

Physical Reality, Language, and the Cinderella Problem

Paul Rastall, independent scholar, UK

Abstract

This article identifies, and explores the nature of, a number of “explanatory gaps” between our conception of physical reality and our cultural understanding, in particular our understanding of language and experience of reality. Some suggestions are made to address those gaps. On the one hand, certain positions in physical science are widely accepted; physical monism, the commonality of behaviour, reality at a quantum level, biological entities as temporary clusters of atoms held together by energy fields, and “facts” as constructs. On the other hand, reality as we experience it is “of many sorts” (Popper, 1972); neither physical nor perceptual, but verbally constructed, “unreal” in any physical or historical sense. Language is rooted in sociality and *qualitatively* different from other forms of communication. The article identifies and considers some major disparities and some tentative ways of reconciling them. In particular, it addresses the disparity between physical reality and fiction or purely imaginary reality (the “Cinderella Problem”) through the notions “*what if...?*” and “*as if*”.

Keywords: physical monism, interactions, model-dependent realism, imaginary reality, verbally constructed reality, sociality, problem-solving, communication models

Explanatory Gaps

It seems to me that a number of ideas in science (physical and biological) and humanities (language/communication studies in particular) have become widely accepted, and that they seem to be in some cases wide apart. There is an “explanatory gap” that needs to be addressed from both sides. In particular, views on the nature of “ultimate” physical reality do not extend easily or in any detail to the everyday world of socio-cultural reality and experience. On the other hand, some humanities-based ideas need adjustment in the light of the physical understanding of the world and the physical monism that goes with it. Any approach that contains, or implies, a mind-body dualism will be inconsistent with much in physical science and our understanding of the brain (Eagleman, 2015). Our understanding of verbal communication involves cultural and social parameters that are distant from physical and biological fact. There are different “realities”, and much of our reality, that is, reality as we experience it, is verbally constructed and “unreal” in a physical sense. Thus, questions arise about whether an integrated and consistent view of physical and social reality is possible, and indeed about what we take “reality” to be. The role and nature of verbal communication is central to this discussion. We need to identify what questions need to be answered. Some of the ideas in question are on the one hand:

- “Reality is not what it seems” (to use the title of Carlo Rovelli’s recent book (2016) in which “reality” is the strange and not directly knowable, but scientifically describable, ultimate quantum reality). According to the “Copenhagen interpretation”, we can have no knowledge of that ultimate reality; we have only phenomena which are our ways of perceiving and measuring ultimate reality (Baggott, 2013)
- Physical reality, including every living thing, is a single interconnected totality
- There is no radical Cartesian mind-body dichotomy
- Reality is our model or construction of it, and it is formed by the ways our brains work (Eagleman, 2015)
- Our awareness of reality is a product of interactions (Rovelli, 2015)
- The human perceptual range is very limited, and that is a limitation on what (everyday) reality is for us
- All of our understanding is “model-dependent”; there is no independent, external viewpoint that can determine “truth” (Hawking and Mlodinow); we only have the coherence of models and observations or other models.
- Each individual is integrated with a social group or community and shares many of its characteristics.

And on the other hand:

- Reality as we experience it is “many-sorted” (as Popper (1972, pp. 37–38) put it), and includes physical, perceptual, social, ideological, and personal constructions. As Popper (1972) says,
 - “ ... there are many sorts of reality... such as our subjective decoding of our experiences of foodstuffs, stones and trees, and human bodies...Examples of other sorts in this many-sorted universe are: a toothache, a word, a language, a highway code, a novel, a governmental decision; a valid or invalid proof, perhaps, forces, fields of forces, propensities, structures; and regularities.” (pp. 37–38)

- Much of our reality is verbally constructed (and this may limit our constructions of reality). Note that many of Popper's examples are wholly or partly matters of verbal construction.
- Much of our reality comes from and is integrated with other people; that is, it is socially constructed, but each individual is thought of as a "knowing subject" with an individual experience and understanding of the external world.
- Language has its origins in sociality and has developed multiple functions exponentially through positive feedback, one of which is reasoning in a verbal "surrogate" world.
- Our everyday awareness of language and sense of reality in consciousness are "macro-level" phenomena arising from complex "micro-level" processing of which we are unaware and which depend on how our brains work.
- Language is qualitatively different from other naturally occurring and artificial communication systems.

It should be obvious that there are wide disparities between our understanding of physical (including biological) reality and what we know about the functions of language and our verbally constructed realities. As Ewing (1951, p. 145) pointed out, the Einsteinian conception of space-time is quite different from our everyday experience of time and experience of the passage of time. In a similar way, we know there is a wide gap between our understanding of the brain at a cellular level and our conscious awareness. As the biologist Steve Jones (2009, p. 77 *ff*) has pointed out, there are wide gaps between our understanding of the biology of the brain on the one hand and sociological and behavioural phenomena on the other. As he says, biologists naturally hesitate to act as sociologists (and, of course, *vice versa*). Furthermore, the outstanding genomics expert, Svante Pääbo, also points out (2014, p. 208) that "[T]he dirty little secret of genomics is that we still know next to nothing about how a genome translates into the particularities of a living and breathing individual". Conversely, students of the humanities cannot provide the physical underpinnings of social, aesthetic, cultural, or linguistic constructions. Many Cartesian philosophical approaches focus on the separate "mind" of the individual knowing subject, whereas most neuroscientists would point out that our experience of mind is the representation of the brain interacting with information from outside the individual in an integrated process. As Jones also says in the same context, we must admit to areas of ignorance. However, it may be useful to highlight some of the problems and propose some solutions. The discussion takes us into a wide range of connected issues.

"The Cinderella Problem"

Some of the above disparities between our physical understanding and our understanding of language might be summed up as the "Cinderella Problem". It is a problem of understanding reality as we experience it, and specifying the mechanisms by which our sense of reality arises. To put it another way, Cinderella is simultaneously both *unreal* and *real*. In the frequently held philosophical sense of reality as the state of things as they actually exist, or more widely everything that is or has been, or everything that is, has been, or will be regardless of whether it is observable or comprehensible, Cinderella (the character and story) is *unreal*. There never was a "real" Cinderella. There is no evidence for her existence and the story involves supernatural processes beyond physical reality. Cinderella is not the real-world value of a variable. And yet... Cinderella lives in the imagination of millions and exists in books and films. The story of Cinderella may not be highly realistic, but it has an element of *realism*. There is a recognisable (physical) human setting and social context, and the story

raises obvious social and ethical issues. Cinderella can be a vehicle for the discussion or awareness of those issues, especially, but not solely, for children. The Cinderella story appeals to our emotions and sense of justice, and it helps to construct ideas about human relationships, including myths about romantic love.

Moreover, the story has a certain universality. As Arthur Waley (1947) has pointed out, there is a Chinese story that has clear similarities with the western story, and the Chinese story was possibly transported to China from India – the Cinderella scenario transcends cultures. The suffering, virtuous heroine ultimately rescued is a recurring literary trope in, for example, medieval romance, Pushkin's *Captain's Daughter* and Wilkie Collins' *Woman in White* as well as in cheaper fiction and in old *Perils of Pauline* films. Cinderella and the Cinderella story make up a discussion world. In those ways, Cinderella is *real* – part of our “many-sorted universe”. In that sense, anything we can think of has a certain existence in our brains, and is hence “real” – golden mountains, triangular unicorns, and so on but the latter are just additional examples of how we can create a kind of reality through verbal combinations that have no real-world reference. If Cinderella is a reality, it is a very different one from the reality of quantum physics or neurotransmitters between synapses; and yet the two extremes must be connected to form reality as we experience it. It is a verbal construct, not an “imitation” in the Aristotelian sense, because there is nothing that is imitated; it is rather a world created by verbal means. Why should humans engage in such constructs?

The Cinderella problem is connected to, but of wider scope than, the issue of whether constructed examples such as Russell's much-discussed *The present King of France is bald* (1905) or the similar *Sherlock Holmes is bald* discussed by Kripke (1971, p. 65 ff) have a truth value or not. (Whereas *the present King of France* is a possible verbal construction [naming by description] with a meaning but no reference in the real world, Sherlock Holmes is a fictional character in an imaginary world, like Cinderella [with direct naming], with various characteristics in that imaginary world.) Philosophers are divided on whether a sentence without a real-world reference can have a truth-value. Kripke takes the view that there are multiple possible worlds, and in each one a truth-value can be assigned. The view taken here is that *language* allows the construction of multiple realities (“possible worlds”), including fictional worlds, and that this is a normal human means for exploring existence – not a regrettable logical lacuna. Thus, *Sherlock Holmes is bald* can be true or false within the fictional world, but of greater importance is the exploration of issues (in fiction) and the verbal mechanisms by which “unreal realities” are explored. The idea that truth is limited to reference to real-world referents is very narrow.

The philosophical definition (above) related to actual existence in time and space may also be narrow, but it would become useless if anything imaginary or verbally constructed were counted as “real”. We would not be able to express the clear sense of (ontological) difference in the types of reality, or between golden rings and golden unicorns. We regularly distinguish reality from fantasy; for some people suffering from severe psychological conditions the inability to make the distinction is a central part of the condition. On the other hand, some “unreal” things (in addition to those mentioned by Popper) – qualities such as justice, virtue, malevolence, greed, and so on – are important social “realities”. How can we resolve that paradox of the reality of the unreal? Can we connect physical processes through to a cultural construct? Is there any sense in which the many “sorts of reality” are all reality? We know that reality for a bat or a clownfish is different from our human reality, so we must have a particular kind of human reality, although even human reality clearly exists in a spectrum of experience; people with synaesthetic connections (e.g. between sound and colour) live in a

different form of reality from that of most people; some people have very visual representations and memories, others have less visualisation and more verbal constructs. The question can be re-phrased as what is non-physical human reality, how can we explain it, and how can cultural realities – stories, ideologies, laws, social and economic systems, economic transactions, linguistic expressions, and many more – be connected to physical reality? The answer lies in language.

We can be misled by our perceptions (as many psychological experiments have shown), although we generally trust the evidence of our eyes and ears in everyday life. Verbally created constructs of all sorts may be questionable, but they are generally relied on; a price label of £10 for the purchase of a packet of birdseed or an ice cream might be deemed expensive, but is unlikely to be questioned as a statement of fact. However, verbal constructs can clearly be misleading, at least in certain respects. The sun does not “rise” and “set”; the breeze does not “get up”. We cannot take every news story at face value. We cannot take the Cinderella story as an account of fact, events, or as an accurate representation of a social reality. We suspend our disbelief to engage with the story, and do not question it *as a story*¹ – the textual object is what it is, even if we think it is silly. The story may lead us into a belief that justice and virtue will always be rewarded, the wicked will be punished, that love triumphs over adversity, that wrongs will ultimately be put right, or even that there are magical forces at work in the universe – or we may judge such ideas as bunk, – but we will form a judgement on it using the story as it is. Like any myth it is a component of a particular conception of society and its belief systems. This is one way in which language may be misleading. Notions or conceptions of reality can be false. Prince Charming could turn out to be a brutal wife-beater, or Cinderella may turn out to be a terrible nag.

Misleading Aspects of Language and the Objectification of Language

Philosophers have long distrusted language, and pointed out the discrepancies between linguistic expression and the reality of what is “really” meant. It is easy to see that the sun does not really “rise” and “set” and that it is not really pulled across the sky by a three-legged golden crow. The view of Ewing is typical. He says (1951, p. 37 ff) that variation in meaning is a problem in arriving at truth and that,

Language may also lead to philosophical mistakes, because its verbal form gives misleading suggestions as to the structure of reality or because two sentences which really do not assert the same kind of thing at all are taken to do so because they have the same grammatical structure.

For example, the sentences: *The man came out* and *The sun came out* express quite different realities with the same grammatical form.

Rovelli (2016) takes a similar view from a scientist’s perspective when he tells us that physical reality is not what it seems. He draws attention to the clear disparity between ultimate physical (quantum) reality and our everyday reality, much of which depends on verbal conventions. We are misled partly because our perceptual and cognitive abilities are too slow or too limited to capture ultimate physical reality or other dimensions of reality

¹ Generally...the late radio humourist, Dennis Norden, once imagined a child asking to the perplexity of a parent, if everything returned to normal after midnight, why didn’t the glass slipper disappear? One might wonder also whether Prince Charming needed to visit the optician if the only way to recognise Cinderella was by her shoe size even after dancing with her all night.

(such as UV light or ultra-sound). Rovelli (2016) adds “We slice up the reality around us into discrete objects. But reality is not made of discrete objects. It is a variable flux”. (p. 224)

His view is not new. The contrast between the atomic world and our world of appearances was made by Stuart Chase in his *Tyranny of Words* (1938). Buddhists have long held the doctrine of the “inherent non-substantiality” of things (Dalai Lama, 1999, p. 109) and that objects regarded as discrete are not so, but are recognised because of the fact that by convention we give names to parts of the world. Antal (1976) pointed out that we think of the Danube as a single “thing” but that in reality “it” is constantly changing in various ways; it is the name that gives a sense of constancy and sameness to the river. That is another of the problems in the relation of reference – where does an “object”, such as a river, or plane journey begin and end? Where does the Pacific become the China Sea?

However, Rovelli’s view is important because it expresses a fact about the physical universe. Our language behaviour and our mental resources too rest on an ultimate quantum reality. But we should remember that language (the totality of speech acts or the stored verbal resources in our brains and in our speech communities) is *also* a reality of a different sort (as Popper [above] says) – at least it is part of the human experience of reality. Verbally constructed reality is, nonetheless, a reality that appears to have a degree of constancy like other social institutions. It may be a “flux” (and verbal communication clearly changes over time), but it also has organisation and some stability. Furthermore, we “reify” or “objectify” our utterances and texts (Strawson, 1971, p. 3; Mulder, 2005, p. 71 *ff*) in order that they can be combined, manipulated, and discussed; that is, given a kind of stability. An objectified statement may, among other things, be assessed for truth. In order to do that we require an awareness that a verbal construct may not correspond to reality as experienced; that is, the dual view of verbal constructs as simultaneously “real” and “unreal” is a necessary part of having language as a surrogate world. We may say, *John answered the door*, or *All John’s plans went up in smoke*, but we know that the door did not ask a question and John did not answer; the expression is a conventional way (in English) of describing his action in responding to a knock at the door. Furthermore, there was no burning of plans or real-world smoke, but the failure of plans is real enough. Cinderella’s visit to the ball and Sherlock Holmes’ baldness are both unreal and real.

Real-world utterances are physical events in time and space with social functions and effects; they are not “things” in the way that tables, trees, or doors are “things”. Our objectified utterances are constructs from sound input processed by our brains in several ways; we then treat them as “things”, reify them as speech sounds, meanings, requests, assertions, aesthetically pleasing or displeasing, typical of a class or ethnicity, sensible or outrageous, and so on. Electronic or written storage of speech acts as text enhances objectification and analysis. A recorded utterance is not an utterance, but an object for analysis. All of those ways of looking at an utterance contribute to our construction of social reality and orientation in it. The objectification of utterances and written texts is a necessary part in the construction of a virtual reality. Cinderella too is an objectified text creating a virtual world.

The Flux of Physical Reality and the Relative Stability of Language

The reality of objectified utterances comes about through our cognitive processes. Objectified texts exist in a discussion world that can persist over thousands of years, like the sayings of Confucius or Plato. Language is the means of cultural transmission (and it is the means of its own transmission in language acquisition). Objectified texts or utterances are all unreal

realities, like Cinderella. Popper (1972, p. 31 *ff*) calls this creation of a discussion world the “argumentative function of language” (although there is no need to restrict verbal worlds to the rational discussion of ideas). Thus, Rovelli’s (2016, p. 9) view of reality flux or “endless dance of atoms” in the quantum world is inconsistent with our sense of the stability of social products and structures and our attribution of reality to non-physical things, such as classes, abstractions, imaginary characters or circumstances, ideologies, or social systems. We have here an explanatory gap between (temporarily) organised stability and flux, and also between a physical view of reality and ways in which language is our default *modus operandi* for social and real-world orientation. As the anthropological linguist Foley (1998, p. 74) argues, language has “colonized our brains”, and become our way of looking at reality, orienting ourselves in society, and creating verbal explanations, explorations, and representations. For Rovelli,

We, just like the rest of the natural world, are one of the many products of this natural dance – the product, that is, of an accidental combination. Nature continues to experiment with forms and structures; and we, like the animals, are the product of a selection that is random and accidental, over the course of eons of time. (p. 21)

An “endless dance of atoms” cannot explain the relative constancy and stability either of ourselves or cultural products such as language. The inconsistency is partly resolved by seeing objects as temporary clusters of organised material and energy, and language as existing in human clusters like a “dissipative structure” in chemistry. Delsemme (2000, pp. 146–147), following Prigogine, defines this as “an open system that is constantly crossed by a flux of matter and energy which permits entropy to diminish and the system to become organized”. For the individual, language and language products can be maintained through the use of a great deal of energy to support the enormous number of synaptic associations which underlie our experience of language. But, because of human mortality and the need to integrate all individuals into social structures, we also require cultural transmission for the continued existence of language and language products (Jones, 2009, p. 40 *ff*).

That cultural transmission is a feature of human sociality, and is aided by the spread of “memes” (Dawkins, 2004). It should be obvious, however, that the explanatory gap is *only partly* filled, since the relation between brain activity at the cellular level and consciousness of language (and language created consciousness) as well as social and interpersonal constructions remains. Furthermore, the role of “memes” with positive feedback mechanisms, while a plausible model, lacks a clear mechanism². Thus, there are many features of language and historical change in language which one can reasonably describe as “memetic”. Clichés (*not rocket science, heart of the home*, and so on), fixed expressions (*red rag to a bull, a stitch in time,...*), regular collocations (e.g. *in case of, in consideration of, on behalf of, over and above, in a minute, ...*) are examples, as are the “wave-like” spread of phonological and grammatical changes through speech communities with new forms appearing (such as “do-support” and inversion in early Middle English, or recently a subject-predicate structure after *how about* – e.g. *how about we go?*) and others becoming less used (*how about us going?*) or more or less disused (such as *lest* or the passive in *-ing*; e.g. *the tea was serving = the tea was being served* in 18th century English). New expressions appear all the time for new needs (*brexit, brexiteer*) or new ways of saying things (*funky, pants, newbie, peng*) for

² It is possible that “mirror neurons” in the pre-motor cortex involved in imitative behaviour are a mechanism (Provine, 2012, pp.18–19).

innovation or social differentiation. The factors in the spread of memes and the gradual disappearance of other linguistic forms involve cultural and dispositional parameters; exposure to expressions in the media, peer-group pressure, leaders with perceived prestige, generational differentiation, adaptation to new circumstances, and so on. Those are all factors in what Houdebine (2015) calls “l’imaginaire linguistique”—the ways people conceive of and relate to their language. Fitting them together with our physical understanding of the world is the problem of the construction of human reality through language and its characteristics. The sociological notion of a “meme” needs to be fitted into a wider understanding of cultural transmission, including the *pre-requisites* of cultural transmission. One such prerequisite is the integratedness of the individual into the speech community. As noted above, we must not underestimate the extent to which our brains are concerned with other people and coordinated with them. Communication is obviously the mechanism for that integration.

Language as a Social or Species Phenomenon

“Integratedness” means that language, objectified utterances, and other cultural structures do not exist for the individual alone. Language can be seen as a property of the species *homo sapiens* and specific languages as *properties* of groups of individuals in communities (and across communities). It binds individuals and groups together (and divides them). Objectified utterances, such as those of Popper or Rovelli, exist in the discussion world (Popper’s *World 3* is one way of looking at this, but one should not be restricted to the world of rational ideas and discussion; Popper’s *World 3* of rational discussion, ideas, and scientific knowledge is also a verbal construct dependent on cultural transmission rather than an independently existing entity). These explanatory constructs (language, a language, objectified utterance, *World 3*) are further instances of the Cinderella problem. They are both real and unreal. They exist in our brains and databases as extensions to our brains, not in the external reality of physical processes, and arise from a combination of the properties of verbal communication and the grouping of individuals into cooperative, organised societies. A concept such as “language” as a species property (the intension of the set of all languages or the factors that make any language an instance of language) involves the attribution of a kind of reality to an abstraction (as also in structure, justice, or beauty). That hypostatisation is typical of verbal communication, and occurs in the attribution of existence to types, as opposed to tokens (the archetype gorilla as opposed to this or that gorilla), and to classes as well as to members (the class of ruminants as opposed to individual cows or zebras).

We are touching here on the ancient debate between realists and nominalists over whether concepts are realities or just names or verbal conventions. Any linguist will emphasise the conventionality of verbal expressions, but the point here is that regardless of one’s position in the philosophical debate we treat class concepts *as if* they were real – they become a kind of reality by our thinking of them. The philosopher Quine (1956, p. 12 *ff*) has pointed out that treating classes as if they existed is a matter of verbal construction and is useful for explanatory purposes (we want to state what is true of any member of the class of gorillas); thus, there are limits to extreme nominalism in which only individuals exist. Classes are convenient, if arbitrary, fictions, and part of normal language behaviour—unreal realities again. Moreover, the cohesion of any group requires some form of common communication system with acceptance of the constructs it creates. In French (but not English), there is a verbal convention to distinguish *la fierté* (justifiable pride) from *l’orgueil* (unjustifiable pride); in French (but not English), one distinguishes *libre* (“free – without restriction”) from *gratuit* (“free – without charge”) and, in Russian, going by a means of transport (*jexat*) from going on foot (*idt’i*). The problem is wider, however, because a single human is both an

individual communicator and a member of a class of speakers, whose verbal behaviour contributes to, and is largely determined by, the norms of the group. We need to look at “communication”³.

Communication Models and Explanatory Gaps

Communication is often described as a process in “transfer” models or “exchange” models for two-way communication or networks. The best-known transfer model is that of Shannon and Weaver (1949), although Saussure’s “speech circuit” (1916/1972, pp. 27–28) is very similar. The Shannon and Weaver model (1949, p. 7) is:

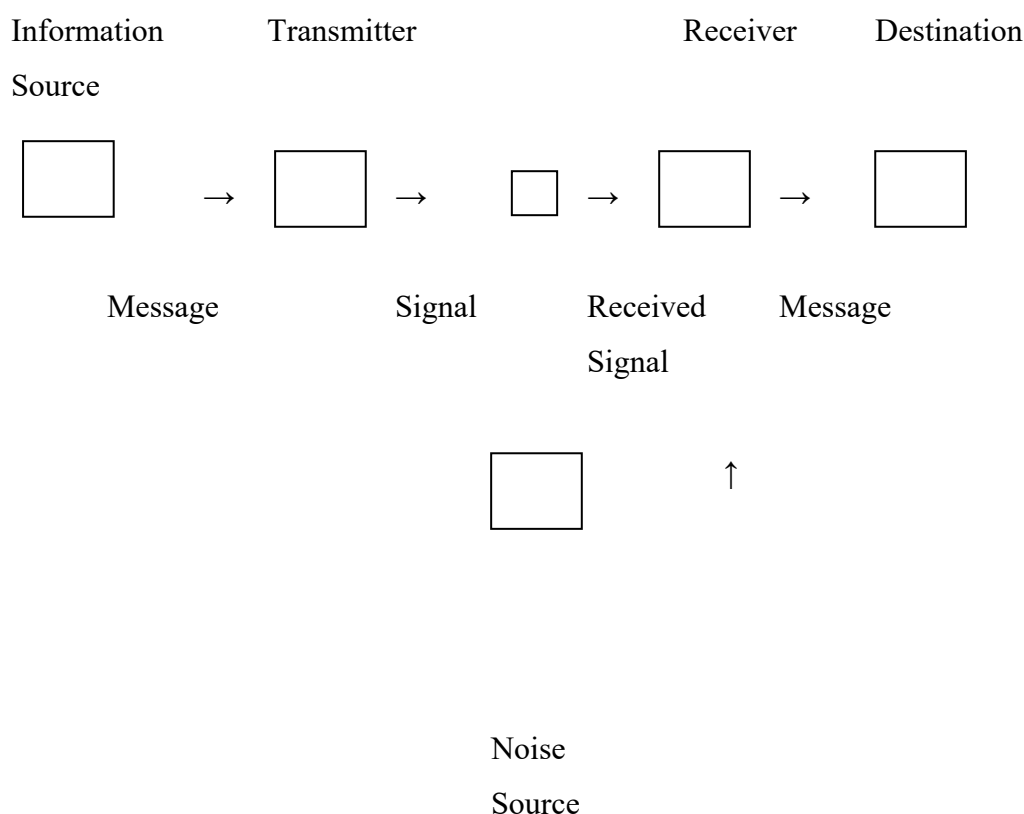


Figure 1: Shannon and Weaver model.

It is obvious that the directionality of the arrows in this model can be reversed for two-way communication, in cases where the information source and destination can swap places (as in speaking, but not traffic signs and signals). It can also be the basis for network models involving multiple participants (e.g. in one-to-many communication). The Shannon and Weaver model has been widely used in many disciplines from linguistics to marketing. It is useful as a starting point for the consideration of the communication process, but it has been extensively criticised (Chandler, 2007; Rastall, 2015). The main criticisms are that the model is too broad and fails to discriminate between different types of semeiosis; that it lacks a social, discursive, and situational context for communication; that it lacks a feedback

³ The work of the Sebeoks and their followers and co-workers is particularly important. Sebeok (1986) is a useful starting point.

component (either from the receiver or from the signal); that the role and place of the communication *system* is unclear; and that, hence, the many complex disposing factors in utterance formation and interpretation are absent. In short, meaning-making is left unexplained along with language as a social phenomenon. (Shannon and Weaver quite explicitly said they were not concerned with qualitative (“semantic”) information, so one must beware of applying their model too readily.)

It is irrational to be over-critical of Shannon and Weaver. Their model was probably only ever intended as a convenient visualisation, although they make excessive claims for its general applicability to virtually any form of semeiosis (1949, p. 7) – language, animal communication, mechanical or cybernetic control, artistic performances, interpretation of natural phenomena – regardless of the medium, the direction, the nature of the participants or agents, or the type of semiotic entities involved (natural indices, artificial symbols, unmotivated signs, and so on).

Shannon and Weaver (1975) explain:

The *information source* selects a desired *message* out of a set of possible *messages*...The selected message may consist of written or spoken words, or of pictures, music, and so on

The *transmitter* changes this message into the *signal* which is actually sent over the *communication channel* from the transmitter to the receiver...In oral speech, the information source is the brain, the transmitter is the voice mechanism producing the varying sound pressure (the signal) which is transmitted through the air (the channel).

The *receiver* is a sort of inverse transmitter, changing the transmitted signal back into a message and handing this message on to the *destination*. When I talk to you, my brain is the information source, yours is the destination; my vocal system is the transmitter, and your ear and the associated eighth nerve is the receiver. (pp. 7–8)

I should like to mention two other problems that are relevant to our discussion. First, the model is too compartmentalised. This is inconsistent with the integrated oneness or totality of reality – one of the explanatory gaps alluded to above – including integration into a language community. Second, the Shannon and Weaver model (and a great deal of linguistics) can too easily suggest the idea of someone “using” a language through the notion of “selection” and, hence, to imply a mind-body dualism that is inconsistent with most modern thinking, that is, a controlling mind which “selects” pieces of language for communication (although Shannon and Weaver speak of the actions of “brains”; their position is thus also consistent with scientific monism). Lakoff and Johnson (2003) describe (and later criticise) the transfer view of communication in *language* as follows:

The speaker puts ideas (objects) into words (containers) and sends them (along a conduit) to a hearer who takes the ideas/objects out of the word containers. (p. 140)

The notion of “selection” by the human brain (let alone for innate animal behaviours or for programmed machines) is clearly problematical, if interpreted too literally. Any “selection”

in language is not the same as conscious forms of coding (e.g. in map symbols or Morse) or instinctual animal responses from a fixed repertoire of behaviours. In language, there are too many disposing factors, so that “selection” needs to be seen as an (unconscious) adaptation of verbal resources to complex circumstances. One does not “select” a tense or number from a set of choices, but one applies the appropriate tense or number in the circumstances, and *mutatis mutandis* for other verbal features, such as “going” in Russian. The problem is really the uncritical acceptance and application of the model. The compartments in the model can, perhaps, best be seen as ways of looking at phases in a very complex and continuous process of energy transfer without sharp boundaries, and as *foci* for different perspectives on communication (such as the physical mechanism or process of interpretation or the set of resources in the communication “system”). The messages, sent and received, need to be seen as end points (for participants) in a communication process which exists in the wider situational and social context, and in particular in the context of a mass of parallel and simultaneous associations (phonological, grammatical, semantic, connotational, logical, associative, value-based [“aesthetic”], and so on). Thus, we can say *Fred is rich / well off/ not short of a bob or two/ rolling in it*, and so on with multiple associations and disposing factors in the “selection”. As noted above, we know little of the micro-level connections involved and of how they build up into verbally created representations and social orientations, let alone the many discourse worlds or “virtual reality” of verbally constructed reality. We have little choice but to work *a posteriori*, that is, we can attempt to use the comparison of different texts and utterances in their situation, attitudinal factors, and social context to work out the disposing factors in their production and interpretation (e.g. in the “selection” of *well-off* rather than *rolling in it*), and hope that we might find the physical mechanisms of organisation in the gap between cells and conscious awareness.

Given the fact, however, that utterance formation *precedes* our awareness of our own speaking, and that our verbal resources are not conscious, the notion of a controlling mind separate from the process is untenable⁴, as is the idea of an autonomous brain acting as an instigator of communication outside any context or situation. The individual speaker is a member of a wider group from whom language is acquired and in whose speech community the individual communicates. Any actual signal sent by the speaker takes place in a situation or context which influences that communication. The isolation of the individual sender and receiver is a convenient fiction for the purposes of analysis (see below); all verbal productions and interpretations require the norms of a given community which are determining factors in that production and interpretation. We are too enamoured of our own autonomy, and too inclined to focus on language as a property of the individual alone. The neuroscientist David Eagleman (2015) makes a similar point when he says, “Brains have traditionally been studied in isolation, but that approach overlooks the fact that an enormous amount of brain activity has to do with other brains. We are social creatures.” (p. 133)

Furthermore, the behavioural psychologist, Robert Provine (2012) has provided convincing studies of involuntary group behaviour, such as yawning, laughing, coughing, and so on which show that our behaviour is closely attuned to that of the group and much less controlled and individual than we like to think.

A similar point has been made by philosophers such as Hegel and Bradley. Francis H. Bradley (1962 [1876]) says, for example:

⁴ There are, of course, many reasons for thinking this, for example, the facts that physical brain states affect mental states or health and that different experiences of reality can be physically induced by action on the brain through drugs or perceptual input.

The child learns...to speak and here he appropriates the common heritage of his race,.. the tongue that he makes his own is his country's language. It is the same that others speak, and it carries into his mind the ideas and sentiments of his race...and stamps them indelibly... (pp. 171–172)

Ignoring Bradley's 19th century mode of expression, Peter Singer (1983) comments:

Bradley's point, and Hegel's, is that because our needs and desires are shaped by society, an organic community fosters those desires that most benefit the community; moreover, it so imbues its members the sense that their identity consists in being part of that community... (p. 41)

Our language and our verbal responses are not our individual choices, but are acquired from the community wherein we acquired our language. This is obvious, if we think of the phonology, grammar, and lexis we have as well as of our verbal responses in social situations, where we have little or no individual choice⁵. The phonological form of the word "cat", the grammatical requirement to select for number in English count nouns, the semantic distinction between *bull* and *cow*, and all the other phonological, grammatical, and semantic forms and distinctions are acquired for membership in a linguistic community and are not a matter of individual selection or decision. Any individual variation in expression is relatively minor by comparison with the mass of verbal conventions. Perhaps, we act more like ants in a social collective linked by communication than we care to think⁶. (For a further discussion of these points, see Rastall, 2018). We think of verbal performance and our understanding of the world as belonging to our private and individual experience, but ignore how much is shared and common to all members of the community. This social integration in a communicating totality, along with empathy, is one of the prerequisites of cultural transmission.

Language as a Selective Advantage; Qualitative Features of Languages

One other way forward might be to see language in terms of Tinbergen's (1963) four questions and in particular to ask what its selective advantage as a behavioural adaptation is. This has been a matter of some debate between ethologists. Communication is clearly one of the current functions of language and the sub-classification of communicative functions has been extensively discussed, but it is also clear that the present complexity of language with its multiple functions, including the verbal creation of discussion worlds, the provision of social orientation, and the role of language as our means of construing reality, has arisen from simpler origins. As Bateson and Laland (2013, pp. 712 *ff*) have pointed out, current utility in behavioural adaptations is not necessarily the same as the origin of a behaviour. The production of tears as a symptom of emotional state, for example, has its origins in keeping the eyes free of infections and irritants (a Darwinian "associated serviceable habit"). For language, those simpler origins were probably connected to the adaptations of humans to living in larger groups and having a more cooperative lifestyle, which in turn led to increases in brain size (Dunbar's "social brain hypothesis", 1998) through genetic modifications. Positive feedback could have played a role in the great increase in the functions of communication (Rastall, 2000, pp. 99 *ff*) until the present position is reached with a complex of social, representational, and argument functions to such an extent that in many ways

⁵ Speakers use, for example, different greetings – *hello*, *hi*, *g'day* and so on, but the "choices" here are determined by social and personal variables. The same is true for other variations in expression.

⁶ The work on ants in Würzburg by Franck et al. (e.g. 2017).

language is our reality. (For the role of positive feedback in biological systems, see Dawkins, 2004).

Qualitative Developments in Language

However that may be, it should be remembered that there have been a number of steps along the way to language as we currently experience it. Notably, as Bühler (1981) and later Popper (1972) pointed out, there is a clear *qualitative* difference between communication as an expressive symptom (e.g. a cry of pain) or an address signal (e.g. a warning or sexual attraction behaviour) and the use of representational symbols to refer to discrete portions of the world or processes in it, that is, the development of unmotivated conventions for symbolic (and abstract) communication. In particular, language symbolisation allows reference to the external world in the absence of any direct stimulus or referent.

Language is not just quantitatively different from other naturally occurring communication systems, that is, with more signs in the system. It is qualitatively different in several respects. First, language is not only a form of signalling emotional states (e.g. aggression, submission, fear, sexual intention or response) or expressing feelings such as pain. Language involves taking the world of experience and re-working it in a world of symbols as a way of manipulating experience and ideas into a kind of virtual reality of language, or model of reality. That is a major qualitative development and the origin of the Cinderella problem because the virtual world created by language is inherently unreal, but also a way of exploring the real world. One should note also that, in language, expression and address functions are fulfilled not by inarticulate or iconic cries but by articulate utterances; those functions are shared with other animals, but they are quite differently formed in humans and have far more complexity. When hurt, the anthropomorphic Yogi Bear is made to respond not just with *ouch*, but also *That smarts, that really smarts*, that is, with both an inarticulate and an articulate expression. A real bear would just howl with pain. Furthermore, there is the obvious complexity of sign constructions.

Second, groups of connected signs provide *multiple perspectives* and *greater precision*. Thus, we have, for example, *the big tree over there*, to specify the tree in question and to classify it. In “sentences” different components of experience are linked into a whole – for example, to make a judgement (*the tree is big*) or predication (*the tree has fruit on it*).

Third, all languages show the feature of “double articulation”; that is, we have complexity both in combinations of signs (grammatical complexity) and in phonological/differential units (/pat/ – /bat/, /pit/, /pin/, /apt/, /tap/ showing the separate relevance to communication of the differential (meaningless) units {/p, a, t/} and their sequence) – phonological complexity.

Fourth, signs (and also phonological units) are not simply discrete “choices” from sets of units; they have social/aesthetic values (“connotation” as when we attribute different values to, for instance, *combine*, *join together*, *muck in* or *cat*, *moggy*, *pussycat*, and use them in different contexts; phonological units also have expressive and connotational characteristics – for example, “hissing sounds” such as [s] and [z] have often been used for aesthetic effects in poetry and in English /n/ is associated with signs of negation – *not*, *never*, *no* (and combinations such as *nowhere*), *null*, *non-*, *un-*, *in-*). There is complexity arising from multiple associations of verbal units and the factors determining their selection in an utterance. Information implies (unconscious) “choice”, but information value is not purely quantificational, nor a matter of a controlling “mind”.

Furthermore, at some point in the development of language as we know it, there was the qualitative step of combining signs to present analytical representations of complex processes, which in turn led to the possibility of questioning and explanation. Those developments were not positive feedback in the same way that the male lyre bird has acquired an enormously long tail, or bats have acquired large ears, that is, uni-directional, quantitative development. The *qualitative* changes require additional explanation as multi-dimensional developments. Perhaps, increased cooperation required increased reasoning as part of cultural evolution (Steels, 2011). Popper's view is that language developed as a "problem-solving" device (1972, pp. 145 ff). We can interpret "problem-solving" in a very wide sense to cover any semiotic means to address a communicational need (social or practical), but symbolic conventions and the conventional linguistic analysis of experience are clearly important for reasoning in practical problem-solving. As we have seen, however, they can be useful but misleading in the construction of verbally created worlds; that is, in our verbal construction of reality.

The analysis of our experience by verbal conventions (Martinet, 1962, 1989) is one of the key strategies. Thus, the experience of heat from the sun can be expressed as *I am warm* by conventionally separating the experiencer (*I*) from the experience (*warm*) and linking them by reference to a present state (*am*) in a conventional sequence. That this is conventional is shown by the German *Mir ist warm* (lit. "to me is warm") or French *J'ai chaud* (lit. "I have warm(th)"). Of course, one could just say *Phew!* to express what is after all a direct totality of experience. The idea of being warm leads us to a view of reality in which being warm is a state and in which there is a reality called *warmth*, as opposed to a set of individual experiences.

Another aspect of the qualitative step in the conventional analysis of experience is the identification and naming of the components of an experience; this involves a step of abstraction. Thus, in *Mary is dancing* the person, Mary, is distinguished from her actions. From another point of view, Mary and the dance are a single totality. The poet, Auden, asks (in *The Tower*) "who can tell the dancer from the dance?". Linguistic abstraction and the conventional analysis of experience allow us to identify Mary (who can do many things) from her actions (which could be performed by someone else): *Mary is working, Fred is dancing*⁷.

There is a further level of generalisation of signs. Thus, in *Fred made a fire, Fred made a boat, Fred made dinner* Fred performed very different actions, but *made* is used in each case, rather than a separate verb or distinct predicate for each set of circumstances (at least in English); it indicates that the fire, boat, and dinner were the result of Fred's actions. The verb, *made*, can then be extended to other cases such as *Fred made a mistake* (where the mistake is not a physical *result* of "making", but the action itself, and *mistake* is also a judgement on the action). We end up with a very vague notion of what it is to make something, but the uncertainty is reduced by the direct object. In these cases, we have the sort of divergence of verbal convention from "objective reality" that philosophers have drawn attention to. This is the "downside" of verbal conventions and indeterminacy of reference; verbal reality can be imprecise (lack one-to-one isomorphism with experience) and it can create misleading conceptions of the world (e.g. through hypostatisation or myth-making). However, verbal conventions are useful and efficient and, of course, they are the way language has developed

⁷ The answer to Auden is that in physical reality one cannot distinguish the dancer from the dance, but thanks to language conventions we can all make the distinction – but the distinction is a verbal construction for talking about the world – dancer and dance are verbal ways of looking at, and classifying, events.

for human purposes; that is, not for the exact representation of the world, but as a practical means for talking about it and orienting ourselves in it.

Interaction and Mental Models

Language requires both a physical mechanism for signalling – social and communicational interaction – and a means of interpreting signals, both verbal organisation in the form of conventions and patterns of verbal association and some relatively stable associations with memories and experiences. The reality of quantum phenomena (or any other reality), Rovelli (2015, p. 18) tells us, consists in their interaction. We can say that we too are constantly adjusting our sense of reality through interactions. They may be perceptual input or some form of semeiosis, verbal or otherwise; usually multiple forms of semeiosis are involved-communication is multi-modal and integrated. Real verbal exchanges must be seen as dynamic events, not as static things (Rastall, 2006). Because of its conventionality and many social dimensions, however, language signalling is not just a matter of physical interaction. There must also be interaction *with something*, that is, some mental model (Johnson-Laird, 2006) that is updated. That mental model must be relatively stable, that is, maintained by a constant flow of energy, as suggested above, and it must also involve the objectified speech event. The failure to maintain any part of the model (e.g. through non-use) can lead to its weakening or loss – that is, we forget.

A freshening breeze, a barking dog, a road sign, an utterance may all cause a change to our picture of some part of reality- the weather, the arrival of the postman, cows crossing the road, a letter from the bank... The notion of some relatively constant mental model with which interactions occur is implicit in the philosopher David Hume's account of our sense of the relative constancy of the world around us (1748/1968, pp. 192 *ff*), in which new information must be compared and contrasted with a previously constructed reality. Any change would have to be explicable. We would be surprised and upset to find that the car was not in the garage where we left it. Not finding the car would conflict with our expectation or model of that bit of our reality, and we would want a reason for it. A change in the appearance of a road could be explained by road works or a new building. The idea of a mental model is close to the physicist's notion of model-dependent realism, explained by Hawking and Mlodinow (2010) as follows:

According to the idea of “model-dependent realism...our brains interpret input from our sensory organs by making a model of the outside world. We form mental concepts of our home, trees, other people, the electricity that flows from wall sockets, atoms, molecules, and other universes. These mental concepts are the only reality we can know. There is no model-independent test of reality. It follows that a well-constructed model creates a reality of its own. (p. 172)

Hawking and Mlodinow are not concerned with social interaction, but we can see that similar principles can apply to social communication. The physical model of reality is maintained so long as observations are consistent with its predictions, but may be overturned by a body of contrary evidence; similarly, our model of, say, the appearance of a street remains constant until we notice a change. There may be a new building, or it may appear darker than before. In the first case, we must change our model. In the second, we look for an explanation such as the cloud cover or time of day. Hawking and Mlodinow's view is an updated version of George Berkeley's principle (1710/1910, p. 31) that *esse est percipi* to *esse est intelligeri*. In both, the only route to knowledge of the world is through the senses and the operation of

intelligent modelling. It should be clear that the information which reaches us through the senses is not only perceptual, but also communicational, and especially verbal. A lot of that information, however, is concerned with our social orientation and exploration of ideas rather than with factual information. We must allow for model-dependent reality through verbally constructed worlds and social orientation.

Here we come back to the Cinderella problem. The reality of our verbal interactions undoubtedly has a physical mechanism, but our models and the messages we send and receive are non-physical realities. Indeed, verbal constructions may have no real-world reference at all. Language then creates a world of imaginary experience. We live in our own constructions of the world, as Schopenhauer would say our “representation of it”, but we must remember that our representation is shared with that of others and to a large extent dependent on what we acquire from others. Our representation is not purely individual, as Foley, Eagleman, and Provine (above) suggest. But our representation depends also on human cognitive capacities and our socialisation, including the myths and abstract constructs that come from language and from a long history of rationalisation (and, so to speak, “irrationalisation” – mythologising) of the world around us.

In Conclusion: Physical and Verbal Reality

It makes no sense to say that somehow there is language on the one hand and factual reality on the other. That view is a commonplace of much language philosophy and the “criticism of language”, which led to (failed) attempts to set up logically perfect languages such as we find in the *Principia Mathematica* (Whitehead & Russell, 1910) and Wittgenstein’s *Tractatus* (1922) as well as in much of truth-functional semantics. Language is a reality (not outside, or opposed to, reality) and, as we have seen, language *creates* a significant part of our reality. Our verbal interactions as we are aware of them are parts of a social reality connecting each individual to others and to the external world. Our language depends on our cognitive processes; each apparent “speech sound” is a construct of our brains along with all of the other linguistic units and their associations. Language is also part of the interconnected oneness of all things too, but – as a surrogate for, or conventional way of modelling, physical reality – it is both a function of physical processes and a way of construing, or looking at, the external world and internal experiences. We live much of our lives in a language world- it is our reality even if it is just a (misleading) construct. “Possible worlds” are constantly created by verbal means. Any possible world is treated as if it were a reality, but any possible world is subject to judgements about its realism, factuality, morality, among many others- we fantasise, but are not fantasists.

Where language creates experience, we project (objectified) verbal constructions onto the real world of experience and look for resemblances. Thus, in proverbs such as *a stitch in time saves nine* or *one swallow doesn’t make a summer*, we look for cases in which a timely action prevents damaging consequences or in which one good thing does not mean that all is going well. The real-world possibilities are, of course, endless. A swift movement may prevent the breaking of a valuable vase or foresight in driving may prevent an accident; one report of good company profits may be set against a generally gloomy economic outlook, or one win by a generally losing football team is a rarity rather than an indication of major improvement. The proverb can thus function as a warning or caution. But also we look for a lack of resemblance; in such a case we might say the proverb does not apply. Similarly, with any verbal expression. In *John loved Mary*, we will assess whether John’s attitude and behaviour is really that of loving and whether the loving is really something in the past. In the

Cinderella story, we can project the key features of the story into a potential real world to determine (*inter alia*) the poetic truth of the construction – do the ideas resemble known situations, attitudes, and so on? can we learn from the moral of the tale?

However, we must also allow that, if language is a reality, then language too is not what it seems, and that is clearly the case when we consider the unconscious processes and verbal resources that are applied to circumstances and communicational needs. Our awareness of language, like our awareness of the perceptual world, exists at the “macro-level” of everyday experience.

A further implication is that the speaker participant producing or receiving verbal signals is internal to a complex social process. We are not observers independent of the totality around us, however much we feel ourselves to be separate individuals operating independently. That feeling is an illusion and the philosophical distinction between the empirical and transcendental subjects used to account for the “paradox of subjectivity” (very clearly discussed by Carr, 1999) must give way to a process in which the brain creates a representation of the world (including a representation of language) to itself as part of a single totality and in conjunction with other brains. As noted, speech sounds are not discrete entities, but constructs formed by the brain from continuous sound energy, and English speakers can respond to circumstances with *plural* or *non-plural* nouns and a range of tenses-but “select” they must and the range of “choices” (not conscious ones), that is, the set of conventions we have acquired and which integrate us into the Anglophone community, is determined by the norms of our language community, which we have acquired and apply (unconsciously) to circumstances. The same can also be said of the language analyst observing verbal phenomena. The analyst too is part of the totality and not a purely external observer. The analyst may not be part of the verbal exchange, but does need to be internal to the conventions of the language under analysis and to have the cognitive processes for recognition of verbal phenomena. The vaunted “scientific objectivity” of linguistics is an illusion. The best we can do is to adopt an artificial “objective stance” towards verbal phenomena applying a limited and selective range of criteria and abstracting phenomena of interest (otherwise no analysis would be possible (Ewing, 1951, p. 210); there would be too many aspects of a single problem), although in reality everything is interconnected and can be seen from indefinitely many points of view. The point was made by Bradley (1897).

Language is then a key behavioural adaptation, and a major part of a strategy of cooperation for survival. Humans invest an enormous amount of energy in maintaining language and in its cultural transmission. It is likely that language has its origins in sociality (Dunbar, 1998; Jones, 2009) along with the development of empathy and the recognition of emotions in others, but language as we have it today has both a social purpose and a purpose in our understanding of the world- the representation of events and states as well as their interconnections and rational analysis, the maintenance of memories, and guesses or imagination about possibilities in the future. It helps us to think of what might have been and what might be occurring elsewhere or in the experience of others. The social side of language can be seen in greetings, farewells, polite enquiries about health or wellbeing (where there are reciprocal “adjacency pairs”, a kind of mirror behaviour) as well as in requests, suggestions, advice, warnings, and even demands and orders.

Above, we have identified some of the complexities in the explanatory gap between physical and social constructs, especially the qualitative factors. In order to account for the cultural development of language *as a way of thinking* with many qualitative steps, we need to look

for the seeds of language development in such abilities as individuation of experiences, recognition of similar individuals as representative of types, the symbolisation of components of experience, the identification of cause and correlation and their representation, and the development of hypothesis formation about the world of experience (guessing, trial and error learning). Those qualities are matters of the *organisation* and *integration* of physical mechanisms. Of course, our nearest living primate relatives have only very rudimentary abilities of those sorts and in particular have relatively little symbolisation and empathic abilities, and we can only speculate about the abilities of other hominins⁸. We can, however, identify the qualitative properties of communication. On the other hand, humans' heavy investment in cooperation and the reduction of confrontation in larger social groups has led to characteristics such as high levels of empathy and awareness both of personal identity and of others as persons as well as the sense of group membership. The high level of teaching in, for example, the parent-child relationship has led to the possibility of significant cultural transmission – language development and socialisation go hand in hand for the individual and for the species. The rational and social aspects of human development suggest possibilities for a resolution of the Cinderella problem through the ideas of projection and resemblance.

In the case of language as a means of problem-solving, as we have seen in the case of proposals such as those of Rovelli or Hawking and Mlodinow, there is the statement of a *position* (e.g. that all reality is interaction, or model-dependent) – an objectified verbal construct. Such a position can be seen in a wider context of debate and can be discussed from a variety of perspectives; as we have seen social interaction implies some point of comparison in the form of a mental model. The debate can be seen in the wider context of proposals for understanding the nature of reality⁹. Positions such as “model-dependent reality” can be regarded as starting with ideas of the form “**what if...?**” and thinking through or projecting those ideas (onto real-world experiences) and comparing with observations. In the case of practical thinking on problems, such as how to skin a rabbit, how to store water, and so on, we can imagine solutions in the form “what if...?” based on observations (such as sharp things cut, what if we use a sharp stone?, or rainwater is retained in tree hollows, what if we made our own hollow as a container?). Language allows the exploration of possibilities as well as possible alternatives (e.g. for a container) and problems (of materials or tools) *before* practical action and at a distance from or in the absence of the real-world objects or issues- we imagine with language; it is a kind of substitution of language for physical reality and actions. The hypothetico-deductive approach is inherent in language. In a more advanced case: *what if* reality is just our verbal model of it? Is that a starting point for explanation?

However not all “problems” are of the practical sort. Interpersonal relations and social organisation are also “problems” to be solved in complex communities. Story-telling is also a vehicle for arriving at understanding through imaginary, but realistic circumstances on the basis of possibilities – a form of “what if ... ?” (and for storing and transmitting memories in the form – look what happened when ... , look what happens if ... for instance in morality or admonitory tales). Language allows the construction of imaginary worlds for the exploration of social and interpersonal issues without the need for actions, as in the various forms of the Cinderella story or parables. *What if* a girl loses her wealth and social status to greedy relatives? *What if* some chance or intervention could benefit a virtuous but powerless person? Acting out stories and rituals are intermediate between real-world actions and purely imaginary constructions. Isn't that what we find also in games or children's play – or drama?

⁸ Although the sociality, artistic products, and inhumation practices of Neanderthals suggest that they too had developed a strong sense of empathy.

⁹ For further discussion of this point, see Rastall (2017).

Thus, in both practical and imaginary problems, language allows the representation and discussion of possibilities, which can be *treated* as “real”. That is, the suspension of disbelief in a story like Cinderella is the treatment of it **as if** it were real – a “possible world”. The agents in the story and their actions allow us to ponder issues of justice and moral behaviour as well as the role of chance in human affairs. The qualitative step here is this substitution of symbol for physical reality; we can thus see a link between the real and the unreal, or between physical monism and verbally constructed reality.

Reducing the explanatory gap between our physical understanding and perspectives on reality-as-experienced involves, on the one hand, the recognition that individual experience is to a large extent a part of, and determined by, the wider community and one’s place in a physical and social totality and, on the other hand, that language as we now have it is the product of complex *qualitative* developments. But we must also accept that everyday reality as we experience it is limited by our perceptual and cognitive capacities and that language is the default mechanism for orientation in everyday reality. Part of that linguistic construction of our reality and human concerns involves using the unreal as if real to explore “what if” possibilities. The investigation of physical reality through modelling reality beyond our human perceptual capacities similarly involves setting up hypotheses of the form “what if?” and models of physical reality “as if” they directly represented ultimate reality. The remaining gap is the distance between physical and biological understanding of the brain and qualitative developments in language.

References

- Antal, L. (1976). Psychologismus und Objektivismus in der Sprachwissenschaft. In S. Moli , M. Jayazeri, E. Palome, & W. Winter (Eds.), *Linguistic and Literary Studies in honor of A. A. Hill, Volume 1* (pp. 51–62). Netherlands: de Ridder.
<https://doi.org/10.1515/9783110808995.51>
- Baggott, J. (2013). *Farewell to reality*. London: Constable.
- Bateson, P., & Laland, K. N. (2013). Tinbergen's four questions: an an appreciation and an update. *Trends in Ecology and Evolution*, 28(12), 712–718.
<https://doi.org/10.1016/j.tree.2013.09.013>
- Berkeley, G. (1910). *The principles of human knowledge*. Chicago: Open Court. (First published in 1710)
- Bradley, F. H. (1897). *Appearance and reality* (2nd ed.). London: Swan and Sonnenschein.
- Bradley, F. H. (1962). *Ethical studies*. Oxford: Oxford U.P. (First published in 1876)
- Bühler, K. (1981). *The theory of language* (D.F. Goodwin Trans.). The Hague: Mouton. (Original work published in 1934)
- Carr, D. (1999). *The paradox of subjectivity*. Oxford: Oxford U.P.
- Chandler, D. (2007). *Semiotics: the basics*. London: Routledge.
- Chase, S. (1938). *The tyranny of words*. New York: Harcourt Brace.
- Dalai Lama. (1999). *Essential teachings*. London: Souvenir Press.
- Dawkins, R. (2004). *The ancestor's tale*. London: Phoenix.
- Delsemme, A. (2000). *Cosmic origins*. Cambridge: Cambridge U.P.
- de Saussure, F. (1972). *Cours de linguistique générale* (T. de Mauro Ed.). Paris: Payothèque. (First published in 1916)
- Dunbar, R. (1998). The social brain hypothesis. *Evolutionary Anthropology*, 6, 178–190.
- Eagleman, D. (2015). *The brain: the story of you*. Edinburgh: Cannongate.
- Ewing, A. C. (1951). *The fundamental questions of philosophy*. London: Routledge and Kegan Paul.
- Foley, W. A. (1997). *Anthropological linguistics – an introduction*. Oxford: Blackwell.
- Frank, E. T., Schmitt, T., Hovestadt, T., Mitesser, O., Stiegler, J., & Linsenmair, K. E. (2017). Saving the Injured: rescue behaviour in the termite-hunting ant *Megaponera Analis*. *Science Advances*, 3(4). <https://doi.org/10.1126/sciadv.1602187>
- Hawking, S., & Mlodinow, L. (2010). *The grand design*. London: Bantam
- Houdebine, A.-M. (2015). De l'imaginaire linguistique à l'imaginaire culturel. *La linguistique*, 51(1), 3–40. <https://doi.org/10.3917/ling.511.0003>
- Hume, D. (1968). *A treatise on human nature. Volume 1*. London: Everyman. (First published 1748)
- Jones, S. (2009). *Darwin's island*. London: Little, Brown.
- Kripke, S.A. (1971). Semantical considerations in modal logic. In L. Linsky (Ed.), *Reference and Modality* (pp. 63–71). Oxford: Oxford U.P.

- Lakoff, G., & Johnson, M. (2003). *Metaphors we live by*. Chicago: University of Chicago Press. (First published 1980)
- Mulder, J. W. F. (2005). Beyond realism. In J. W. F. Mulder & P. Rastall *Ontological questions in linguistics* (pp. 71–102). Munich: Lincom Europa.
- Pääbo, S. (2014). *Neanderthal man*. New York: Basic Books.
- Popper, K. R. (1972). *Objective knowledge*. Oxford: Oxford U.P.
- Provine, R. R. (2012). *Curious behavior*. Cambridge MA and London: Harvard U.P. and Belnap.
- Quine, W. V. (1956). *From a logical point of view*. New York: Harper.
- Rastall, P. (2000). *A linguistic philosophy of language*. Lewiston and Lampeter: Mellen.
- Rastall, P. (2006). *The power of speech*. Munich: Lincom.
- Rastall, P. (2016). *Questioning communication models and constructs: qualitative distinctions*. Retrieved from <http://www.edusoft.ro/brain/index.php/libri/article/view/553>.
- Rastall, P. (2017). Representation and argument is communication the central purpose of language? *La linguistique*, 53(1), pp. 69–86. <https://doi.org/10.3917/ling.531.0069>
- Rastall, P. (2018). Knowing subject and external object in language and language analysis. *Organon F*, 25(3), pp. 339–367.
- Rovelli, C. (2015). *Seven brief lessons on physics*. London: Allen Lane/Random House.
- Rovelli, C. (2016). *Reality is not what it seems*. London: Penguin.
- Russell, B. (1905). On denoting. *Mind*, 14, 479–493.
- Seboek, T. (1986). *I think I am a verb*. New York: Plenum.
- Singer, P. (1983). *Hegel: a very short introduction*. Oxford: Oxford U.P.
- Steels, L. (2011). Modeling the cultural evolution of language. *Physics of Life Review*, 8(4), 339–356.
- Strawson, P. F. (1971). *Logico-linguistic papers*. London: Methuen.
- Tinbergen, N. (1963). On aims and methods in ethology. *Zeitschrift für Tierpsychologie*, 20(4), 410–433.
- Whitehead, A. N., & Russell, B. (1910). *Principia mathematica*. Cambridge: Cambridge U.P.
- Wittgenstein, L. (1922). *Tractatus logico-philosophicus* (D. F. Pears & B. F. McGuinness, Trans.). London: Routledge and Kegan Paul. <https://doi.org/10.1524/9783050050348.1>

Corresponding author: Paul Rastall

Contact email: paul.rastall@googlemail.com