) hilarity (2)/ sulks (2)/ (such absurd) anxiety (2)

List 2. Polish National Corpus[2], 'emotional' complements of *wpaść w* ('fall into').
(dziki) szał (43)/ panikę (34)/ (apoplektyczną, prawdziwą) furię (17)/ (ciężką) depresję (nerwową, gigant) (15)/ (wielki) gniew (straszny a słuszny) (13)/ (głęboką) rozpacz (12)/ (niekłamany, cielęcy, obłąkany, nie tajony) zachwyt (12)/ (jakiś małpi, dobry, doskonały, świetny) humor (9)/ popłoch (9)/ (fotogeniczny, ten swój) trans (9)/ złość (7)/ (prawdziwą) histerię (7)/ (ludobójczy, pijacki) amok (hitleryzmu) (4)/ pasję (4)/ stan (lekkiego rozmarzenia, bliski zachwytowi, agresji, euforyczny) (4) / (niebywałe, trudne do opanowania, nagłe) podniecenie (4)/ (nostalgiczny, tak dobry, ironiczny) nastrój (kontemplacyjny) (4)/ euforię (4)/ (swój najgorszy) dołek (3)/ obłęd (3)/ (większą) wściekłość (3)/ przerażenie (2)/ (rasową) paranoję (2)/ osłupienie (2)/ odrętwienie (2)/ (gorączkowe) zniecierpliwienie (2)/ rozdrażnienie (2)/ (nową, kolejną) fazę (napięcia, otępienia) (2)/ (radosne) zdumienie (1)/ apatię (1)/ nudę (1)/ ferwor (1)/ nerwy (1)/ irytację (1)/ beznadzieję (1)

Lists 1 and 2 serve only as an example of the proliferation of motion-emotion metaphors in English and Polish and we are not going to extend the corpus comparison any further in the present paper; however, even a cursory glance at the corpus frequencies and the number of complements of 'fall into' in the two languages reveals that Polish *wpaść w [emotion]* is not a good equivalent of English *fall into [emotion]*. Firstly, the Polish metaphor is much more productive, with a significantly larger number of more frequently occurring 'emotional' complements. Secondly, the most frequently occurring complements are different. The three most frequent Polish complements are rage (szał), panic (panika) and fury (furia), while the most frequent emotional states in English are trance, reverie and depression[3]. This point is further illustrated in Figures 1 and 2, showing the corpus frequencies of the most frequently occurring 'emotional' complements of 'fall into' in English and Polish respectively.

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1 http://www.natcorp.ox.ac.uk/ (accessed Feb. 5th 2015)
2 http://nkjp.pl/index.php?page=0&lang=1 (accessed Feb. 5th 2015)
3 It could be interpreted as Humboldtian 'spirit of the nation', supporting the stereotype of the hot-headed Polish vs. the more phlegmatic English but, of course, theoretical reservations aside, the meager scope of our corpus research does not allow for any conclusions of this type.

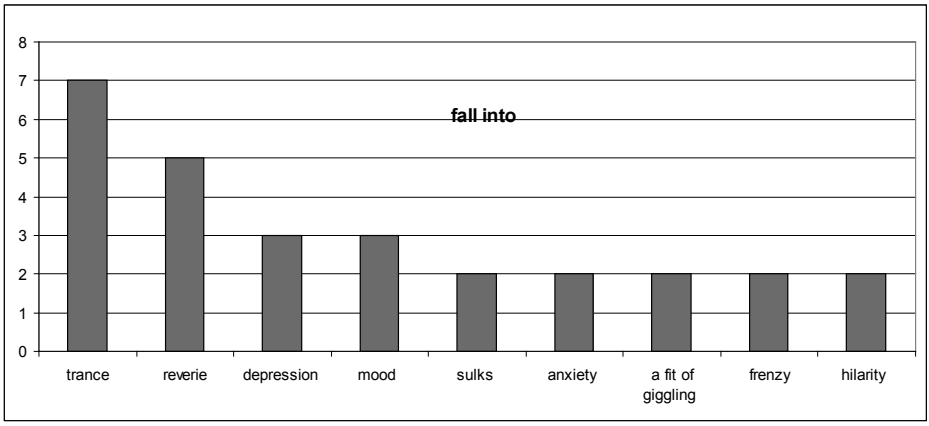

Fig. 1. Corpus frequencies of the 'emotional' complements of 'fall into' in a random sample of 500 concordance lines.

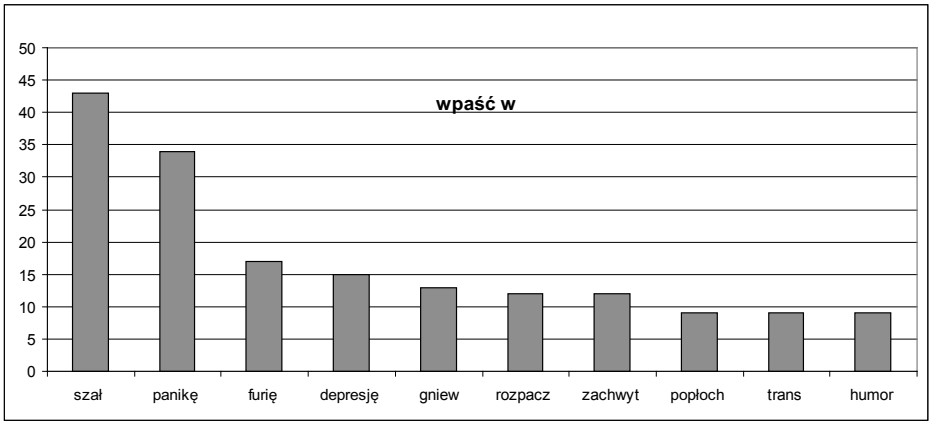

Fig. 2. Corpus frequencies of the 'emotional' complements of 'wpaść w' (fall into) in a random sample of 500 concordance lines.

Zlatev et al. (2012: 425) suggest that a systematic cross-linguistic comparison of motion-emotion metaphors may lead to certain significant theoretical conclusions. Depending on the degree of correspondence, one of the following three theoretical standpoints may be reinforced:

> The first position is that of (embodied) *conceptual universalism*, proposing to ground linguistic meaning in pan-human bodily experiences. This is the case in Lakoff & Johnson's (1980, 1999) Conceptual Metaphor Theory. [...] If the motion-emotion metaphors in the four languages under discussion can be shown to be **more or less the same**[4], this would lend support to theories of this type. [...]
>
> The second position claims that thinking in general, and metaphor formation in particular, *depends crucially on language* (or discourse). If motion-emotion metaphors turn out **to vary extensively and "arbitrarily"** across languages this would give credibility to the position that the meanings of emotion expressions are derived primarily from their role in the linguistic-conceptual schemes provided by the languages themselves. [...]. In general, such a position was earlier held by representatives of structuralism, but has lost its appeal for most linguists. [...]
>
> The third position can be referred to as *consciousness-language interactionism* (cf. Zlatev 1997, 2003, 2008). [...] The predictions from such an interactionist position are [...] that there will be **a degree of overlap** between conventional motion-emotion metaphors in different languages, but that such overlap will be higher for more closely related languages and cultures. (Zlatev et al. 2012: 425)

The emphasized expressions, "more or less the same", "vary extensively and arbitrarily", "a degree of overlap", suggest clearly that a reliable method of quantifiable cross-linguistic comparison of motion-emotion metaphors needs to be established for us to be able to draw viable theoretical conclusions. To this goal, Zlatev et al. (2012: 429) suggest creating a language-independent taxonomy of motion situations – an ide a reminiscent to that expressed on a more general level by Benjamin Lee Whorf:

> To compare ways in which different languages differently „segment" the same situation of experience, it is desirable to analyze or „segment" the experience first in a way independent of any language or linguistic stock, a way which will be same for all observers. (1956: 162)

The taxonomy of motion situations proposed by Zlatev et al. (2012) will be discussed in the next section.

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4 Emphasis mine.

2. A critical outlook on the taxonomy of motion situations proposed by Zlatev et al. (2012)

2.1. The definition of motion

Zlatev et al. (2012: 429) suggest adopting the following definition of motion:

(i) "continuous change in the relative position of an object (the figure) against a background," emphasising *continuous* as a necessary perquisite in order to distinguish motion 'from imaginary acts of Star Trek-like "teleportation"' (ibid.).

Conversely, we believe that *teleportation* or *quantum motion* is part of our everyday experience and, as such, extensively coded in language. A corpus study carried out by Woźny (2013) revealed that as many as 36% of a random sample of motion metaphors containing the verb 'went' represented a case of discontinuous motion, with the moving object disappearing in one place and then 'magically' appearing in another. Consider, for example, the following metaphorical expressions of motion:

(5) *He went to university.*
(6) *The cry went up.*
(7) *He went on a killing spree.*
(8) *She went skiing.*

In each case the moving object moves from point A to B and disappears between the starting and finishing point, which is indicated by the semantic oddness of the following sentences:

(9) **He went to university at 50 km/h.*[5]
(10) **The cry was going up, higher and higher.*
(11) **He went on a killing spree, it took him two hours to get there.*
(13) **She went skiing but stopped on the way to have a cup of tea.*

Examples (9-13) demonstrate that it is impossible, without creating a semantic oddity, to refer to the velocity, trajectory, time or position of the moving object between the starting point and the finishing point of the metaphorical motion expressed by examples 5-8. In other words, the moving object ceases to exist between point A (not a student yet, the information not made public yet, before the killing began, not skiing yet) and point B (already a student at university, the information made public, the victims killed, having skied) in a way reminiscent

[5] "to go to university" in its metaphorical, intensive sense of "to become/be a university student".

of an electron in a hydrogen atom undergoing a 'quantum leap' between discrete energy levels.

Looking for the experiential basis for discontinuous (quantum) motion being represented in conventional metaphors of motion is not the goal of the present paper but one may venture a suggestion that perhaps it is because we often perceive only certain stages of motion – for example, when we fall asleep on a bus or observe a train disappear and then reappear again after going through a tunnel. A passenger plane, travelling at sub-sonic speed would typically cover about 200 meters in the time it takes a human observer to blink and an average person blinks about 17000 times a day. In other words, we should not be surprised that discontinuity, fragmentary nature of our perception of motion became conventionalised in a large proportion of motion metaphors.

To sum up our remarks on the above definition of motion (i), it seems that removing the word 'continuous' from it would make for a better representation of fragmented, discrete human perception of motion phenomena. Therefore, the definition of motion we are left with is:

(ii) Motion is a change of the position of an object.[6]

As we can see, the notions of 'relative' and 'background' were also dispensed with as they are part of the meaning of 'position', which has to be given relative to a point or frame of reference- a subject on which we will focus in the next section.

2.2. Translocative and non-translocative motion, frames of reference

Zlatev et al. (2012: 429) propose the following definition of *translocative motion*:

(iii) *Translocative* motion involves the perception of continuous change of an object's average position according to a spatial frame of reference, while in *non- translocative* motion the figure maintains its average (perceived) position (as in the situation described by the sentence *He waved goodbye*).

As we have already stated, definitions are never perfect (cf. Fn. 6) when it comes to covering human perception and the above one is no exception. According to this definition, the motion described in the following example is non-translocative:

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[6] Although we tried to improve the definition of Zlatev et al. (2012: 429), we would never expect it to cover all aspects of motion. Ever since the ground-breaking work of E. Rosch in the 1970's (Rosch 1973, 1978) and many others before her, n.b. L. Wittgenstein and his famous argument on the meaning of 'games' (Wittgenstein 1953), we are aware of the limited utility of definitions when it comes to representing human categorization. And indeed, we will see in the following sections that definition (ii) is far from perfect.

(14) *I am going to London for five years to study and then I am coming back.*

If the average is calculated over five years for the complete trip to London, staying there, and coming back – the average position of the moving object (person) stays the same. By the same token, the annual rotation of the Earth around the sun is also non-translocative, despite the fact that every day our planet (and both the author and the reader of this paper with it) travel 2.6 million kilometers, at 30 km/s along virtually straight line (with just 1 degree curvature) relative to the sun. As we can see, the time over which the average position is calculated is crucial here. Let us consider another example:

(15) *Human heart expands and contracts every second.*

Intuitively, we feel that it is a case of non-translocative motion but definitions (i) and (iii) do not cover it very well. The position of the heart (relative to the chest cavity) does not change at all therefore, according to definition (ii), contractions of the human heart do not constitute motion. We could try to improve definition (ii) by adding 'object or any part of the object' but even then definition (iii) is not guaranteed to yield the expected result if the average position of a point on the surface of the heart were calculated over, say, 12.5 seconds or 60.7 seconds. We could in turn try to improve definition (iii) demanding that the average be calculated over a given amount of time – a multiple of the time it takes to finish one cycle perhaps but, each time, no matter how long the definition[7], we would be defeated by the infinitely complex cornucopi a of human experience.

Definition (iii) contains the phrase 'frame of reference' (FoR) therefore Zlatev et al. proceed to explain the concept by providing the following taxonomy, based on the earlier works of Levinson (2003) and Zlatev (2005, 2007).

(16)[8] *Turn right.*
FoR: Viewpoint-centered
(17) *Drive West.*
FoR: Geocentric, Horizontal
(iv) (18) *The balloon flew up in the air.*
FoR: Geocentric, Vertical
(19) *The demonstration pushed forward.*
FoR: Object-centered, Figure
(20) *The horse walked into the stable.*
FoR: Object-centered, Landmark (Zlatev et al. 2012: 430)

[7] For example, Ann a Wierzbick a (1999: 110) defined the category of FRUIT in as many as 494 words. But it is still quite easy to find gaps in her definition – for example, fruit grown hydroponically (without soil) is not covered by it.

[8] The numbers of examples in this and the subsequent quotations from Zlatev et al. (2012) have been changed to coordinate them with the numbers of the previously given examples.

We have to say we are mystified by the above classification of frames of reference for several reasons. Firstly, how can we establish a reference point (or frame) based on one short sentence like 'Turn right'? Without the context we have no ide a if the speaker's or the hearer's 'right' is meant. Perhaps it is a phone conversation, and the speaker is calling from another city giving the hearer directions to the nearest airport. Of course, then the hearer's 'right' must be implied and according to (iv) the frame of reference is not (16) but (19) (object-centered, figure) because the hearer is also the moving object.

Secondly, why should we have only geocentric and not, say, heliocentric frame of reference? Why limit the possible reference frames only to the view-point, the landmark, the moving object and the Earth? Why not the point situated a 100 meters north-west of the landmark? Why not a drone-mounted camer a following the figure from above? Why not the Sun or the Northern Star? What is the frame of reference in the following: 'The Earth is rotating the Sun in the clock-wise direction'? It's not object-centered figure or landmark (the Sun). It could be perhaps classified as view-point centered but the direction is given as clockwise which places the observer in the outer space 'above' (north of) the plane of the orbit so it is also geocentric. Is the frame of reference a view-point-geocentric hybrid in this case?

Thirdly, it seems that a single, very simple motion event as in, for example, 'the horse moved forward, up the hill, to the stable', would involve many frames of reference. In this case, according to (iv), it would be: 1. object-centered figure, 2. geocentric-vertical, 3. object-centered landmark. And, if this simple case of motion was being perceived by a stationary observer positioned somewhere near the path, could we not say that the frame of reference is just view-point centered? And what if the observer was riding the horse or perhaps waiting at the stable?

To summarize all the questions and doubts concerning the above classification of frames of reference, we believe that it is impossible to establish a frame of reference from just linguistic cues like 'turn right' or 'moved to the stable' because the same motion event can be perceived or imagined relative to many arbitrarily chosen reference points. In the words of R. Langacker: 'There is no question that we apprehend our surroundings from a particular vantage point and have the ability to mentally adopt a vantage point other than our actual one' (2008: 86). Finally, since one motion event can be tied to any number of possible frames of reference, the notion could not be useful in creating a taxonomy of motion events. And indeed, perhaps not surprisingly, Zlatev et al. (2012) did not use the frame of reference as a parameter in their classification of motion-emotion metaphors. A parameter they did use, however, is *boundedness* which is the subject of the following section.

2.3. Bounded/ unbounded motion

Zlatev et al. (2012) define the parameter of bounded/unbounded motion in the following way:

> [...] in expressions of *bounded* motion, the figure will depart from a Source (as
> in 21), pass through a mid-point (22), or reach a Goal (as in 20) – or all three as
> in (23). In *unbounded* motion, this is not the case, and in principle the motion
> (v) of the figure can go on indefinitely, as in the motion situations described above in examples (16-19).
> (21) *I left the room.*
> (22) *He crossed the road.*
> (23) *The dog ran out of the barn across the field to the house* (431)

The first part of definition (v) is very clear – bounded motion involves either or all of the three: Source, Midpoint, Goal. Of course, the name may seem counterintuitive because *bounded* as an adjective may be interpreted as having boundaries, limited, confined to a certain area, etc. and neither (21) or (22) seems to correspond to this meaning. We don't know if and how the motion continued after the person left the room or what happened before or after crossing the road. One may also wonder if for the purpose of creating a taxonomy of motion situations it is advisable to bundle three well defined parameters of Source, Midpoint and Goal into one parameter of +Bounded.

The second part of definition (v) seems problematic because we learn that 'in principle the (unbounded) motion can go on indefinitely' (ibid.). So unbounded motion is not only defined as not bounded in the sense discussed above but a condition is added of there being no temporal (spatial?) limits. Examples (16-19) – 'turn right, drive west, the balloon flew up in the air' are said to represent the unbounded motion. Can turning right (16) continue indefinitely? Theoretically it can but it would result in circular motion. Examples (17) and (18) seem to be better candidates for limitless motion although in reality both would be limited, the first by the boundary between the atmosphere and outer space[9], and the second by the fact that land masses on Earth are separated by the oceans.

Additionally, apart from definition (v), Zlatev et al. (2012) provide certain additional characteristics of bounded and unbounded motion. For example,

> The boundedness of a process undergone by the figure implies that it will inevitably (not just possibly or probably) lead to it undergoing a state-transition (cf. Vendler 1967). (430)
> In the case of unbounded translocative motion, we have rather the category Direction, specified either as a *vector* according to one of the other FoR conditions (as in 16–20), or as a *trajectory* that can take particular shapes such as AROUND or ALONG. (431)

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9 The current balloon altitude record of 41,424 meters belongs to Alan Eustace, a senior vice-president at Google.

However, in (22), which was given as an example of bounded motion, there does not seem to be any state-transition. On the other hand, if we consider the following sentence:

(24) *He moved the cup.*

The state transition is definitely there, because the cup goes from rest into motion into rest again. Unfortunately, according to (v), since neither Source, Mid-point, or Goal are specified, (24) would have to be classified as unbounded motion. We are also not convinced that the presence of direction or the trajectory shape is a good indicator of unbounded motion. In (25) both the direction and the trajectory shape are given and yet, according to definition (v) it would have to be classified as bounded motion because the source (cave entrance) is indicated.

(25) *From the cave entrance, she moved west, along the ledge.*

So far, we have discussed two parameters of the taxonomy of motion events proposed by Zlatev et al (2012): +/-Translocative and +/-Bounded. In the next section we will take a closer look at the final parameter of the taxonomy: +/-Caused, which is supposed to separate cases of self-motion from caused motion.

2.4. Caused motion and self-motion

Zlatev et al. (2012) introduce the third and final parameter of their taxonomy of motion events in the following way:

> The final parameter concerns whether the figure is perceived to be moving under the influence of an external cause or not. The relevant notion of causality concerns the (naïve) human Lifeworld, and not our scientific understanding of the universe. Thus, the situation described in (26) is one of translocative "self-motion" even though the motion of the raindrops is caused by gravity. On the other hand, (27) clearly represents a (translocative, bounded) caused motion situation.
> (26) *Raindrops are falling on my head.*
> (27) *John kicked the ball over the fence.* (431)

The above quotation may suggest that in the scientific sense as opposed to 'naive sense' – the motion must always be caused (raindrops falling because of the gravity) – in fact it is quite the opposite. One of the most fundamental of intuitive beliefs is that the (absolute, not relative) rest is the natural state, and motion (except a few special cases mentioned below) always requires an explanation. In the Newtonian physics, on the other hand, motion and rest have equal status as both are relative and only change of motion (acceleration) requires a causal explanation. The widespread, naive beliefs about the nature of motion are extensively described in the body of literature collectively known as Disaster

Studies (e.g., Champagne et al. (1980), Larkin et al. (1980), McCloskey (1983), Halloun et al. (1985), Hammer (1995), diSess a (1988, 1993, 1996)), where the authors prove that most people retain their naive view of the physical world[10], regardless of the number of hours they spent in the physics classroom.

These non-scientific beliefs about the nature of motion can be summarised as follows[11]:

A. All motion requires causal explanation, except downward motion of heavy objects and upward motion of light objects, which is natural.
B. Active[12] motion is different from passive[13] motion.
C. All continuing passive motion, apart from the natural motion mentioned in A., is sustained by a stored 'force' (also 'impetus', 'energy' or 'oomph').
D. In the case of self-motion[14], the moving body is its own motor (mover).

Zlatev et al. (2012) seem to use 'self-motion' synonymously with 'not caused motion' and indeed, the categorization of examples (26) and (27) as -Caused and +Caused do not contradict the naive belief system summarized by points A-D. The same can be said about:

(28) *I fell into a state of depression.* (–Caused, +Trans, +Bound)
(29) *My spirits soared.* (–Caused, +Trans, -Bound) (437)

Because both examples refer to 'natural motion' of heavy and light objects, which according to point A. does not require causal explanation. However, the same cannot be said about the following examples:

(30) *My heart fluttered.* (–Caused, –Trans, –Bound)
(31) *He plunged into despair.* (–Caused, –Trans, +Bound) (437)

If Zlatev et al. were indeed, as they claim, to base their parameter of +/-Caused on 'the (naïve) human Lifeworld', (30) and (31) would have to be classified as +Caused because neither of them represents a case of 'natural motion' (i.e. falling of heavy objects and rising of light objects) according to point A. What is more, (30) could also be described as a case of self-propelled motion in the sense of point D. Unfortunately, Zlatev et al. (2012) bundled causation into just one binary category, whereas, according to points A-D, a motion taxonomy based on naive physics should contain three such parameters: +/-caused[15], +/-active and +/-self-propelled, which would allow us to characterize the following four categories of motion:

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10 Almost identical with the physics of Aristotle and Medieval scholars (e.g., Narsessian and Resnick 1989) like Buridan, who in 4th c. A.D. introduced the concept of impetus to explain the movement of projectiles through air (Clagett 1959).

11 cf. Narcessian and Resnick (1989: 7)

12 The mover (motor) is apparent, something is pushing or pulling the moving object.

13 The mover (motor) is not apparent, for example a projectile moving through the air.

14 self-propelled motion.

15 lower case letters used deliberately, to avoid confusion with the parameters of Zlatev et al (2012)

I. Natural motion (-caused, -active, -self-propelled), e.g. a heavy object falling.
II. Active motion (+caused, +active, -self-propelled), e.g. a cart being pulled by a horse.
III. Passive motion (+caused, -active, -self-propelled), e.g. a ball flying through the air.
IV. Self-propelled motion (+caused, +active, +self-propelled), e.g. a horse galloping.

As it is, the singular parameter of +/-Caused serves only as a syntactic (not extra-linguistic) tool for highlighting transitive and passive constructions and, indeed, all motion-emotion metaphorical expressions classified by Zlatev et al. (2012) as +Caused fall into that grammatical category. For example:
(32) *His bad manners **put** me **off***. (+Caused, –Trans, +Bound)
(33) *Their threats made me **shrink***. (+Caused, –Trans, –Bound)
(34) *I was **thrown off** my feet*. (+Caused, –Trans, +Bound) (437)

In Section 3 we will summarize our critical comments made so far and, to make our criticism constructive, suggest a new taxonomy of motion situations.

3. A new taxonomy of motion situations

Let us recapitulate our critical analysis from the previous section (Table 1).

Table 1. The problems of the taxonomy of motion situations proposed by Zlatev et al. (2012)

Definition of motion (Section 2.1)	Continuity should not be part of the definition of motion but rather should be treated as a parameter in the taxonomy. Discontinuous motion common both in language and experience.
+/-Translocative motion (Section 2.2)	Unnecessary parameter based on the notions of 'frame of reference' (arbitrary, eluding categorization) and 'average position' – an average over an unspecified time- results unpredictable. For example, the contractions of the human heart could be classified as +Translocative.
+/-Bounded motion (Section 2.3)	Useful and well defined categories of Source, Midpoint and Goal unnecessarily bundled into one parameter of +Bounded. The parameter of -Bounded unclear ('motion could go on indefinitely'). Additional sub-criteri a added, like state-transition, direction and trajectory – neither of them effective in separating +Bounded from -Bounded.

+/-Caused motion (Section 2.4)	One binary parameter of +/-Caused is not sufficient to reflect the well documented complexity of naive mechanics. The resulting taxonomy is not language independent (+Caused always allotted to passive or transitive constructions)

Following our discussion of the taxonomy proposed by Zlatev et al (2012), summarized in Table 1, we would like to propose the following (Table 2):

Table 2. New taxonomy of motion situations

Trajectory parameters	T1. +/-continuous T2. +/-bound T3. +/-source T4. +/-mid-point T5. +/-goal
Dynamic[16] parameters	D1. +/-time-limited D2. +/-caused D3. +/-active D4. +/-self-propelled

Instead of three parameters of +/-Translocative, +/-Bound and +/-Caused, the new taxonomy contains nine binary parameters, the first five of which characterize the geometrical features of the trajectory and the remaining four refer to the dynamic features of time and causality. The first two parameters (T1,T2) describe the geometrical features of the trajectory understood as a set of all points in space through which the moving body passes. The next three parameters (T3-T5), traditionally subsumed under the category of PATH, pertain to specific points of the trajectory (starting point or 'source', mid-pint and goal). The first of the dynamic parameters (D1) can be seen as a temporal counterpart of the geometrical parameter (T2) because it pertains to the motion being limited in time. The remaining three parameters (D2-D4) define the type of causality. Most of the parameters in Table 2 were already discussed in Sections 1 and 2 but additional brief description is provided in Table 3 below:

[16] Dynamic parameters refer to motion as an ongoing process as opposed to the stable, atemporal geometrical parameters. The three parameters describing the type of causation (D2-D4) can be referred to as dynamic because in naive physics most types of motion are believed to be caused by some kind of force. In Newtonian Mechanics force is also understood as a causative factor but only for the 'change of motion', i.e. acceleration.

Table 3. Brief description of the parameters

Trajectory features	
T1. +continuous	The trajectory does not contain any gaps or 'quantum leaps'
T1. -continuous	The trajectory contains a 'quantum leap' (cf. Section 2.1)
T2. +bound	The trajectory is geometrically limited
T2. -bound	The trajectory is not geometrically limited
T3. +source	The motion has a starting point
T3. -source	The motion does not have a starting point (e.g. orbital motion)
T4. +mid-point	The trajectory passes through a specified point
T4. -mid-point	Lack of specific mid-point of the motion
T5. +goal	The motion has an end-point
T5. -goal	The motion does not have an end-point
Dynamic features	
D1. +time-limited	The time of the motion is limited
D1. -time-limited	The time of the motion is not limited
D2. +caused	Any type of motion, apart from 'natural motion'
D2. -caused	'Natural motion', i.e. falling of heavy objects or rising of light objects
D3. +active	The cause of motion is apparent (e.g. pushing or pulling)
D3. -active	The cause of motion is not apparent (e.g. movement of projectiles)
D4. +self-propelled	The moving object is its own motor (mover)
D4. -self-propelled	The moving object is not its own motor

Nine binary parameters listed in Table 2 could theoretically yield as many as 512 different types of motion (compared with just 8 types in the case of three parameters) but, of course, not all of our parameters are independent because, for example, +self-propelled implies +caused and +active. Similarly +time-limited necessarily implies +bound, etc. We should also remember that no matter how precise and complicated the taxonomy- border cases are to be expected (cf. Fn. 6 and 7).

For further illustration let us go back to examples (28-34) to compare how the old (Zlatev et al. 2012) and the new taxonomy categorize the motion-emotion metaphors.

(28a) *I fell into a state of depression.* (–Caused, +Trans, +Bound)
+continuous, +bound, -source, -mid-point, +goal
-time-limited, -caused, -active, -self-propelled

(29a) *My spirits soared.* (–Caused, +Trans, -Bound)
+continuous, -bound, -source, -mid-point, -goal
-time-limited, -caused, -active, -self-propelled

(30a) *My heart fluttered.* (–Caused, –Trans, –Bound)
+continuous, +bound, -source, -mid-point, -goal
-time-limited, +caused, +active, +self-propelled

(31a) *He plunged into despair.* (–Caused, –Trans, +Bound)
+continuous, +bound, -source, -mid-point, +goal
+time-limited, +caused, +active, +self-propelled

(32a) *His bad manners put me off.* (+Caused, –Trans, +Bound)
-continuous, +bound, -source, -mid-point, +goal
+time-limited, +caused, +active, -self-propelled

(33a) *Their threats made me shrink.* (+Caused, –Trans, –Bound)
+continuous, +bound, -source, -mid-point, -goal
-time-limited, +caused, +active, -self-propelled

(34a) *I was thrown off my feet.* (+Caused, –Trans, +Bound)
-continuous, +bound, -source, -mid-point, +goal
+time-limited, +caused, +active, -self-propelled

The differences in categorizing motion events by the two taxonomies can be clearly seen. For example, in the old taxonomy (28a) and (31a) differ only with respect to the parameter of ±Trans, which is mystifying because both examples refer to downward motion ending in a specified point (depression, despair) and, additionally, (31a) represents a case of active, self-propelled motion, which is clearly indicated in the new taxonomy. The differences are also striking in example (30a), where in the old taxonomy 'fluttering' – a kind of cyclical, oscillatory, and self-propelled motion – was categorized as -Bounded and -Caused. Examples (32a) and (34a) were classified as -continuous in the new taxonomy (in the old taxonomy motion was continuous by definition), because the trajectory of the motion consists of just two points: (not off) and (off), which is confirmed by the semantic oddity of the following examples:

(35) **His bad manners put me even further off.*
(36) **I was thrown half-way off my feet.*
(37) **Throwing me off my feet took about 5 minutes.*
(38) **I was being slowly put off by his manners.*

4. Summary and conclusion

We have critically analyzed the taxonomy of motion situations proposed by Zlatev et al. (2012) with regard to the definition of motion, and the notions of continuity, translocativity, boundedness and causation. The results of our criticism have been briefly summarized in Table 1. We argued that motion should not be defined as a *continuous* change of state because discontinuity or *quantum character* of motion are common in both language and experience (cf. Woźny 2013). Furthermore, we reasoned against the applicability of the parameter of +/-Translocative in the taxonomy of motion situations, demonstrating with examples that the definition of translocative motion (Zlatev et al. 2012: 429), even if it were improved, would result in categorization contradicting our deeply rooted and unchanging intuitions concerning motion events. We also critically analyzed the consequences of homogenizing the categories of Source, Midpoint and Goal into one parameter of +Bounded. In addition, we proved that the sub-criteri a of *state transition, direction and trajectory* are ineffective in separating bounded from unbounded motion. Finally, we challenged the ide a of using just one binary parameter of +/-Caused to express the complexity of our naive, non-scientific, albeit well documented in the literature of the subject[17], concepts of the causality of motion.

After recapitulating our criticism (Table 1), we proposed a new taxonomy of motion situations, consisting of nine criteri a the first five of which define the geometrical features of the trajectory, and the remaining four pertain to the dynamic characteristics of motion (Tables 2 and 3). The new taxonomy was then applied to several examples of motion-emotion metaphorical expressions to illustrate how the resulting categorization of motion situations differs from that proposed by Zlatev et al. (2012). The main differences between the two taxonomies were summarized in Table 4.

Table 4. The main differences between the old and the new taxonomy of motion situations

The old taxonomy (Zlatev et al. 2012)	The new taxonomy
3 parameters: +/-Translocative +/-Bound +/-Caused	9 parameters, including 5 geometrical and 4 dynamic ones. Geometrical parameters: +/-continuous, +/-bound, +/-source, +/-mid-point, +/-goal, Dynamic parameters: +/-time-limited, +/-caused, +/-active, +/-self-propelled

[17] e.g., Champagne et al. (1980), Larkin et al. (1980), McCloskey (1983), Halloun et al. (1985), Hammer (1995), diSess a (1988, 1993, 1996).

The geometrical features and the dynamic features are not separated. None of the three parameters can be said to be purely geometrical or purely dynamic.	The stable, geometrical features of the trajectory separated from the dynamic features of time and causation.
Motion events are continuous by definition.	+/-continuous included as a parameter, because discontinuous (quantum) motion is common in language and perception (Woźny 2013).
The parameter of +/-Translocative included in the taxonomy	The parameter of +/-Translocative absent, considered to be ineffective, resulting in counter-intuitive, arbitrary categorization of motion events.
The parameters of Source, Mid-point and Goal grouped into one parameter of +/-Bounded.	+/-source, +/-mid-point and +/-goal included as separate parameters, geometrical features of the trajectory.
Causality of motion expressed by one parameter of +/-Caused.	Causality of motion expressed by three parameters of +/-caused, +/-active and +/-self-propelled, the better to reflect 'the (naïve) human Lifeworld' (ibid.)

As we have already stated above, we agree with Zlatev et al. (2012) that a cross linguistic comparison of motion-emotion metaphors may lead to crucial theoretical conclusions and we hope that the new taxonomy of motion situations offered by the present study may facilitate subsequent research in this area.

References

Champagne, A. B., Klopfer, L. E., and J.H. Anderson 1980. Factors influencing the learning of classical mechanics. *American Journal of Physics* 48: 1074-1079.

Clagett, M. 1959. *Science of mechanics in the Middle Ages*. Madison: University of Wisconsin Press.

diSessa, A.A. 1988. Knowledge in pieces. In G. Forman and P. Pufall (eds.), *Constructivism in the computer age*, 49 – 70. Hillsdale NJ: Lawrence Erlbaum.

diSessa, A.A. 1993. Toward an epistemology of physics. *Cognition and Instruction* 10 (2-3): 105-225.

diSessa, A.A. 1996. What do "just plain folk" know about physics? In D.R. Olson and N. Torrance (eds.), *The handbook of education and human development: new models of learning, teaching, and schooling*, 709-730. Oxford: Blackwell.

Halloun, I.A., and D. Hestenes 1985. The initial knowledge state of college physics students. *American Journal of Physics* 53: 1043-1056.

Hammer, D. 1995. Student inquiry in a physics class discussion. *Cognition and Instruction* 13: 401-430.

Lakoff, G., and M. Johnson 1980. *Metaphors we live by.* Chicago: University of Chicago Press.

Lakoff, G., and M. Johnson 1999. *Philosophy in the flesh: the embodied mind and its challenge to western thought.* New York: Basic Books.

Langacker, R. 2008. *Cognitive grammar, a basic introduction*. Oxford: Oxford University Press.

Larkin, J., J. McDermott, D. Simon and H.A. Simon 1980. Expert and novice performance in solving physics problems. *Science* 208: 1135-1142.

McCloskey, M. 1983. Naive theories of motion. In D. Gentner and A. Stevens (eds.), *Mental models*, 299-324. Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Narsessian, N.J., and L.B. Resnick 1989. Comparing historical and intuitive explanations of motion: does "naive physics" have a structure? In *Proceedings of the eleventh annual of the cognitive science society*, 18-29. Ann Arbor, Mich.

Rosch, E.H. 1973, On the internal structure of perceptual and semantic categories. In T. Moore (ed.), *Cognitive development and the acquisition of language*, 145-158. New York: Academic Press.

Rosch, E.H. 1978. Principles of categorization. In: E. H. Rosch and B. Lloyd (eds.), *Cognition and categorization*, 27-48. Hillsdale, N.J.: Erlbaum Associates.

Wierzbicka, A. 1999. *Język-umysł-kultura*. Warszawa: PWN

Wittgenstein, L. 1953. *Philosophical investigations*. Oxford: Blackwell Publishing

Slobin, D.I. 2003. Language and thought online: cognitive consequences of linguistic relativity. In D. Gentner and S. Goldin-Meadow (eds.), *Language in mind*, 157-192. Cambridge: MIT Press.

Vendler, Z. 1967. *Linguistics in philosophy.* Ithaka: Cornell University Press.

Whorf, B.L. 1956. *Language, thought and reality: selected writings of Benjamin Lee Whorf.* Cambridge: MIT Press.

Woźny, J. 2013. Force-motion schemas in metaphors of motion. *Studi a Linguistic a Universitatis Iagellonicae Cracoviensis* 130: 351-368.

Zlatev, J. 1997. *Situated embodiment: studies in the emergence of spatial meaning*. Stockholm: Gotab.

Zlatev, J. 2003. Beyond cognitive determination: interactionism in the acquisition of spatial semantics. In J. Leather and J. van Dam (eds.), *Ecology of language acquisition*, 83–107. Amsterdam: Kluwer Academic Publishers.

Zlatev, J. 2005. Semantics of spatial expressions. *Encyclopedi a of language and linguistics, second edition*, Article 00298. Oxford: Elsevier.

Zlatev, J. 2007. Spatial semantics. In H. Cuyckens and D. Geeraerts (eds.), *The Oxford handbook of cognitive linguistics*, 318–350. Oxford: Oxford University Press.

Zlatev, J. 2008. The dependence of language on consciousness. *Journal of Consciousness Studies* 15 (6): 36–62.

Zlatev, J., J. Blomberg and C. David 2010. Translocation, language and the categorization of experience. In V. Evans and P. Chilton (eds.), *Language, space and cognition*, 389–418. London: Equinox.

Zlatev, J., J. Blomberg and U. Magnusson 2012. Metaphor and subjective experience. A study of motion-emotion metaphors in English, Swedish, Bulgarian, and Thai. In A. Foolen, U.M. Lüdtke, T.P. Racine and J. Zlatev (eds.), *Moving ourselves, moving others: motion and emotion in intersubjectivity, consciousness and language viii,* 423–450. Amsterdam: John Benjamins.