# How the Sperm Dominates the Ovum – Objectification by Metaphor in the Social Representation of Conception [*]

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Abstract:

This investigation is about the use of metaphors in the everyday understanding of conception. It is argued that the analysis of the relationship between source and target domain in a metaphor used as an objectification device can help explain how social representations are acquired collectively and individually. We expect that in popular knowledge of conception the central metaphors and images relate to the Ss' everyday experience as social actors and sexual beings because social and sexual experience is pervasive and well-understood. In an experimental questionnaire study involving 169 Ss, it is shown as hypothesized that Ss prefer to compare the process of fertilization, i.e. the role and behaviour of sperms and ovum, with sexual and sex-role behaviour where the role of men is projected upon sperms and the role of women upon the ovum. This implies that sperms are seen not only as more active, but also as harder, stronger, and more dominant than the ovum. These effects are stronger, the more Ss personally subscribe to a more conservative sex-role orientation. In the discussion it is suggested that it is necessary to analyze the two intricately linked levels of objectification, the cognitive process of selecting specific images and the  social  process  of  the diffusion of popular knowledge, if we want to understand how common sense works.

# How the Sperm Dominates the Ovum – Objectification by Metaphor in the Social Representation of Conception

Despite the fact that scientific knowledge in its original form is difficult to understand for lay people, such knowledge quite frequently becomes popularized and part of common sense. In the process of its popularization by mass media and school education, scientific knowledge becomes transformed and simplified. Nevertheless the resulting folk knowledge of such diverse fields as, for example madness, health, illness, psychological functioning, AIDS, and atomic power, can be seen to be as valid as scientific knowledge if one takes into account that they pertain to different fields of "expertise" and that they are applied in different fields of practice each with its own criteria of validity (Moscovoci, 1994). The social representation theory explicitly acknowledges this fact and provides a conceptual framework for the processes involved in such transformations of knowledge.

In the present context we understand the term "social representation" in the distributed view (Harré, 1984) as structured mental - i.e. cognitive, evaluative, affective, and symbolic - content about socially relevant phenomena, which takes the form of images or metaphors which is created in the everyday discourse of social groups and shared between its members. (Doise, 1993; Jodelet, 1989; Moscovici, 1984, 1988; Wagner, 1994; Wagner & Elejabarrieta, 1994). The function of social representations is to render the unfamiliar familiar (e.g. Moscovici, 1984). This is achieved by two closely linked processes: the first - anchoring - is similar to categorization and describes the assimilation of unfamiliar phenomena to pre-existing representations, thereby "converting" an external object into a mental content (cf. Moscovici, 1993, p. 163); the second - objectification - turns mental content into "reality". This process is dealt with here in detail.

## Objectification in Social Representations

Objectification is a mechanism by which socially represented knowledge attains its specific form. This process has sometimes been described differently by different authors. In his assessment of the French society's representation of psychoanalysis, Moscovici (1976) describes the process by which scientific psychoanalytic knowledge impregnates everyday thinking. As a result of this process the naïve recipients take the concepts and their signification literally and attribute them physical reality. They detach the ideas from their social sources, i.e. from the theory as a scientific construction and from the psychoanalysts as its practitioners, and turn the ideas into a reality confirmed by the senses (Doise, 1993,

p. 163; Moscovici, 1976, p. 109f). Instead of relating to a theoretical mental construct which depends upon the social fabric of science, everyday ideas relate to a series of empirical phenomena, which are taken as _"being"_ the theory and its concepts: words and logical relationships become physical reality in the view of the recipients. At this socio-cognitive or mental level objectification consists of identifying or constructing an iconic aspect for a new and/or difficult to grasp concept, theory, or idea. From this results a "figurative nucleus" which seems to capture the essence of the concept, theory, or idea. This figurative nucleus has an image structure "that visibly reproduces a complex of ideas" (Moscovici, 1984, p. 38; for a critical position see Billig, 1993).

This understanding of objectification refers to holding a representation and attributing ontological reality to its associated beliefs. By doing this one behaves towards the world _as if_ the ideas existed outside of the mind (cf. Moscovici & Hewstone, 1983). While scientists, when thinking and talking about their theories, also use images and metaphors and in their empirical work also act as if there was some material counterpart of their ideas, they are usually aware of the ontological limits of their ideas. Experts use scientific information differently than novices. By virtue of their expertise they are aware of the fact that the empirical objects of the world are constructions depending upon their theories or descriptions, their methods and assessment procedures (Dee-Lucas & Larkin, 1986).

The picture changes when scientific ideas become assimilated by scientifically naïve lay people. Novices usually do not differentiate scientific information and think in general terms. They are likely to take their assimilated ideas as real, i.e. not only as a logical and epistemological construction, but as a thing in the world outside of their mind. (Jost, 1992; Moscovici & Hewstone, 1983). This difference between lay and scientific knowledge does not imply, however, that folk knowledge may not be perfectly valid for its purpose as a means of understanding and communication in everyday life.

Social representations, if acted out collectively, materially "create" their object. This refers to an understanding of objectification as the reification of a social representation in objective things or institutions. An example for this process is the existence and the use of "money" in all known societies. Money, as we know it, appears as a thing which gives substance to the pure idea of exchange value. Like ideas which allow us to relate such divergent things as bread and apples, elephants and a human life, refrigerators and ecological disasters, money makes everything which exists in the world of men commensurable in terms of value. Since the contemporary forms of money have no utility value of their own, their existence depends completely upon the ideas or representations associated with them (e.g.

Doise, 1990, p. 143f; Moscovici, 1988, p. 315ff).

So, what do these different views have in common? On a general level these conceptualizations of objectification put emphasis on the implicit _convictions people hold_ about the relation between their _beliefs about the world_ and the supposed _outside world itself_. If people take money to _be_ value instead of symbolizing value, a psychic complex to _be_ a thing in the head instead of a pattern of thoughts assessed in psychoanalytic sessions and madness to _be_ a contagious substance instead of a "deviant" state of mind, they implicitly make a statement about the relationship between their beliefs and reality.

Social representations emphasize the contrasts between social groups instead of the  opposition between group and individual (Moscovici, 1988, p. 222). Hence, representations and their objectifications depend upon the characteristics of the social unit where they are formed. The specific social conditions of a certain group favor specific kinds of images, metaphors, or  symbols  to  be  used  as  objectification "devices", i.e. "tools"  by  which  the  end  of  understanding through objectification is  achieved.  Such differences in social  conditions  between  groups  may  be  socio-structural, historical, cultural or sub-cultural, inter-generation or simply differences in schooling and education level. Differences in living conditions of groups delimit the space of experiences of their members, which in turn delimits the world of images, metaphors and symbols accessable for objectification.

The group process which results in the collective preference for a specific objectification device can be compared to an epidemic (Sperber, 1985). In the same way as illness only becomes epidemic if germs meet favorable conditions for survival and propagation (poor hygiene, specific dietary customs, etc.), a new idea only diffuses in a group if an image, metaphor or symbol is found and used in public discourse which (a) appeals to a qualified majority of the target population and (b) captures the essentials of the new idea. The objectification device need not primarily be "true", "correct", or "accurate" in capturing the new idea. It is more important to be _good to think_ with. That is, whether an image is accepted or not by a group is neither a problem of truth nor an arbitrary choice,  but  determined  by  the  group  members' experiential world and the associated collective aesthetics (cf. Bourdieu, 1979). However, for an icon to become epidemic it is not important whether it is created and propagated by an active minority, say, or whether many icons "float freely" within a society and one occasionally becomes "fashionable".

**Metaphors in Objectification**

The linguistic theory of metaphors and concepts as proposed by Lakoff (1987) provides a model

of how this process may look in detail. Lakoff follows a social and at the same  time  psychological approach which makes his theory broad enough to be integrated in the theory of objectification.

A _metaphor_, as understood here, consists of three parts: a target domain, a source domain, and a relation defined between target and source domain. The _source domain_ is an iconic and concrete mental content. This domain is closer to personal experience than the domain to be understood and, because of its experiential basis, it is immediately comprehensible. The source domain provides the mental image by which another less comprehensible concept, theory, or phenomenon becomes intelligible or "explained". The _target domain_ always is farther away from experience, more abstract, and less iconic and, because of this, less comprehensible. Source and target domain are linked by a mapping which defines a _structural correlation_ between the two. It is a prerequisite that relevant structural similarities between target and source appear to exist. The relationships between the elements of the abstract target  domain  thereby become intelligible in terms of the experiential relationship between the elements of the concrete source domain. In this sense, a metaphor is an iconic illustration of a non-iconic mental figure. It "transports" or "projects" the structure and meaning of the source onto the target. A metaphor, therefore, represents a kind of reference-fixing which is not a definition, but resembles the concrete operation of ostension (cf. Kripke, 1972). Whereas, however, ostension refers to real objects, metaphorical reference  indicates structural properties of phenomena, "rather than features of internal constitution" (Boyd, 1979, p. 358).

The linguistic theory of metaphors can be applied to analyze some basic issues in objectification. First, a metaphor, like objectification, is a device to make something less familiar more familiar. Second, iconic thinking as proposed by representation theory is closely related to metaphorical thinking. In fact, we argue that all that is  said  about  metaphors  in  the  present  context  also  applies  to  images  as objectification devices. We are convinced, however, that not all instances of metaphorical reference also are instances of objectification. Neither are all instances of objectification in common-sense instances of metaphors. But there certainly are at least some objectification processes which can be analyzed in terms of metaphorical reference.

There are two principal consequences of the use of metaphors and images in the understanding of more abstract phenomena. Because of being close to experience, the understanding derived from  the source domain implies (a) an ontologization in terms of the source domain (Lakoff & Johnson, 1980). That is, the elements of the target domain are seen and experienced as real, perceivable, and touchable as the specific entities of the respective source domain. The _"experiential realism"_ of the source is projected

upon the target. Second, besides the structural similarity which stimulates the use of a specific source, (b) non-structural experiential properties, such as *affective and moral connotations,* also are generalized onto the target (Fernandez, 1974). This *"metaphorical entailment"* (Lakoff, 1987, p. 384) impregnates the target with characteristics which originally pertain to the source (Figure 1).

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Metaphors can be observed in many social representations. In its  representation the theory of psychoanalysis, for example, is condensed to a schema, where two forces, the conscious and the unconscious, interact in such a way as to produce displacement of desires, which results in a psychic complex (Moscovici, 1976, p. 116). The underlying metaphor likens emotions and  motivations to impenetrable objects, e.g. like passengers in a crowded bus, causing other things to be  displaced. Although physical events in a bus and competing entities in the mind are "radically different  in content and complexity, ... the schema of interaction is experienced as dynamically similar, having to do with the application of force and of resulting action in line with or contrary to it" (Asch, 1958, p. 93).

Jodelet (1991, p. 209ff) discovered metaphors of "decay", "curdling" like butter, "fall", "souring" and "turning off" like milk, when her lay subjects talked about the mental illness of their mentally ill guests. With these metaphors they associated "the phenomena of organic transformation with processes of a more or less material nature". Being farmers and village dwellers these material processes used as a source domain are  closer to their everyday experience than these metaphors would be, e.g., to the everyday life of inhabitants of large cities. Close experience of these source domains determined them to "explain" the abstract, unfamiliar, and "strange" phenomenon of madness.

Arruda (1992) investigated women's opinions and representations relative to conception and contraception in some districts of Campina Grande, Brazil. She observed repeatedly that her Ss talked about the (unwelcome) consequences of taking the contraceptive pill in metaphorical and iconic forms: "the pills accumulate until they block the channel of the woman"; therefore "it is necessary to de-block (the channel) by having a baby"; "opening her uterus they found this rotten mass in there..."; a series of statements which illustrate widespread metaphorical use of simple technological household experiences of plumbing. Bloor and Bloor (1982) observed that industrial scientists, when speaking about nature and science, typically used metaphors and images which reflected the structural characteristics of  their institutional workplace.

The foregoing examples illustrate kinds of metaphorical and metonymic understanding in everyday life and social knowledge. They should not, however, suggest, that metaphors are the only or prime objectification device in social representations. The kind of objectification - metaphorical, iconic, or other - which may be found in an investigation depends on the methods used to study the representation (cf. Breakwell & Canter, 1993) and on the kind of social object being represented.

**Everyday Understanding of Conception**

The present investigation is about metaphors in the social representation of conception. The process of fertilization within conception is a natural process which is described in biomedical terms of anatomy, cytology, physiology, and endocrinology. In its scientific understanding it is a complicated process stirred by complex biological relationships between gametes and ovum within the chemical ecology of vagina, uterus, Fallopian tube, and ovary. The concrete scientific knowledge related to this process need not concern us here. The basic structure of this target domain is the coming-together and merging of two entities, the sperm and the unfertilized ovum, to produce the fertilized ovum. This fact is known in medical science since the end of the 18th century. The Baroque Age, hence, played a crucial part in developing our contemporary scientific, as well as everyday knowledge of procreation (cf. Darmon, 1977).

In the industrialized world contemporary folk knowledge about procreation is vulgarized scientific knowledge transmitted in school and by parents and the media. People with a standard level of schooling know about the two entities, sperm and ovum, involved in procreation. Knowing that there exist sperm and ovum is the scientific part of folk knowledge. The only problem that has to be solved is to elaborate an image of how these two entities function, meet and interact. This is not a trivial problem and it is here where the process of objectification comes in.

Knowledge about sperms and ova cannot be presupposed in countries with a low level of schooling and scientific training. Thus, for example, in rural parts of Brazil (Solange Souto and Angela Arruda, personal communication) and Venezuela (Banchs & Lomelly, 1984, p. 39ff), everyday understanding of conception as well as beliefs about human procreation do look quite different. People with no or with a low level of schooling usually know about the significance of man and woman having sexual intercourse for the woman to become pregnant, but the biological role of the two may be unknown. Hence, they may assume either that the woman is the only source of what later becomes the baby, attributing to the man

only a "trigger effect", or that the man implants a "proto-baby" in the female womb as Aristotle hypothesized.

We expect that the natural process of fertilization is understood by naïve subjects in terms of a metaphor, whose source domain is sexual behaviour. _The coming together and merging of sperm and ovum_ (= structure of target domain) is understood in everyday life as an analog to _the attracting and meeting of men and women in social life and sexual  relationships_ (= structure of  source  domain). Structural mapping equates the stereotypical sexual behaviour of men with the "behaviour" of sperms, as well as the stereotypical sexual behaviour of women with the "behaviour" of the ovum. That is, we expect that people use a social metaphor in order to make the natural process intelligible. This metaphor of a humanized sperm and ovum also appeared in a public advertising campaign for a brand of mineral water in Paris 1993 (depicted in Wagner, 1994, p. 209; Wagner & Elejabarrieta, 1994), adding weight to our hypothesis.

In order to show that the sexual metaphor of conception forwarded here  is  "motivated  by  the structure of (the Ss) experience" instead of arbitrary, we need to answer the following questions about the relationship between source and target domain (Lakoff, 1987, p. 276f): (a) "what determines the choice of a possible well-structured source domain?"; (b) "what determines the pairing of the source domain with the target domain?"; and (c) "what determines the details of the source-to-target- mapping?". We will answer these questions with regard to the social representation of fertilization and conception.

(a) If a domain is to function as a source domain for a metaphor, the domain needs to be experienced independently of the target. This means that "it must be pervasive in experience, well-understood because it is pervasive, well-structured, simply structured, and emergent and well demarcated for these reasons" (Lakoff, 1987, p. 278). Additionally and equally  important,  if  it  is  to  serve  as  a resource in social communication and discourse, all these characteristics need to apply not only to an individual, but to the majority of communication partners in a group.

It is immediately conceivable that public and intimate sex-role behaviour are experienced in social interaction independently of fertilization. Further sex-role behaviour is pervasive: the vast majority of people in Western society observe it and have experienced it at various occasions. For these reasons it is well-understood, also because the rules regulating this behaviour are a central topic of informal socialization and a frequent topic of conversation. It is well- and simply structured: there are two potential romantic or sexual partners, who establish rapport with each other according to rules provided by the peer

group and society. Consequently, sex-role or sexual role behaviour also is emergent and well-demarcated not only for isolated individuals, but also as a widespread experience. In fact, sexual behaviour is a pre-conceptual domain close to bodily experience. It has a simple logic and can be thought of without the use of language. Therefore it offers itself naturally as a source domain for metaphorical understanding.

(b) Why is a source taken from social experience rather than a  source  taken  from  non-social experience, such as the attraction between two magnets, or the "attraction" between mosquito and victim, paired with the target? The answer is equally straightforward. First there is an obvious _functional_ relationship between sex-role behaviour, sexual relationship and intercourse, and - perhaps - conception and getting a baby. This implies a certain  proximity  between  source  and  target  domain  which  may propose a metaphorical mapping. Other, non-social domains, such as attraction and coming into contact of two objects, like two magnets, mosquitoes and victims, cats and mice, etc., equally depict the _structure_ of the process of fertilization, but they are not immediately proposed by everyday experience. Conception and its social consequences for father and mother tend to imply a social context,  specifically  sexual relationships, rather than a non-social context.

(c) Why is the natural activity of sperms mapped onto sexual behaviour of men rather than onto sexual behaviour of women? This question relates to the active-passive distinction in sex stereotypes. It is a widely accepted wisdom that sperms move and  the  ovum  is  stationary  as  it  is  a  widely  accepted stereotype that men are to be active and women passive in sexual intercourse. This, as well as the fact that there exists an obvious functional relationship between men and sperms and women and ova, make this specific metaphorical pairing more available than any other pairing and justify our proposition.

Our arguments about the use of metaphor in the social representation of conception implies the following hypotheses:

_(a) Metaphor use:_ It is expected that Ss prefer a social source domain (i.e. a domain related to gender-role behaviour in sexual relationships) to  natural,  non-social  source  domains  to  describe  the process of conception. Moreover, Ss should prefer metaphors, the more stereotypical they are, i.e. the more the male side (sperm) takes an active part relative to the  female  side  (ovum).  This  hypothesis follows immediately from the rationale given above.

_(b) Metaphorical entailment:_ it is expected that, because of their preference for stereotyped sex-role metaphors, Ss will not only project activity, as implied by the metaphor, but also other stereotyped male and female attributes onto the target domain, i.e. sperms and ovum, respectively. Besides perceiving

sperm and ovum as respectively active and passive, Ss are expected to attribute to sperms and ova non-functional attributes, which are not immediately implied by a purely structural mapping of source onto target. On the one hand these may be physical attributes such as "hard vs. soft" and "strong vs. weak", and on the other hand non-physical, i.e. social and moral attributes, such as "dominant vs. submissive".

*(c) The consequence of everyday experience:* effects hypothesized in (a) and (b) should be the stronger, the more the Ss subscribe to a conservative sex-role view in social life. As was argued before, everyday experience and thinking determines the availability of a source domain which in turn influences the perception of the target domain. Hence it is expected that Ss adhering to different sex-role views and life styles also differ in the degree of their metaphorical perception of sperms and ova. That is, Ss with a more sex-role liberal view in everyday life, granting women and men similar rights and duties than conservative sex-role Ss, should observe less differences between sperms and ova than sex role conservative Ss.

## Method

### Subjects

One-hundred-and-sixty-nine persons served as Ss, approximately half being women. These partitions were further subdivided into Ss between 20 through 30 and 40 through 50 years of age. Although we did not expect any relevant effect differentiating age and sex groups, these partitions were introduced as a control. The Ss were recruited from small cities and semi-rural areas. All fieldwork was carried out during winter and spring of 1993.

### Material

The Ss were presented a questionnaire containing (1) a set of socio-economic questions (age, civil status, having children, educational level).

The independent variable (2) sex role-orientation was assessed by the sex role inventory taken from ENRICH (Olson et al., 1983, p. 255). By and large the 10 items refer to whether a woman should have equal rights and duties as men in professional life and whether husbands and wives should have equal responsibilities with respect to household chores.

Apart from these questions which were identical for all, there existed two versions of the questionnaire. In the first version the questionnaire was worded using the term "conception"

(Empfängnis, German), which refers to the female side of getting a child, the other version was worded using the term "generating" or "fathering" (Zeugung, German) for the male side of getting a child. These two versions were thought to balance sex-specific connotations in the wording of the questionnaire.

This applied to the following dependent variables: (3a) One set of six adjective polarities with a clear sex-role connotation: "soft-hard", "weak-strong", "passive-active", "slow-fast", "small-big", and "submissive-dominant", as well as to (3b) a set of six adjective pairs with no straightforward sex-role connotation: "bad-good", "unimportant-important", "ugly-beautiful", "dumb-clever", "negative-positive", and "simple-complicated". The two sets of sex role vs. non sex role-related adjective pairs were confirmed by two independent judges who categorized the 12 adjective pairs according to their sex-stereotypicality. They were measured on a 7-point scale.

All 12 adjective pairs were presented twice. The first time Ss had to characterize the female ovum on the adjective scales and the second time the male sperm. This sperm-ovum manipulation represented a within-Ss independent variable.

In a set of eight questions Ss were asked for their agreement with metaphorical comparisons. These comparisons were constructed to be either from an explicitly romantic and sexual domain or from a non-sexual domain. Additionally they were crossed with two conditions, where the wording stressed the activity of the sperms in conception/generating or the activity of the ovum. Four metaphors, each in two semantically identical, but differently worded versions, resulted from this procedure: (4a) Sexual role-related/active sperm ("sperms relate to the ovum like men who compete for a woman"; "the sperm fertilizing an ovum is like a man conquering a woman"); (4b) Sexual role-related/active ovum ("the ovum relates to the sperms like a woman who decides in favor of a man"; "the ovum being fertilized by a sperm resembles a woman fishing for a man"); (4c) Non-sexual role-related/active sperm ("sperms relate to the ovum like mosquitoes attacking a victim"; "sperms fertilizing an ovum resemble an army conquering a city"); (4d) Non-sexual role-related/active ovum ("the ovum relates to the sperms like a spider catching a fly"; "the ovum being fertilized by a sperm resembles a cat catching a mouse"). The four conditions represent a 2 x 2 within Ss design of the independent variables type of metaphor (sexual vs. non-sexual) and active part (sperm vs. ovum). The dependent variable was the agreement score on a 7-point scale.

All relevant sets of questions (3) and (4) were balanced for sequence. An additional set of questions tapped determinants of belief systems related to the topic of conception and generation. These are not relevant here and therefore not reported.

**Procedure**

The Ss, a convenience sample, were contacted at home and instructed that this was an investigation on public images of men, women, and pregnancy. They received the questionnaire to be filled out in the presence of the (female) investigator. Two to three Ss within each of the four sex by age-group conditions, 11 in total, were additionally questioned in a semi-structured interview as to their theories and opinions about everyday sex-roles and conception/generating.

## Results

**Agreement with Metaphors**

The set of questions (4) relating to metaphorical comparisons was analyzed by MANOVA. The independent variables according to a 2x2x2 design were sex-role-orientation of Ss (liberal vs. conservative) x active part (active sperm vs. active ovum; within) x type of metaphor (sexual vs. non-sexual, within).

The independent variable of sex-role orientation resulted from a factor analysis of the inventory's 10 items (2). Factor analysis yielded one factor and Ss were classified on a median split as either more liberal or more conservative.

The agreement of Ss with metaphorical comparisons yielded the  dependent  variable. Each cell contains two equivalent comparisons which were supposed to control for idiomatic effects (see material section). Both of the two equivalent comparisons within  each cell  were  entered  simultaneously  in  a multivariate analysis. The degrees of freedom for the F-values in the following paragraphs, therefore, are multivariate estimates. Table 1 presents the results.

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It has been hypothesized that Ss agree more with sexual, i.e. social, than with non-sexual, i.e. non-social, metaphors. Since the role stereotype in sexual relationships implies an active male part and  a passive female part, it was additionally expected that if the sperm is ascribed the active part (according to the stereotype of the active male part in intercourse and social life) instead of the ovum (representing the stereotype of the passive female), such active-sperm metaphors should be agreed with more than with active-ovum metaphors. This was found in the data.

Sexual  metaphors  were  agreed  with  more  than  non-sexual  metaphors,  specifically  if  the

metaphorical comparison depicted an active sperm instead of an active ovum. The interaction of type of metaphor x active part was significant (F(2,166) = 7.48, p    .001) (for means see Table 1, row "Mean"). The related main effects for type of metaphor and active part were also significant. Sexual metaphors attracted higher levels of agreement (M = 3.85) than non-sexual metaphors (M = 3.25; F(2,166) = 32.86, p    .001). Agreement with metaphors was also higher if the active part was the sperm (M = 3.96) than if it was the ovum (M = 3.14; F(2,166) = 28.13, p    .001).

The most important hypothesis, however, was that sex-role orientation of Ss determines agreement with the metaphors. It was expected that sex-role conservatives would agree more with stereotypical metaphors than sex-role liberals. This hypothesis implies a three-way interaction between sex-role orientation, type of metaphor (sexual vs. non-sexual) and active part (sperm vs. ovum). This interaction nearly reached significance (F(2,166) = 2.60, p = .07).

Because of its theoretical importance in the present context the last hypothesis was additionally tested by computing (a) the marginal *simple* interaction of sex-role orientation and active part *for sexual metaphors only*, and (b) the marginal *simple* interaction of sex-role orientation and type of metaphor for *active sperm metaphors only*. Both effects were significant in the hypothesized direction:

(a) The four cells of *sexual metaphors* (columns 1 and 2 in Table 1) exhibited a significant interaction (F(2,166) = 8.61, p    .001) such that sex-role conservative and liberal Ss differed more in their agreement with the active-sperm metaphor (M = 4.75 vs. 3.90; F(2,166) = 14.57, p    .001) than in their agreement with active-ovum metaphors (Ms = 3.59 vs. 3.14; F(2,166) = 3.34, p    .05).

(b) Equally, the four cells of *active-sperm metaphors* (columns 1 and 3 in Table 1) showed a significant interaction (F(2,166) = 9.39, p    .001) such that sex-role conservative and liberal Ss differed more in their agreement with the sexual metaphor (M = 4.75 vs. 3.90; F(2,166) = 14.57, p    .001) than in their agreement with non-sexual metaphors (Ms = 3.88 vs. 3.30; F(2,166) = 4.32, p    .05).

In post hoc MANOVAS with the same design as the one reported before for the independent variable sex-role orientation of Ss, we checked whether the stimulus word (conception vs. generating), or the sex or age of Ss had an effect on the degree with which Ss accept specific metaphors. However, none of the effects involving these independent variables turned out significant. Given that the only significant effects were those obtained with the independent variable sex-role orientation, we argue this is strong support for our hypotheses (a) and (c).

**Metaphorical Entailment: Non-Functional Attributes of Sperm and Ovum**

In hypothesis (b) it was argued that a preference for stereotypical sexual metaphors, i.e. seeing the sperm as being the active and the ovum as being the passive  part,  implies  that  other  non-functional properties also are projected upon the "natural actors", i.e. sperms  and  ova.  To  test  this  hypothesis adjective polarities (sets of questions 3a and 3b in the questionnaire) were used. It was expected that sperm and ovum be attributed sex-stereotypic adjectives of men and women which go beyond the simple use of the sexual metaphor in thinking about conception.

To test whether ratings on gender-related and non-gender-related scales differed on a global level, they were compared in a 2 x 2 x 2 MANOVA with sex-role orientation and sperm vs. ovum (within) as the other independent variables. As dependent variables the ratings on five gender and five non-gender-related polarity scales, respectively, were entered simultaneously in a multivariate design. For this analysis one adjective pair from each six-item subset (small vs. big and simple vs. complicated) was excluded. This was necessary because the adjectives "small vs. big", though generally gender-related, were expected not to be used in the sex-stereotypic manner because most of the people know that ova are bigger than sperms, hence reversing the effect. In order to balance the design again, one non-gender-related adjective was also excluded arbitrarily (simple vs. complicated).

If the two classes of adjective polarities were in fact perceived by the Ss as substantially different, i.e. if they discriminated between sperm and ovum only with gender-related but not with non-gender-related adjectives, we would expect a significant two-way multivariate interaction involving all three independent variables. This turned out as expected ($F_{multivariate}(5,163) = 5.39$, p    .001) and confirmed the a-priori classification of the adjective list by the judges.

For detailed analysis the ratings in each subgroup of gender-related and non-gender-related polarity scales were submitted to a 2 x 2 MANOVA with sex-role  orientation  and  sperm  vs.  ovum (within) as independent variables. In line with the hypothesis each of the adjective polarities, except the passive-active polarity revealed a significant interaction of sperm vs. ovum and sex-role orientation, such that sex-role conservative Ss  attributed  higher  sex-stereotypic  characteristics  to  sperm  and  ovum, respectively, than sex-role liberal Ss (Table 2). For the passive-active polarity only the main effect of sperm vs. ovum was significant. This indicates a strong tendency of Ss, irrespective of their sex-role orientation, to attribute activity to sperms and passivity to ova.

INSERT TABLE 2 ABOUT HERE

The pair "small vs. big" is an exception. This adjective pair refers to physical size such that men stereotypically are expected to be larger than women. In the present context, however, an ovum is certainly larger than a sperm. This fact seems to have been acknowledged by the more sex-role liberal Ss. They, but not the sex-role conservative Ss, judged the ovum as being significantly larger than the sperms.

Further, as expected, non-sex-stereotypic adjective pairs were not attributed differentially to sperm and ovum, neither was there a significant interaction effect.

From the six sex-stereotypic adjective pairs three may still be perceived as being functionally related to the physical process of conception. These are "passive vs. active", "slow vs. fast", and "small vs. big". Besides the latter two, which present a more or less veridical judgment of the "visible" speed and size of sperms and ovum, the results for "passive vs. active" replicate the findings reported in the last section on the use of sexual metaphors.

Although the means of the adjective pair "soft vs. hard" were in the sex-stereotypic direction, the interaction with sex-role orientation did not reach significance. This may be due to a semantic problem induced by the linguistic proximity of the concepts "ovum" and "egg", which in German everyday language are called by the same word ("Ei"). Since eggs have a relatively hard shell, this idea may have interacted with the sex-stereotypes to reduce the effect.

The most striking finding is the strong effect for the adjective pairs "weak vs. strong" and "submissive vs. dominant". Neither adjective pair describes the behaviour of sperms and ova. If the Ss apply such adjectives in thinking about the process of fertilization, they refer to sex-stereotypic images of men and women in everyday life. This is a striking illustration of hypothesis (b) about metaphorical entailment, even more so, because sex-role conservative Ss show the effect significantly more than sex-role liberal Ss.

## Discussion

The present research argues that objectification, or making abstract knowledge conceivable in everyday discourse, is achieved by the use of images and metaphors. This was demonstrated with the folk knowledge of conception. It was shown that Ss prefer social, and specifically sexual and sex-role metaphors when asked to think of the natural process of conception to non-social metaphors. This implies that sexual stereotypes of men and women are projected upon the "natural actors" in fertilization,

the sperm and ovum. As with the stereotypical images of men and women in social and sexual interaction sperms are seen as the active part in conception and they are judged as harder, stronger, and more dominant than the ovum. This effect is particularly prominent among Ss who subscribe to conservative sex-role views in everyday life.

By comparing gametes and ova in the female womb metaphorically to men and women in social and sexual life, the process of fertilization becomes as intelligible, "real", and "tangible" as sexual interaction and intercourse in real life. The previously abstract entities of sperm and ovum known from popular science become converted into concrete entities with specific attributes; the cells, invisible to the unaided eye, become part of our everyday world. But this objectified conception of sperm and ovum-cells is not a neutral conception. With the process of selecting and using a specific metaphor the source domain of the metaphor is converted into the symbol of the formerly unknown cellular entities. The new objects which are thereby created, the "socialized" sperms and ova, also possess new attributes unknown to biologists. The evaluatively neutral description of fertilization in the reified scientific universe gives no grounds for thinking of sperms as active, hard, and dominant and of ova as passive, soft, and submissive. These moral and evaluative attributes make sense only in the consensual universe of everyday thinking and communication. Metaphors and attributes in everyday understanding are not applied because they reflect some truth about a phenomenon, but because they are good to think. This is vividly illustrated by the dictum of an eminent Spanish professor of gynecology in a class in the 1960's, who said that "Contra esperma vigoroso no hay óvulo que resista" (There is no ovum which resists a vigorous sperm). With little imagination such thinking can turn into a justification of rape (Carmen Huici, personal communication). The same imagination may have guided the author of a newspaper story about "subzonal insemitation", whereby a single sperm is artificially injected into an ovum, who titled his story "Le viol de l'ovule" (The rape of the ovum) (Nau, 1994).

Let us add that there are no _logical_ but only _moral_ and _social_ reasons to liken men with sperms and women with ova. In the natural process of conception there is nothing to suggest that sperms _must_ be considered more active than the ovum. In fact biological research on fertilization suggests that sperms would move rather aimlessly around if there was not some orienting "activity" on part of the ovum .

The social representation of conception lends itself to illustrate the consequences of the social bounding conditions for everyday thinking about scientific findings. The Ss in the present study felt no inclination to assume that the ovum may play an equally or even more active and dominant role in

fertilization than the sperms. The pervasive everyday experience of gender inequality in a superficially gender-role integrated society as the Western world (Wagner & Brandstätter, in press; Illich, 1983), left no doubt of the cellular inequalities in the female womb. Equally, the scientific content of psychoanalysis only became part of everyday discourse in French society after having been "cleaned" from  morally "offensive" terms like "libido" (Moscovici, 1976). It appears that scientific insight never enters the realm of everyday thinking before it has passed the filters separating the  world-as-it-must-not-be  from  the world-as-it-should-be. Folk science always obeys the limits of the morally admissible and thereby becomes a valid means for everyday understanding and communication.

The metaphorical understanding of conception illustrates the becoming social of a natural process, i.e. making the natural part of the moral domain (Harré, 1981). One can hypothesize that the social is often the point of reference for a group's system of knowledge, be it about "natural" or other phenomena. In an experiment Deconchy (1990) tested the Ss' acceptance of scientific explanations when their causality was directed either from the social to the natural or from the natural to the social. He presented students a simulated research report showing the result that either the concentration of a fictive acid in the blood was determined by manipulating some religious imagination in a person, or that religious imaginations were evoked by manipulating the concentration of the acid in the blood. His student Ss consistently rejected the latter fictive report, which "proved" a causality running from the natural to the social. Hence, in the popular view the social seems to have more power over the natural than vice versa. The popular tendency to "naturalize" the social as expressed in Garfinkel's "natural attitude", does not prove the opposite. The adjective "natural" in an interview statement like "It is _natural_ that men work and women stay at home", does not refer to nature as such, but to the _status quo_ of the social. It is a rhetorical knack.

Moscovici and Hewstone (1983, p. 112) list three transformation processes which can be observed in objectification. These are personification, figuration, and ontologization. These processes are overlapping categories where "socialization" should be added as a fourth process. This is suggested by our results on objectification in vulgarized scientific domains.

The present investigation also sheds some light on the relationship between anchoring and objectification. These two processes are closely linked. In the presence of an unfamiliar phenomenon or idea, people initially link or anchor, and in consequence explain this phenomenon by reference to their available categories and schemata. Anchoring has a social dimension such that people in a group do not

revert to categories and schemata arbitrarily, but in a coordinated manner. One even may propose that the categories and schemata primarily used for anchoring the unfamiliar are those which are particularly well-known and/or appear in some way to be functionally or structurally related to the unfamiliar - like sexual relationships are functionally related to fertilization. Such initial anchoring of something unfamiliar to a familiar domain – often occurring during childhood (Duveen, 1993, p. 175) – can in due course result in the reverse process of objectification, where the prior anchoring category, schema, or experience serves as the source domain to objectify the unfamiliar. In the case of sexuality and conception such a switch from anchoring to objectification is particularly likely.

Objectification is a key process in the formation and elaboration of social representations. As such it deserves due attention in research. For our research the approach of Lakoff (1987) proved to be useful as a conceptual model for its analysis. It allows new empirical questions to be posed about how "social representing" functions at the micro-level. For us it seems particularly important to answer the queries posed by metaphor theory if one wants to avoid arbitrary uses of the concept. If a specific image or metaphor is to function as an objectification device for a social representation, one needs to establish that (a) the source of the image exists independently of the idea to be objectified, that (b) the source is pervasive in experience and well-understood, that (c) the experience of the source domain of the image is a pervasive experience not just for isolated individuals, but for a qualified majority of group members, that (d) the reasons of the structural or symbolic mapping of the source onto the target are made explicit, and that (e) the specific pairing of elements of the source with elements of the target is rationally justified by reference to the social domain and function of the social representation.

These queries allow a fresh look at Sperber's (1990) idea of an epidemiology of representations. They are a step towards an empirical investigation of "the relationship between the relative shares of perception and communication in the construction of an intuitive belief on the one hand, and its social distribution on the other" (p. 39). Individual and collective acceptance and diffusion of images as objectification of the unfamiliar is a highly integrated process. There are few processes in social psychology in general and in social representation research specifically which lend themselves to such explicit demonstration of the action of the social in the individual as much as does objectification.

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experienced as objective and real

"is"

Source domain

projection of
structure

projection of
experiential realism

Target domain

"is"

"becomes"

conceptual, artificial, and abstract
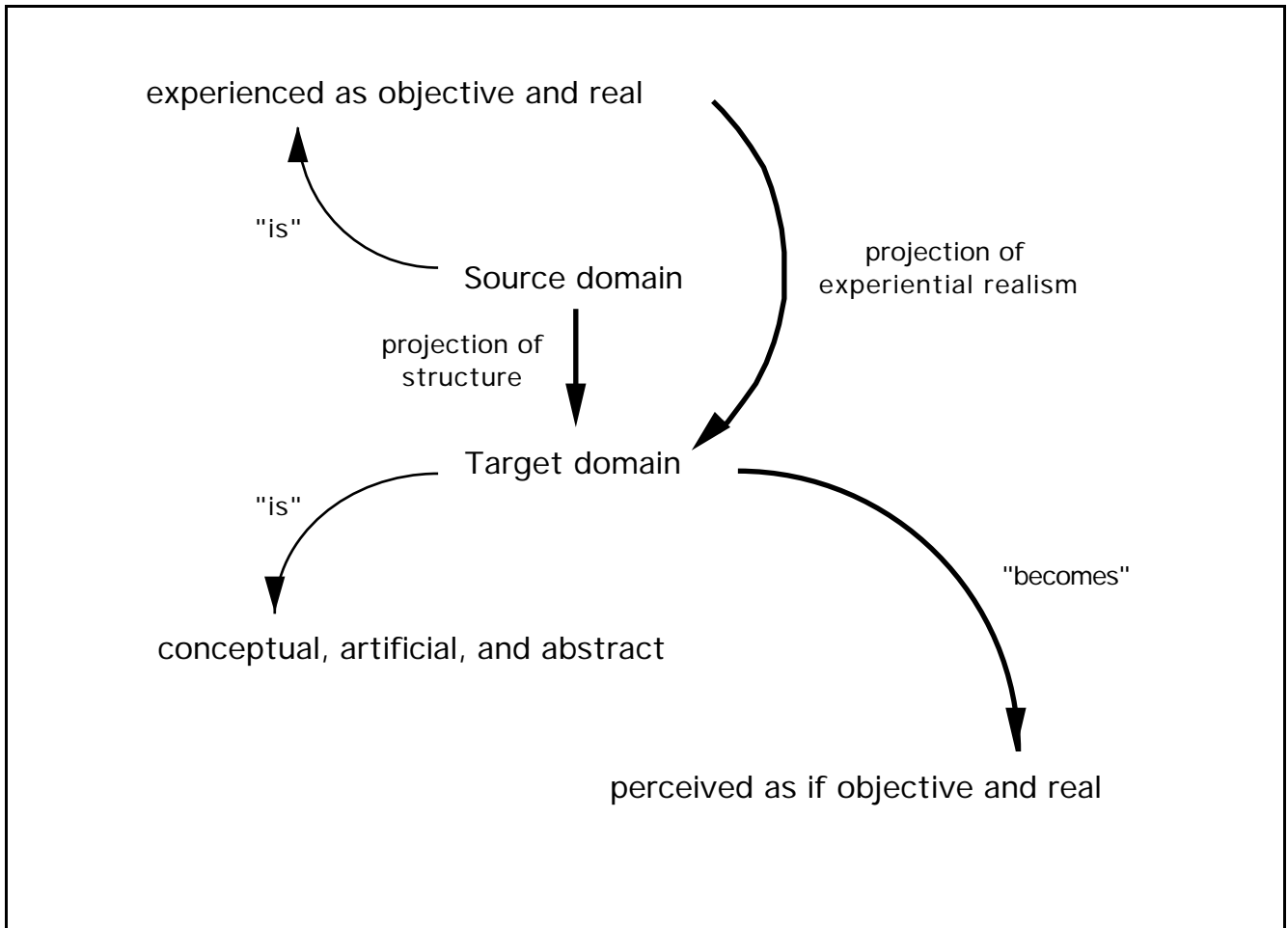
perceived as if objective and real

Figure 1

Illustration of relationships between source and target domain in metaphors.

**Table 1**

Agreement with metaphorical comparison by sex-role orientation, sexual vs. non-sexual metaphor, and active part in conception.

| | sexual metaphor | | non-sexual metaphor | |
| --- | --- | --- | --- | --- |
| | active sperm | active ovum | active sperm | active ovum |
| | 1 | 2 | 3 | 4 |
| Sex-role orientation of Ss | | | | |
| Liberal (N=84) | 3.90  (1.98) | 3.13  (1.85) | 3.30  (1.84) | 2.66  (1.48) |
| Conservative (N=85) | 4.75  (1.60) | 3.58  (1.63) | 3.88  (1.76) | 3.16  (1.62) |
| Mean | 4.33 | 3.36 | 3.59 | 2.91 |

Note: The higher the score, the more the Ss agree with the respective comparison. Scale range from 1 through 7. Numbers in parentheses indicate SD.

**Table 2**

Sex-role and non-sex-role stereotypic attribute polarity scores by sex-role orientation and attribution target (sperm vs. ovum).

| | sex-role liberal Ss | | sex-role conservative Ss | | main effect (sperm vs ovum) | | interaction | |
|---|---|---|---|---|---|---|---|---|
| | sperm | ovum | sperm | ovum | F(1,167) | p | F(1,167) | p |
| sex-stereotypic adjectives | | | | | | | | |
| soft vs. hard | 3.71 (1.46) | 2.81 (1.19) | 4.05 (1.54) | 2.82 (1.08) | 87.31 | .001 | 2.88 | .09 |
| weak vs. strong | 4.60 (1.39) | 4.70 (1.37) | 4.94 (1.12) | 4.46 (1.39) | 2.98 | .080 | 7.36 | .01 |
| passive vs. active | 5.79 (1.26) | 4.17 (1.68) | 5.58 (1.19) | 4.24 (1.73) | 83.45 | .001 | < 1 | ns |
| slow vs. fast | 5.62 (1.28) | 3.83 (1.60) | 4.95 (1.52) | 3.79 (1.46) | 87.51 | .001 | 3.88 | .05 |
| small vs. big* | 2.71 (1.68) | 4.10 (1.94) | 3.38 (1.73) | 3.38 (1.57) | 17.52 | .001 | 17.52 | .001 |
| submissive vs. dominant | 4.63 (1.22) | 4.38 (1.24) | 5.00 (1.26) | 4.27 (1.30) | 14.82 | .001 | 3.88 | .05 |
| multivariate test* (d.f. 5,163) | | | | | 53.96 | .001 | 5.32 | .001 |
| non-sex-stereotypic adjectives | | | | | | | | |
| bad vs. good | 5.32 (1.32) | 5.55 (1.20) | 5.22 (1.12) | 5.26 (1.19) | 2.14 | ns | 1.14 | ns |
| unimportant vs. important | 5.77 (1.02) | 5.79 (1.26) | 5.62 (1.34) | 5.73 (1.20) | < 1 | ns | < 1 | ns |
| ugly vs. pretty | 4.62 (1.24) | 4.62 (1.26) | 4.74 (1.25) | 4.75 (1.35) | < 1 | ns | < 1 | ns |
| dumb vs. intelligent | 4.45 (1.26) | 4.69 (1.33) | 4.75 (1.24) | 4.71 (1.17) | < 1 | ns | 2.16 | ns |
| negative vs. positive | 5.49 (1.11) | 5.42 (1.22) | 5.45 (1.23) | 5.35 (1.33) | 1.04 | ns | < 1 | ns |
| simple vs. complicated | 4.50 (1.71) | 4.62 (1.82) | 4.19 (1.61) | 4.38 (1.70) | 1.69 | ns | < 1 | ns |
| multivariate test (d.f. 6,162) | | | | | 16.43 | .001 | < 1 | ns |

Note: The higher the score, the more the second of the adjectives in each pair applies. Scale range 1 through 7. Numbers in parentheses indicate SD.

*) The pair "small vs. big" was not included in the multivariate test.