Abstract
The design PeR was created as part of our research on how to design for perceptive qualities in objects. PeR, or perception rug, is capable of showing perceptive activity related to actions from a subject and related to other events. The integration of conductive yarns makes PeR sensitive to the touch of a subject. Furthermore the use of nylon threads enables a body of light to behave within its surface.

Keywords
Designing for Interaction, Perception Theory, Perceptive Qualities, Design Platform

1 Introduction
PeR integrates conductive and optic fibres, which respectively are used to sense the touch of a subject and to let a body of light act within the surface of the rug. The design is part of a research project that investigates how to design for perceptive qualities in objects.

1.1 Theory
The starting points for this research are considerations of the phenomenology of perception [1] and the ecological psychology [2]. Based on these notions, perception, in this case, is described as inherently active. Perception is the result of actions we undertake and the consequent sensory feedback we experience. This makes perception a very bodily and, therefore, personal matter. What I perceive depends on what I can act upon with the body I have. [3] Perception, being inherently active, also brings forward the idea that there is a pre-conceptual meaning of the world. In other words; the world means something to us before thinking and recollection. [4]

Merleau-Ponty’s approach of the phenomenology of perception, in which perception is described as inherently interactive, is important for this research. Perception is an interplay between the perceiver and the perceived. [1] These notions have been recently operationalised by researchers at the University of Compiegne, France. The French researchers conclude that ‘there are two kinds of perceptions over time: perceiving the other as part of the environment, versus perceiving the activity of the other perceiving me. It is by switching between these two kinds of perceptions that it becomes possible for one subject to understand the position from which the other subject perceives the scene.’ [5] To make a feeling of sharing a common space between subjects possible, this constitution of the other subject’s perspective or ‘point of view’ is essential.

Our main focus of investigation is if and how it is possible to design for perceptive activity in an object, in order to create perceptive interplay between it and the subject. As the working hypothesis for our ongoing research we state that this perceptive interplay, of
perceiving an object as part of the environment versus the object perceiving the self, results in a greater feeling of involvement of the subject [6]. The next diagram (figure 1) gives an overview of the perceptive connections between a subject and the designed object with perceptive quality. Part of this scene is also an event. Both subject and object with perceptive qualities could perceive this event.

A very basic example one can consider is an ordinary outdoor lamp. The lamp (Object 1) is capable of detecting the presence of an intentional subject as well as the outside lighting conditions (event). Also, the subject is able to perceive this event, as well the perceptive capability of the lamp when it reacts to its dark surroundings and the presence of the subject by turning on the light.

2 Description PeR

PeR is an exploration of how the theory mentioned above is applicable in design. The structure and open form of PeR allows for the exploration and the design of different behaviours. This allows it to become a platform for design.

In between the threads of the basic rug, conductive yarns are integrated. These conductive yarns are connected to several capacity sensors. An electric capacity change is detected when the rug is touched by the subject. This difference in capacity is converted into an electric signal by the capacity sensor, which, in turn, is read by means of an Arduino (electronics prototyping platform). The detection of touch makes PeR sensitive to the perceptive activity of the subject. PeR is capable of reacting to and evoking these perceptive actions of the subject by the behaviour of its integrated body of light. In addition to the conductive yarns, nylon threads were integrated in the rug. This thread has similar properties as glass fibre as it is able to transport light. The soft feel, transparency, and flexibility of the nylon thread make a smooth integration in the carpet possible. A grid of LEDs is mounted under the nylon threads. This enables PeR to show behaviour by means of light.

The electric signals gathered by the use of the conductive yarns are used as sensory input by the algorithm behind PeR. Based on this sensory input the position of the body of light is adjusted. The algorithm allows for a smooth and natural-like behaviour as the position of the body of light is adjusted gradually. This body of light is reflected within the rug through the light of the LEDs spread by the nylon threads.

3 Platform for design

Through the integrated nylon threads, a body of light behaves within the carpet. The behaviour of this body is dependent on an underlying algorithm. The design can
be used as a platform for the exploration of perceptive behaviour. For example the body of light can follow the subject’s touch directly or on a humble distance. In figure 3 an impression of the light body following the subject’s touch is given.

Behaviour towards an event such as, reacting to music, to the dynamics of people, to incoming mail or to activity in time and over distance etc. is also possible. In this case PeR is the object with perceptive qualities. The behaviour of the body of light shows the perceptive capabilities to the subject.

Different design characteristics, like the size of the light body, the speed by which the body moves, its shape, focus and direction, can be adjusted in order to design behaviour. These characteristics could also adapt over time. This means that the light body could get notion of ongoing perceptions. For example, PeR gets bored, irritated or happy depending on its perception of the subject and the event. Notion of ongoing perceptions implies that PeR is sensitive to the dynamics by which it is touched. Hence PeR could show different reactions to, for example, stroking and hitting.

The design of perceptive behaviour is essential to our research and to our design of PeR. As static images don’t show this behaviour we provide a movie at http://dqi.id.tue.nl/per.

4 Further research

PeR is a first example of why and how to design for perceptive qualities in objects. Next to PeR we have been working on a second research design PeP, short for perception pillar. This installation is specifically designed for research purposes. The integration of the theoretical notions in design is more closely investigated. Next to functioning as a platform for the design of perceptive qualities PeR also adds value in building relations between the textile industry, high tech industry and design. The current prototype of PeR is handmade but the used techniques allow for some parts to be manufactured by means of existing production techniques like tufting and weaving. Creating PeR by means of these manufacturing techniques also would improve the quality of the prototype. This is necessary for PeR to really function as a platform for design. Our research will benefit from a solid and easily accessible prototype.

References


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Abstract
Proponents of design semantics (e.g. Krippendorff) have questioned the adequacy of semiotic theories and methods in relation to addressing the meaning of things and, in particular, the role of design in meaning construction. Scepticism towards, not to say dismissal of, a semiotic approach seems to be based on an understanding of semiotics as a branch of linguistics, which, according to the critics, postulate that things are vehicles by means of which meanings are communicated. However, in the literature on design semiotics, another idea of the meanings of things was re-introduced 40 years ago by the Argentine architectural theorist and critic, Juan P. Bonta, who drew attention to the indicative function of design. Charles Peirce, whose predicament of the index was shaped 80 years earlier, is another theoretical source to this matter. Ten years ago, in the book edited by Dagmar Steffen (Design as Produkt-sprache), the so-called Offenbacher Ansatz to the ‘language of products’ (Steffen, Bürdek, Gros, Fischer) put forward another usage of the semiotic category of the index (in German: Anzeichen). The aim of the following is, first, to question the idea of design as communication as a an adequate model of meaning construction in design objects, second, to throw light on the index category and its relevance to design semiotics/semantics in order to elaborate the phenomenal approach to the materiality of things as a meaning component. Bonta’s and the Offenbach positions will be discussed comparatively and elaborated with the purpose of preparing the ground for more inclusive inquiries concerning theory as well as practice.

Keywords

1 Introduction
One of the most persisting challenges to design theory as well as to design practice is that of defining how meaning results from, and within, the relationship between humans and things. This challenge becomes even harder to take up if it is narrowed down to the task of specifying the particular role design plays in this connection. More specifically, the question is how agents of design either facilitate or hamper the formation of various kinds of meaningful relationships between objects of design and the human agents in their capacity of viewers or customers, users, possessors etc. of given objects for use.

Several approaches have been introduced since the 1960s, most of which describe meaning construction in design objects as a kind of communicative act or speech act. Basically, this implies that the traditional linguistic matrix of sender-message-receiver has functioned as a real or metaphorical scheme to be filled out and, at best,
adapted to represent the relations between designer-object-user in more or less sophisticated ways. However, this model applies only with difficulty to the real world of ‘thing acts’. Many questions arise, for instance, is the role of the designer actually that of a sender? Why are investors, manufacturers, retailers, etc. only as rare exceptions attributed this role? Why choose the user as the privileged agent for the receiver position? And, in the end, does a design object really convey messages - apart from, of course, in the special cases of communication design? [16], which, of course, should be acknowledged and studied as such. The following, however, is not about communication design; the concern is with design and objects of design in general.

An alternative to communication as the theoretical and pragmatic modelling of meaning construction in things and the role of design in that context is indication and the various conceptualizations of the indicative sign function or sign modality in, first of all, Peirce, Buyssens, Prieto, Bonta, the Offenbacher Schule and in the new material culture studies that combine an interest in the reciprocity of indexicality and agency. What follows is, first, a rehearsal of the most basic elements of Peirce’s definition of the index category within his rigorous, yet flexible semiotic systematism. Next follows a brief introduction to the Argentine architectural critic and design theorist, Juan Pablo Bonta’s theory of indication as the nucleus of meaning creation in design. Subsequently, these theories are compared to the ideas of the ‘Offenbach School’ concerning design as product language based on the category of ‘Anzeichen’- German for indicator [36]. Finally, the indication approach will be set against some new theories of materiality that have evolved recently in material anthropology. The aim here is to identify a shared interest among material culturalists, semioticians and representatives of design studies in re-attributing material qualities to things and to insist on materiality as a source of meaning in design. For this purpose, a critique of the index is needed, and a critique means an attempt to disentangle and elucidate the essential conditions for the function of this particular sign.

2 The problematic
The point of departure for the following considerations is that the model of communication, even if used metaphorically, sometimes with interesting results, seems not adequate ‘enough’ to elucidate the processes in which human-thing interactions are actually performed, that is, in the immediate direct, physical encounter and in more regular use situations. Irrespective of how ‘communication’ is (and has been) conceived, a genuine and successful communication process has as its precondition a correlation of three elements: intentionality, conventionality and effectuality [7, 10]. In other words, the special standard case of interaction termed communication, may be identified and described in a minimalistic way as a process, in which one agent deliberately affects, by processing conventional signs, another agent in order to leave the latter, being aware of the first agent’s intention, better prepared to act. Whether the actual, conventional sign used is a written text or a spoken word, a pictogram, a road sign or a policeman’s uniform is of no relevance. In any case, the communicative meaning of the sign is only accessible on the basis of knowledge of the lexicon and codes of a particular sign system used in the transmission process. If this matrix is applied in order to describe how people do things with things, two problems arise. One concerns the very process of meaning production, the other is related to the question of polysemy, which, among others, Klaus Krippendorff claims to be a problem semiotics has created by - and only for - itself. It is “entirely semiotic” [21, p. 276].

From a processual perspective, then, the most precarious problem that meets any simple transference of the communications model to mechanisms of meaningful interchange between humans and objects arises due to the idealistic or metaphysical bias of the communicational mode of signification. An adequate theoretical model that is capable of accounting for how meaning is construed in humans must be a materialistic one, since focus is not on the human’s cognitive relation to artefacts, but on a perceptual-operational appropriation of concrete material entities. Such a model does necessarily have to base its assumptions as regards meaning production in, with and in the vicinity of design objects on the material qualities of those objects. ‘Design object’ is not merely the physical thing, and the notion does not refer to aesthetics, nor to form as such, but the phenomenal thing, the meaning of which is neither ‘objective’ (residing in the thing) nor ‘subjective’ (in the mind of the recipient), but pragmatic and operational. To a certain degree, though
not entirely, this view is covered by James J. Gibson’s definition of ‘affordance’ [14, 15] or Donald Norman’s more simplistic notion of ‘perceived affordance’ [27, 28].

From an analytical (and also historiographical) perspective, it is equally important to develop a new approach to the problem of polysemy in things (and, consequently, objects of design). Polysemy, or the multiplicity of meanings in design, cannot be addressed productively as long as the design, layout or shape of things is conceived in terms of ‘language’ or ‘language’-like artefactual forms. It will be argued in the discussion to follow that, instead of ‘communication’, it seems much more promising to employ the notion of ‘indication’ and the cognitive and operational logic of the sign modality which Charles S. Peirce labelled ‘index’. Focussing on the standard (or regular or normal) situation, the indicative perspective on things underlines that things-as-signs are always polysemic, while signs-as-communicators never are; if a communicational sign is not understood or if it is misunderstood, the communication process is a failure. The solution suggested by some adherents of ‘design semantics’ or ‘product semantics’ that things may mean whatever the recipient, user, consumer want them to, is both in theory and practice unsatisfactory, since this position will render the role of the designer desperate, not to say superfluous. If material, form and appearance are of no importance, why then care about the form at all. Moreover, such a view on meaning production in, with and in the vicinity of things contradicts reality. Thus, polysemy is in fact a genuine semiotic problem, which the varieties of ‘design semantics’ have not been able to solve so far. Theories of indication and of the index sign point to the heart of problems raised here.

2.1 Peirce’s index

Charles S. Peirce gave c. 1897 the following (not published during his lifetime, yet one of the most quoted) definition of the sign:

“A sign, or representamen, is something which stands to somebody for something in some respect or capacity. It addresses somebody, that is, creates in the mind of that person an equivalent sign, or perhaps a more developed sign. That sign which it creates I call the interpretant of the first sign. The sign stands for something, its object. It stands for that object, not in all respects, but in reference to a sort of idea, which I have sometimes called the ground of the representamen. “Idea” is here to be understood in a sort of Platonic sense, very familiar in everyday talk; I mean in that sense in which we say that one man catches another man’s idea, in which we say that when a man recalls what he was thinking of at some previous time, he recalls the same idea” [30, CP 2. 228].

This is not an occasion to initiate a detailed discussion of all the implications of this definition. Comprehensive, general and critical introductions to Peirce’s theory of signs do exist. Unfortunately, however, most attempts to apply Peircean semiotics to design have hitherto been problematic since they tend to isolate and address only a section of the theoretical construct: the second tricotomy, that is, the differentiation of signs into icons, indexes and symbols, and doing so only metaphorically, for instance, by claiming that meaning is a property of the object per se (e.g. Vihma [38]).

The definition quoted above states the principal points concerning semiotic inquiry. Attention should be drawn to the triangular structure of the sign. The sign is a relation of three terms: object, representamen, and interpretant. Sometimes Peirce is using ‘sign’ for the representamen position alone, but a sign process, semiosis, only occurs when all three relata are activated. Most importantly, the representamen—the representation—is physical by nature. It must be accessible to the senses. Semiosis is produced in an inferential act, when somebody draws conclusions as to the quality of the relationship between representamen and object, that is, the representation and what is represented. Thus, the conclusion is the meaning of the sign that is residing, as an interpretant, in the mind of somebody On the one hand, the representamen represents its object, and on the other hand, the representamen is represented by the interpretant. Transposed to the world of objects, the foundation of the sign process may at this initial and seemingly pre-semiotic stage be illustrated as follows. Somebody sees a chair and concludes, on the background of his or her experience or knowledge, that the object qua its form is a chair, and consequently, the object and its utility, function, affordance etc. are categorized. Basically, a chair is not per se a sign, but as any object (and any objective cause of sense perception) may be
taken for a sign of something, so a given chair can be understood as a sign – as the manifest representation of what Peirce calls its object. Placed before an observer, a chair is a product. It came into being because a cabinet maker created it by using given materials and given tools, hence the chair is an index sign of this production process. In the same way, it is a sign of the cabinet maker’s outlook as regards questions of type, style, tradition, fashion, constructive techniques, etc. if somebody for one reason or another wants to see the chair as a token of, for instance, the state of the art within production technology at a given time, or as a sign of the inventiveness and skills of the designer and producer, respectively. The ability to identify this sort of sign function requires, on the part of the observer, a certain amount of knowledge of chair history. However, the more simple identification of the form and structure of an object as a generic chair is nothing but a recognition of its appearance as a materialisation, hence representation, of this particular cultural category, ‘a chair’.

The sign function focussed on here is that of Peirce’s index. An index stands for its object in a direct, factual way (e.g. [30] CP 2.92, CP 4.447). Contact, continuity, contiguity and existential bond are only a few of the many expressions used to qualify this relationship. One of the most illustrative cases of the index is the cause-effect connection between object (cause) and representamen (effect) (e.g. [30] CP 2.228, CP 4.531). Thus, the indexical sign process is brought into life as the interpretant establishes this cause-effect relationship. When an interpreter maintains that, for instance, the activity of the cabinet maker has caused the existence of a given chair by producing it, the interpretant, therefore, is the purposeful understanding of the causal relationship between object/cause (the cabinet maker) and representamen/effect (the chair).

Two points should be made here. First, the latter example does not necessarily account for the user’s encounter with a chair, but it exemplifies explicitly the interpretative approach of the design critic, analyst or historian. Each time a material object is being utilized by the historian for evidence, or as a source of historical information, the particular object is considered an indexical sign. If the historian has no access to the ideas, norms, values and policy of the designer/producer, this, of course, will not prevent the historian from engaging in an interpretative enterprise. Second, it is the particular interest of the historian (or analyst or critic etc.) that characterises, focuses and confines or enlarges the search for potential or actual, physical relation of the material object to something else. Thus, the indexical sign always has multiple meanings, depending on the interpreter’s everyday needs or scholarly interests. No semiotician claims that polysemy is a property of a design object per se. Rather, they maintain that multiplicity of meanings is a consequence of the inferences made by the observer, the critic or the historian as to the factual relation of the properties of the design object to something else - not just anything, but the existential relation to something other than the object that makes it possible to construe the object as meaningful.

The representamen (the physical sign) may be related to its object in different ways. Peirce distinguishes between three modalities or three signs; icons, indexes, and symbols.

The icon is characterised by ‘likeness’ or ‘similarity’ of representamen and object, that is, the icon represents its object due to its resemblance to that object. In other words, the iconic sign is interpreted as a representation, the meaning of which is based on properties being shared by the representation and what is represented. Hence, the source of meaning in iconic signs is properties. The index sign is qualified as such by the factual (in some cases causal) relationship between representation and what is represented. The source of sign meaning in indices is relations between properties and their cause or context. Finally, the meaning of symbols is not the properties of the representation, nor the relations of properties to something else. The source of symbolical signs is conventions or traditions that institute and regulate the processing of cultural sign systems such as language and, more generally, any sign system conventionalised by a semiotic community in order to facilitate dialogues and secure broadcast and exchange of information, direction of behaviour etc.

To put it in a simplistic way, a chair is in various respects an icon of any chair with which it has material, visual, functional etc. properties in common. This is at the level of a chair as, say, (1) a specific type of furniture, (2) any singular manifestation of that type and (3) the individual chair in the series of token chairs – the unique, particular chair with its marks and traces of use and damages. The last category – the unique chair – may also contain all the ‘invisible’ marks that are
being attached to it by its user(s) (memories, traumas, obsessions etc.) during the social historical trajectory of the chair. Likewise, a chair may function as a symbol of something insofar as the particular cultural meaning of the chair is established by convention. This conventional meaning is only discernable by sign users (senders and receivers) familiar with the relevant sign tradition. Otherwise, the chair may function as an index or as an icon.

Peirce’s sign theory is very complex. The above rehearsal is in fact simplifying a number of important dimensions of his numerous three-angulations of the theoretical project – Peirce’s famous or infamous “cascades of triangles”, as remarked once by the German semiotician Roland Posner [32, p. 185]. In the present context, the intention, however, is confined to a preliminary argument in favour of privileging the index sign in relation to design semiotics. Therefore, it seems relevant to foreground further consequences of applying this sign function.

The first consequence is that Peirce differentiates between three kinds of indexical signs. The index presented and exemplified above is what Peirce labels a reagent, in which the representamen is seen as the effect of an object (a cabinet maker’s efforts, a set of materials manipulated, a class of furniture etc.). Another possibility is named designator, and this instances an index that functions as a demarcation of something (the object to which the sign (representamen) is still in a factual relation). The exemplary chair case may also include a situation where a chair (maybe a miniature of it) is hanging in a shop window or above the entrance. Nobody would expect to find food on the shelves of that shop. Anyone with a rudimentary knowledge of the shop system or the differentiation of the market place in a given retail culture would know that the chair indicates a special shop for chairs or seating furniture. It may also indicate a more all round furniture shop.

In the latter case, the index functions in both ways mentioned. It is an index of furniture in general because it is part of the whole category of furniture (a reagent), and in the show case, it is an index of the commodities for sale in the shop behind the windows (a designator). The third index sign is naming, thus ‘Charles’ is an index of whoever is called Charles.

Next, Peirce’s qualification of the index also may contribute to redefine, even ‘solve’, the discomforting question of ‘connotation’ as discussed in the 1960s and 70s under the influence of the writings by Barthes and Eco. The two authors argued that things may have ‘primary’ and ‘secondary’ meanings and that the ‘primary’ meaning is translatable to ‘denotation’, while ‘secondary’ meaning equals ‘connotation’. In Eco, for example, a chair’s primary, denotative meaning is its function, that is, ‘an object to be seated on’, while the secondary, connotative meaning is ‘an object to be seated on in a particular style’ [9, p. 24]. In more general terms, both authors seem to assert that in the first place, we have a generic chair, whose utilitarian function is identified on the ground of its conventional appearance. Next, we have a particular chair that refers indirectly and in a mediated way to cultural values and norms of a specific seating culture. Is that really so? Is it not more correct to state that we only have one chair, and that we are capable of identifying the utilitarian function exactly because the chair is there, in front of us, as a material entity with specific physical properties in whatever style it may adhere to? If the chair refers to certain stylistic qualities, cultural values and, for instance, the taste of a particular class or cultural group, is it not just because it is actually a part of a given cultural segment or subculture? The elaborate (‘connotative’) meaning of the chair is not inherent in the properties of the chair itself, but in the properties seen in relation to something else. Is it therefore possible to perceive the chair as an index of that cultural unit, and not as an elaborated, yet (conventional) symbol? With reference to the indexical function of things, it seems more appropriate to state that the ability to grasp the meaning of a utilitarian object and its role in expressing a particular cultural outlook or a social status is part of a general cultural experience and knowledge of how to understand things and events in the cultural environment and to decide how to act accordingly in the real world.

2.2 Bonta’s intentional indicator
The Argentine architectural critic and theorist, Juan Pablo Bonta referred only once to Charles Peirce’s theory of signs. In a footnote in his book from 1979, Architecture and its interpretation, Bonta merely states that Peirce, Susanne K. Langer and Charles Morris used different terms for the structure and function of signs and that there is no direct equivalence between their terms reciprocally, and between their terms and his [3, p. 234]. Bonta’s aims are stated explicitly in the introduction to his most elaborate discussion of design
semiotics. In his conference paper of 1972, “Notes for a Theory of Meaning in Design”, which was first published in the journal Versus in 1973 and later included in Broadbent, Bunt and Jencks’ collection of essays, Signs, Symbols, and Architecture [4], Bonta states that he wants to follow the line of semiological inquiry represented by the Belgian linguist Eric Buyssens and the Argentine semiotician Luis Prieto. By that, he wanted to present an alternative to Barthes and Eco, who, apparently, had functioned as the privileged reference for the majority of speakers and discussants at the conference during which Bonta introduced his application of European semiology initiated by Ferdinand de Saussure.

His reference to Buyssens is something of a paradox. In his reworked book from 1943, published in 1967 with the title, La communication et l’articulation linguistique Buyssens actually excludes the index and the function of indication from the field of genuine semiotic inquiry. Buyssens states the following concerning communication and indication;

“Semiology can be defined as the study of communication processes, that is to say, of the means used to affect others and which are recognized as such by those whom one wants to affect. […] It is possible to affect others without intention; the way our friend talks suggests that he is in a sad mood, an unknown person’s pronouncement reveals that he is a stranger; the epileptic’s behaviour excites our compassion. It is about indices. We perceive them, we identify them, we interpret them, but this is not communication. Semiology does not study them, but confines itself to conventional means, that is, those means that are accepted as conventional” [6, p. 11-12, my translation, JG].

Excluding the index from the repertoire of semiotic problems, Buyssens nonetheless pointed to the challenge posed by the index to students of the materiality and expressivity of manifested signs. Building upon Buyssens, Luis J. Prieto almost simultaneously addressed the problem of indication. In his book of 1966, Messages et Signaux, Prieto explores the indicative function of signs (also communicative signs) in relation to the discursive formation and organisation of meaning. Prieto also maintains that all signs are indicators, and that the meaning of some indicators is conventional. Such indicators are called signals, a term corresponding to Peirce’s symbols.

A collection of Prieto’s articles and essays, published in 1975 as Études de linguistique et de sémiologie générales, includes a couple of studies of particular interest for the present context. In a programmatic article with the title, “Sémiologie de la communication et la sémiologie de la signification” [34, p. 123ff.] he presents his arguments in favour of a ‘doubling’ of semiotic explorations and of putting communication and indication on the same footing. In another article, “Langue et style” [34, p. 34ff.], he carried through the doubling in a formal way and baptized the indicative sign as a pendant to Saussure’s communicative sign using the same, well-known sign structure to illustrate his ideas. To the sequence of the communicative process;

\[
\text{signe} = \text{significant} + \text{signifié} = \text{signification}
\]

Prieto now adds;

\[
\text{indice} = \text{indiquant} + \text{indiqué} = \text{indication}
\]

The motivation for introducing the indice is, firstly, Prieto’s interest in the way the linguistic sign materialises social, psychological and geographical conditionings of the sign manifestation, and, secondly, his preoccupation with aesthetic or stylistic aspects of signs used to enunciate artistic meanings, that is, aesthetic signs.

This is Bonta’s starting point, and he is particularly interested in sorting out the implications of the expanded theory of the sign to design practice. This means, however, that Bonta’s semiotic theory of design is normative, thus it somehow runs across the meta-analytical position suggested in the present context. Yet, it seems possible to enlarge Bonta’s view and thereby substitute the normative bias for an analytical approach (see [16]). Anyhow, Bonta is unsurpassed as concerns a theory of design semiotics. His theory is based on a differentiation between signals (or communicative signs) and indicators (or indices or indicative signs), and this differentiation is subject to further differentiations in order to emphasize the specific role of the designer in construing meaning in design. It should be noticed that Bonta employs a modified version of the matrix of communication processes to illustrate his conception of the interaction between designer and design object.
and between design object and receiver/potential user.

This is an indication of his loyalty to the European tradition, and it may explain why he did not engage himself explicitly and directly in a dialogue with Peirce’s position.

In the texts cited in the present context, Bonta distinguishes between four signs. To begin with, he introduced three signs; indicator, signal, and intentional indicator. Later on, he added a fourth sign, the pseudo-signal [3], yet finally, however, he excluded this fourth sign modality [5]. His definitions are formal and concise.

Of the indicator, he explains,

“An indicator is a directly perceivable fact, by means of which it is possible to learn something about indirectly perceivable facts. […] Through the former I can learn something about the latter, consequently they are indicators […] The indicative relationship is thus characterized as a triadic one (form/meaning/interpreter)” [4, p. 276-277].

The signal is defined in the following way,

“Signals are a special class of indicators that fulfil two additional conditions: firstly, they must be deliberately used – or eventually produced – with the purpose of having an act of communication; secondly, they must be recognized by the interpreter as such as having been deliberately used to have a communicative act. If either of these two conditions is not fulfilled, we may be faced with an indicator, but not with a signal. […] Signals have form, meaning and interpreter, like indicators; and in addition they have an emitter. The interpreter of a signal can also be called receiver” [4, p. 276-277].

These two definitions conform to traditional predicaments of the two entities, indication and communication, although terminologies vary. However, Bonta’s third sign modality – the most important in relation to his semiotic design theory – is an innovation.

This third sign is termed intentional indicator. Prieto also had a sign category by the same name, but to Prieto an intentional indicator is a signal, or functions like a signal. Bonta introduced his third sign as follows,

“There is an entity which is neither pure indicator nor signal, though it is rooted in both. I shall call it an intentional indicator […] An intentional indicator is an indicator which fulfils the first of the conditions of the definition of a signal, but not the second […] it is an indicator deliberately used — or produced — by someone to generate an act of communication, but which must not be recognised as such […] on the part of the interpreter […] the user or producer of intentional indicators cannot be properly called emitter, since we are not really dealing with communication: it will be better to call him the producer” [4, p. 279].

One of Bonta’s principal points is that designers should avoid using signals to express the meaning of design objects. In other words, they should not see themselves as emitters. Therefore, the mediated interchange between designer and user via the object is not to be considered communication proper. Instead, Bonta claims that the design process, seen in relation to the true values of the professional trade, should be that of producing intentional indicators. Thus, as quoted above, the designer is not comparable to an emitter or a sender, since emitters and senders are processing conventional signs. Likewise, the receiver position is in fact the position of an interpreter, since an interpreter makes use of her or his general or ordinary experiences as to how needs, wants and desires are matched by the shape, substance and unmediated appearance of available artefacts. In the special case of the intentional indicator, the job of the designer is to activate all the professional skills and knowledge of the potential user’s needs and the user’s usual way of interpreting the appearance of things in order to identify their utility and performativity. In other words, the designer should appeal to the ‘materialistic’ common sense of the potential user by means of indices, that is, hints, and not by using conventional signs such as labels, instructions or traditional iconography. It should be noted, of course, that Bonta is not concerned with ‘black box’-cases. In the original version of his theory, Bonta gives only few examples: a door entrance to a bar (which is also used as a case in the article from 1993), a screwdriver and chess pieces – the latter being the principal test case that he used in order to demonstrate a systematic approach to a definition of design as a semiotic enterprise. To Bonta, the chess case is exemplary of how a design tradition characterised by conventional iconography (towers, horses, king’s regalia etc.) is difficult to get rid of, even if, in contradistinction to chairs, there is no logical ground for insisting on certain configurations of forms.

From Bonta’s reflections on the new sign category, the
intentional indicator, it becomes evident that he wants a potential user’s perception of things to be an active interpretation of the performative capacity of given artefacts, not a reception of messages. At this point, it is possible to conclude that Bonta wants a design object to present itself to a user as a ‘natural’ sign that functions as a sign just like footprints in the snow do to the mind of an interpreter. This implies that the designer’s strategy should be to avoid being too personal or subjective or too idiosyncratic in the choice of formal and constructive solutions. In other words, Bonta maintains the modern ideal of the anonymity of the designer. From his discussion of modern and modernist architecture [3] it becomes evident that he favours the cultivation of the expressive properties of architecture. However, he shuns so-called ‘signature-architecture’ – architecture, the most conspicuous characteristic of which is its dysfunctional and excessive expressivity.

Most importantly, with the stress on the designer as producer and the potential user as interpreter, Bonta emphasizes both the activity of the designer in his capacity of the cause of the design of things and the user’s direct and active encounter with things. It is, of course, typical of Bonta’s designer-approach to the issues he raises that he ignores a very simple fact: the designer does not produce the things the buyer/user/consumer etc. actually makes use of. Usually, the designer provides a model or prototype but it is the producer/retailer/gift donor who delivers the item to the future user. In any case, the ideal of anonymity may compensate for this flaw, and above all, it should be remembered that Bonta’s focus is on the designer’s strategy, and a crucial element in that strategy is the designer’s ability to anticipate how the user will encounter and interpret objects for specific uses. To anticipate is not the same as forecasting on the basis of empirical market research, but with reference to the material logic of material, form and function. This implies that, in Bonta’s theory, the process of manufacture is put in brackets, which is rather typical of designers’ theories to conceive the manufactured object as an entity mediating the relationship between designer and user. Yet, the important idea to underline in Bonta is his focus on the direct, sensory contact between things and people, and this implies that the material – and expressive – properties and features of things are in the centre of concern.

3 Anzeichen and indicator

Bonta is no functionalist, even if he made pleas for the anonymity of the designer. To Bonta, architecture and design is always expressive, yet expressive in multiple ways. His view of useful artefacts in all scales is functional, too. His ideal is that expressivity and functionality combine into a coherent whole. In Bonta, expressivity is related to the sign function, which means that, since no specimen of an artefact can avoid being interpreted as an expression of something, the artefact is always a sign insofar as somebody actually perceives it as a sign. Thus, the expressive quality and the design values of modernist or functionalist architecture and design may be catalogued as; simplicity, austerity, sobriety, rationality etc. and, in a broader historical context, related to ideals such as democracy, freedom of alienating norms and traditions, free-mindedness etc.

Apparently, the impetus to the so-called Offenbach approach to consider design as product language is in explicit opposition to the stand taken by Bonta (and, in the end, Peirce as well). So, for instance, one of the founders of the Offenbach position, Jochen Gross, states in his review of the intellectual and political origins of the new approach that he and his colleagues wanted to challenge the functionalist idea of design (and architecture) as a ‘dumb servant’ [36, p. 12]. Now, the point is of course not that design should no longer pay service to consumers and users, but design should raise its voice and ‘speak’ loudly in a new key. Consequently, the Offenbach researchers and teachers introduced the notion of Design als Produktsprache, that is to say, they wanted to treat design as the language of designed objects, which means that the language like performance of design is the focus of the school’s theoretical grounding. By choosing the American philosopher Susanne K. Langer’s book, Philosophy in a New Key from 1942, as a master theory for their reasoning, they came up with the concept of Anzeichen to match the idea of design as a sort of object language [36, p. 62]. Focus on the Anzeichen/indicator of design prevents Gros, Steffen et al. to suggest a simple, unmediated parallel to communication, and in harmony with Bonta, they argue in favour of a more inclusive conception of interaction between design objects and their users. Contrary to Bonta, the Offenbach researchers are generous as to providing concrete examples of how various features of form, material and construction objectify the indicative
functions of useful artefacts. Eventually, the Offenbach theory of product language is modelled over the communications matrix.

One reason for that is, perhaps, the choice of theoretical inspiration. Susanne K. Langer’s terminology is not only rather idiosyncratic (cf. Nöth [29, p. 108-116]. She also revised it, yet only in a half-hearted way. In the first edition of 1942, Langer distinguished two main sign categories, signs and symbols. Signs indicate what they stand for, and as examples, she mentions natural signs, symptoms, signals etc. [22, p. 35-39], while symbols represent, which, for instance, pictures, names, notes etc. do [22, p. 54-67]. However, in Langer, to represent means not to stand for or substitute an object; “symbols are not proxy for their objects, but are vehicles for the conception of objects” [22, p. 61]. In the preface to the second edition of the book (1951), Langer admits after having read Charles Morris’ Signs, Language and Behavior (1946) that she would have substituted sign by signal in accordance with Morris’ terminology if the book had been subjected to a rewrite, which, however, it was not. The differentiation between sign and symbol, which Langer suggests is conventional in semiotic literature. To most semioticians it is, in fact, the basic division of the world of signs. This differentiation has, of course, been elaborated more or less systematically by a number of scholars in order to cover various ranges of phenomena. In Langer, whose sign theory initially was inspired by Ernest Cassirer’s ideas of cultural symbols, the predicament of symbol includes examples that according to Peirce are not conventional signs (‘symbols’, in Peirce) but icons and indices. For instance, in Langer pictures are symbols in the sense quoted above; they bring forth a conception of what they symbolize. Proper names are also being classified as symbols. Though Langer cites Morris as concerns the sign (as opposed to symbol), Morris’ definitions of the terms differ from Langer’s use of them. Morris conception of signal (that approximates Peirce’s definition of the index sign) is relativistic in that he states that “all signs not symbols are signals” and as an example he gives a person who “interpret[s] his pulse as a sign of his heart condition”. The person’s registration and interpretation of his pulse exemplifies that “such signs are simply signals: his resulting words – when substitutes for such signals – would however be symbols” [26, p. 100-101]. The words used to diagnose the heart condition are symbols, while the registration of the pulse is an interpretation of a psycho-somatic condition. Morris gives a formal definition of the symbol by stating: “…a symbol is a sign produced by its interpreter which acts as a substitute for some other sign with which it is synonymous” [26, p. 100-101]. In other words, a symbol substitutes a signal.

In the preface of the 1951-edition of Philosophy in a New Key, Langer states that Morris’ signal covers what she in the book had named sign. Morris uses the term sign to denote any conveyor of meaning. This principle would have been introduced if the book’s chapter on the logic of signification had been revised. Concerning the use of the signal category, Langer further states here that;

“Naturally, the term ‘signal’ is widened to include not only explicitly recognised signals – red lights, bells etc. – but also such phenomena we obey as signals addressing our senses, for example, the sight of objects and windows by means of which we find our bearings in a room, the sense impression that is caused by a fork in the hand of a person, who thereby is induced to raise it to the mouth; in short, it comprises whatever I have called ‘sign’” [22, p. 18].

The German translation of Langer’s book, Philosophie auf neuem Wege from 1965, which is cited in Dagmar Steffen’s presentation of the meaning of Anzeichen, is based on the original edition, which means that the 1951 preface is absent [36, p. 62]. Thus, the translation of Langer’s ‘sign’, wisely enough, is Anzeichen, which in the context of semiotics and semantics usually means marker or indicator. Consequently, there are no signals in the German theory. Then, the question is whether the Offenbacher key concept really is identical with what Morris names signal (a naming that Langer post festum subscribed to) or to what extent it actually overlaps, even covers, the index as elaborated by Peirce and Bonta, respectively. If so, the above comments on technical terminology seem redundant. If not, the Offenbacher may have come up with a fresh perspective on meaning in design. Just like Bonta did in his theory of meaning in design, the doctrine of product language promoted by the Offenbach School adopts a perspective from the inside of the designer’s trade. This means that the theory of product language is partial from the very outset, directed towards designers and students at design
colleges. Certainly, this implies that the pragmatic perspective forces, so to speak, the protagonists to make theoretical issues clear and accessible and to sort out and arrange problems in models and tables that are designed to be easy to understand. Now, the perspective of the present inquiry is not the designer’s, but more general in terms of epistemology, which means that the agenda here is to elucidate whether the theory of product language matches the general requirements of a theory of the indicative or indexical function of design. From this perspective, it is not relevant to discuss the applicability of the insights postulated by a theory to one among a great number of actor roles.

The second chapter of the volume, edited (and co-written) by Steffen, provides a comprehensive introduction to the theoretical stand that informs the theory of product language [36, p. 34-95]. The theory pivots upon object functions that are, firstly, divided into two main modalities called ‘practical’ and ‘produktsprachliche’ functions, the latter being the functions of product language, also termed ‘sensuous’ functions. Secondly, the sensuous functions are again divided in two; ‘formal-aesthetical’ versus ‘sign’ (or semantic) functions. The third binarity is established as a differentiation of the sign functions in ‘indicative’ (Anzeichen) and ‘symbol’ functions. These are the basic components of the field that the Offenbacher want to address, and the field is illustrated in schematic overview [36, p. 34].

Irrespective of what the theoretical endeavours are called – design semantics or design semiotics - the three divisions are based on conceptual choices of great importance to the extent of the Offenbach theory of meaning in design. To begin with, it should be noticed that meaning is defined as a function, not a property of objects, and, further, that function is seen in relation to two entities; user and product. Thus, this view maintains that the relation between user and product is mediated by functions – not the form and material of an object but its utility. Concerning the three divisions (I-III) the following preliminary observations can be made. The distinction (I) between practical and sensuous (product language) functions is somehow surprising. What is the theoretical value and methodological point in isolating practical functions from sensuous functions? If the sensuous functions of the language of a given product are not being considered an integrated part of the specific practical functions, whatever they are, does that not imply that product language tends to be perceived as mere ornamental rhetoric? What about the kinaesthetic experiences made while operating an object for use and realising the functional potentials of it? This is not simply a pedantic, theoretical question. On the contrary, it points to the curious fact that the theory does not operate with further differentiations of practical functions. Apparently, they are seen as one. The second division (II) concerns a differentiation between the aesthetic function of form and the sign function, that is, the meaning function of product language. This distinction is surprising, too, for, accordingly, aesthetic functions are viewed as something other than sign functions. Of course, aesthetic stimulation is one effect of the sensuous functions, but to exclude what people have of affections and sensations from the semiotic or semantic functions of objects seems unjustified, and in fact not well grounded in the presentation of the Offenbach project.

The third division (III) into indicative and symbolic functions also calls for a short comment at this stage. Both functions are conceived as sign functions, and the question is whether the two are identical with how the function of sign categories is defined in Peirce. Superficially, that is, as concerns terminology, whether the indicative and symbolic functions correspond to Peirceian indices and symbols. However, Peirce’s conception of symbol is considered too narrow with its emphasis on conventionality [36, p. 24], and in Steffen’s chapter on symbolic functions [36, p. 82ff] it is stated that the Offenbacher subscribe to Susanne Langer’s reworking of Cassirer as to the cultural meaning of symbolic forms. To this position is added some inspiration from Gestalt psychology (Rudolf Arnheim) and the psychoanalytical method (the so-called ‘deep-hermeneutic method’) proposed by Alfred Lorenzer.

In accordance with Langer, then, symbols give rise to conceptions. In the Offenbach approach, conceptions are of what is symbolized qua the language of an object perceived as a sign. From both Steffen’s and Gros’ accounts of the symbol, it becomes evident that symbolic functions include a variety of sign functions that in Peirce would have been categorized as examples of the indexical sign meanings. Furthermore, the Offenbach symbol also comprises both a number of conventional signs and series of more or less unruly associations that may say something about a given
individual’s imaginative power to get ideas or create phantasms, but nothing substantial about the object itself. So, for instance, possible associations are male/female, young/old, friendly/aggressive, stiff/movable etc. – all very elastic, all very elusive, as most affective reactions are. On the other hand, the category of symbol also extends to a great variety of stylistic features. Some are in fact genuinely conventional (e.g. company style, designer’s style etc.), while other examples are not conventional in any proper sense (e.g. the style of an era (Baroque, Classicism, Modernism etc.)). A baroque joiner could not have decided to construct a modernist cabinet. Hence, a baroque cabinet is an index of baroque product culture, since its material and physical properties are perceived by the critic or historian and, in the same analytical operation, related to a past milieu. Thus, a cabinet from any historical and contemporary unit or segment of product culture may be interpreted as an icon (property). The properties are of interest as an index (properties seen in a causal relation to what conditioned them). A baroque cabinet manifests ‘baroqueness’, irrespective of it being interpreted or not. Baroqueness is a property or quality, and it only exists due to a great number of cabinets exhibiting shared visual and objective qualities. The label ‘Baroque’ is just a name, hence an example of what Peirce calls a designator index.

The classification of functions seems to come short of both the inclusive ambition, which is indicated in the schematic overview [36, p. 94-95], and the aim of focussing on human’s sensuous encounter with the expressive functions of design. This statement is, as remarked earlier, not a criticism of the Offenbach approach, but just an element in a critique of the index category and the indexical/indicative function of things. The schematic overview cited above (construed by Gros and Steffen) is an excellent illustration of the whole field of inquiry addressed by the Offenbacher. A number of catch words organized diagrammatically according to further subdivisions of the three more principal differentiations commented on above demonstrates how valuable this approach is. The final part of the book is called “Product interpretations as cultural study”, and it comprises a number of, for the most part, brilliant analyses of a great variety of cases. These case studies document the power of detailed scrutiny of indicators in the Offenbach style. In fact, most of the sign functions in focus in the case studies are indicative functions, irrespective of the classifications commented on briefly above and illustrated in the tableau by Gros and Steffen. In that way, the privileging of indication seems justified. However, the theory of the Anzeichen could have been elaborated further and sophisticated in order to attain a more solid grounding of it. Even if the Offenbach approach provides one of the most comprehensive and focussed in the field, the ordering of problems and classification of functional and pragmatic aspects of meaning formation in design, leave a set of pertinent theoretical and epistemological problems open and partly unsolved.

To mention only the most acute problem, the classification of sign functions is not in accordance with the most accepted contemporary terminology, nor does this classification meet the requirements of common sense as concerns semiosis, the sign function. For instance, no grounds are given for handling (theoretically) the form-aesthetical issues as non-signs. The aesthetical functions of form are (in the style of Alois Riegl and Heinrich Wölfflin) organized in a series of binary oppositions of order vs. complexity (e.g. simple/complex, closed/open, clear/unclear, balanced/unbalanced etc.). It is difficult so claim such formal characteristics to be non-sensuous or non-expressive. On the contrary, as formal qualities they are essential ingredients of the indicative function of an object, and since the articulation of such qualities is part of the designer’s job, it seems quite reproachable to exclude the aesthetic of form from the system of signs. If the Offenbacher had included the form-aesthetical qualities, the two signs in the classificatory system (indicators and symbols) would have been better described, and if the sign functions included in the latter category had been sorted out in icons, indices and symbols and organized in accordance with the comments given above, the whole functional logic of the theory of product language would have been transparent. Thus, objective properties and formal qualities could have been classified as icons, and focus on how overall qualities as well as the concrete details are ‘addressing’ or ‘appealing to’ the user would certainly have foregrounded the indexical sign function. In the Offenbach model, indexical or indicative signs are divided into categorical indicators (that allow an identification of both object category and a unique object’s present conditions), and functional indicators (giving hints at the handling and
usage of an object, as well as its presence in time and space in the vicinity of the human actor. Both types of indicators may be natural (part of the object as such) or artificial (added graphic signs giving instructions on how to operate the object – "on/off", "max/min" etc.). It should be remembered that what Bonta aims at as a professional ideal by putting emphasis on the creation of intentional indicator as the moral task of the designer is to eliminate artificial indicators – in his terminology: signals – from the genuine repertoire of the designer’s paradigmatic choices.

Another issue, which was pointed at in the beginning, is that of unrestricted semiosis. As mentioned, proponents of so-called ‘product semantics’ often claim that semioticians have problems with multiple meanings (e.g. Krippendorff [20, p. 98f., 21, p. 276-277]. ‘Product semantics’ allegedly has no such problems, nor do the Offenbacher have, for, as hinted at in the preceding discussion, they simply employ a very inclusive conception of the symbol category that apparently allows, even invites, all kinds of associations as adequate. There is a problem here, a problem that Peircean semiotics has a methodological answer to. The sign process, semiosis, emerges when a sign is interpreted, that is, when an interpreter infers the type of relationship between sign (representamen) and its object. This inference produces an interpretant, an understanding of that relationship, by (re)construing the object. In the first instance, the (re)construed object is what in Perceian terminology is the immediate object. Further scrutiny may result in a broader and more elaborated and precise understanding, and the resulting knowledge is termed the dynamical object. The identification of the immediate object may be uncertain and vague. However, the identification will, as one or more dynamical objects are established, gradually become either more accurate or falsified. This means that wrong ideas (interpretants) of what is represented in icons, indices or symbols will be detected. Thus, a sign – a material entity – cannot just mean what so ever, neither in semiotic, nor in semantic terms. An observer or a user may of course ‘read’ or attach the most idiosyncratic meanings to things, but this is of no interest methodologically. What counts in general, and for the designer in particular, are the meanings that actually are materialised in an object’s physical properties. What else?

4 Conclusion and perspective
Design researchers, both theorists and practitioners, are of course interested in establishing firm grounds for addressing how things appear and appeal to people, and, reversely, how people relate to things for different reasons. Designers and design educators may approach the problems discussed above in ways that differ from the ones employed by critics, theorists and historians. No singular path, however, represents the privileged approach, as long as concepts, categories and predicaments are kept straight and grounded in sensible and well argued definitions. The conclusion to the problematic of meaning in (and of) things is, in the present context, that to conceive objects as indicators and intentional indicators opens a way to a sensitive and detailed study of how makers and users actually relate to things in multiple ways. A focus on indexiality, as suggested here, allows much more sophisticated findings to emerge than metaphorical talks about things not communicators as communication (e.g. Barnard [1, 2]; Crilly [8]). As a matter of fact, then, design research (that is to say, design studies beyond marketing, shopping, consumption, identity building etc.) and recent developments in material anthropology actually meet in a common effort to give priority to the material quality of things. In particular, the posthumous work by Alfred Gell, *Art and Agency* [12] has marked the starting point of a new interest among anthropologists and art historians in the materiality of, say ‘aesthetic objects’ including (high) art works as well as humble objects for use. This new interest marks a paradigmatic shift – from the study of consumption as a key to an understanding of contemporary, late- or postmodern culture, to a study of the role of materiality in meaning construction (cf. Miller [24, 25]; Gell [11, 12]).

The idea behind the new approach is to focus on materiality as such as a source of meaning, and more specifically, Gell and protagonists (e.g. Pinney & Thomas [31]) even suggest the possibility of talking about objects having a kind of intentionality, without risking accusations of being animists or fetishists. In short, what is intended with this approach, is not to give a new or conclusive definition of the broad category ‘art’, but to define and analyse how and why people react in both rational and irrational ways to things. Especially, what is interesting is the social relations mediated by and with ‘art-things’. The relations of particular interest are those
that emerge and unfold in the special settings that Gell calls “art-like-situations” where ‘art-things’ function as indices. Gell explains; “I propose that ‘art-like situations’ can be discriminated as those in which the material index (the visible, physical thing) permits a particular cognitive operation which I identify as the abduction of agency” (Gell [12]; cf. also Watts [37]). Thus, the key words are ‘index’, ‘abduction’ and ‘agency’, and Gell’s idea is that observers and users of objects are, by inference, attributing agency to material tings – an ability of things to act upon people, who subsequently react in accordance with the social conventions of ‘art-like-situations’. Such situations could, without any methodological problems, also include ‘design-like-situations’. The point here is that ‘design-like-situations’ are situations, in daily life as well as on special occasions (e.g. museum shows), in which observers and users of utensils relate themselves physically to, and thus are affected by, the material qualities of things. The relation comprises both motor functions and emotions. And also, such situations are characterised by the expectations from the part of observers and users – expectations concerning the material intelligibility of things. That is what the indicative sign functions in design are all about.

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I want to dedicate this paper to my late colleague Anne Borup (1959-2010), who was killed in a tragic traffic accident on May 21, 2010. I’m grateful for her contributions to our intense discussions of the function of indicative signs during the spring of 2010.

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