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Chapter 5

MAPPING TRANSDISCIPLINARITY IN HUMAN SCIENCES

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ABSTRACT

This article sets out to present a fundamental orientation matrix for human sciences, which makes it possible to improve and structure the transdisciplinary discussion and learning process. Some of the basic concepts of the matrix are exemplified with results from the psychology of gender differences.

(I) INTRODUCTION

Transdisciplinarity in human sciences and the dialog among them is often characterized by a variety of contradictory fundamentals and hypotheses which sometimes seem unfounded from the view of neighbouring disciplines (e.g. between different schools of psychotherapy). This sometimes leads to disparagements of both the hypotheses and the disciplines. From a scientific approach, the situation is unsatisfactory.

(a) Issues:

Is There a Basis for Transdisciplinarity in the Human Sciences (Table 1)? What Knowledge is the Foundation for Which Discipline?

Table1: A multitude of human sciences and results, some examples:

Biopsychology	Neuro-Psychology	Sozial Psychology
Chronobiology	Developmental Neurology	Psycho-neuro-immunology
Behavioural Ecology	Neurology	Developmental Psychology
(Human) Ethology (Biology of Behaviour)	Pedagogy	Psychopharmakology
Behavioural Genetics	Psychiatry	Psychosomatology
(Ancient) History	transcultural Psychiatry	Psychotherapy (100 Schools)
Neuro-Biology	Psycho-Endocrinology	Cultural Sciences
Neuro-Endocrinology	Psychology	Political Science
Neuro-Ethology	Applied Psychology	Soziobiology
Neuro-Physiology	Medical Psychology	Soziology

How could a commonly accepted basis and knowledge be developed and structured?

(b) Method, the Four Aspect Perspective and the Levels of Complexity:

In terms of ***theoretical methodology***, (A) the four central questions of biological research are of particular importance (e.g. Tinbergern 1963); i.e. the question of the **immediate causal relationships in behavioural processes** (causation), secondly the question of **psychomotor ontogenesis,** thirdly, the question of the **adaptation value of behaviour patterns**, and fourth, the question of the **phylogenesis** of individual features of behaviour. The first two principles are similar to the principles of physics and chemistry. In ethology (the biology of behaviour) they are summarized as the "proximate causes". The latter two are specific to biology and closely linked to Darwin. They are summarized as the "ultimate causes".

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In addition, (B) complexity or reference levels (e.g. molecule, cell, organ, individual, group) and their "interaction" with each other, play an important role in the human sciences. This aspect is partly circumscribed by the term "bio-psycho-social". Especially when studying the proximate causes, the "basal" reference levels are a prerequisite for understanding the "higher" levels. However, knowledge of the laws of the basal levels (e.g. of cell physiology) is insufficient for understanding complex behavioural patterns or a personal experience. The whole is more than just the sum of its parts (Hartmann 1964). Every reference level (and basic question) is equally important.

In terms of ***empirical methodology***, the comparison between animals and humans and the comparison between cultures are emphasized when investigating the central questions on all the reference levels, if possible – for example on the biochemical level (e.g. pharmacological research), cellular and organ plane (e.g. physiology), as well as on the individual and group level (e.g. ethology).

(c) Results

An orientation matrix can be prepared, based on the central questions (see Table 2: columns) and reference levels (lines), which comprises those disciplines that have a reference to the system layers of the living world:

Table 2: The four Central Questions define the framework of scientific research into brain function on different levels. The questions and planes in *italics* are also subject of the humanities

Table 2	*Column 1* *Causation*	*Column 2* *Ontogeny*	*Column 3* Adaptation	*Column 4* Phylogeny
Molecule				
Cell				
Organ				
Individual				
Group				
Society				

In this "structural model of transdisciplinarity", as exemplified in Table 3, disciplines with a reference to the performance of the nervous system (Tab. 3, paragraph C), their questions (paragraph A) and results (paragraph B) can be allocated and intertwined with each other (Medicus 1995). Central questions and reference levels are the "Smallest Common Transdisciplinary Denominator" and the basis for the development of a "Theory of Human Sciences".

Many aspects of basic questions of biological inquiry were already known to Darwin, but these principles have only in the last few decades been classified as *the* main perspectives of biological research in general and ethology in particular. Here, important methodological theoretical contributions for behavioural biology were, for example, made by Lorenz (1937) in his "Biological Questions in Animal Psychology" and later also by Niko Tinbergen (1963).

If one studies only the proximate causes and underestimates or ignores the ultimate causes (or vice versa), many life phenomena remain inexplicable and many proximately generated theories remain inadequate. The areas of these four basic questions are closely related, so that in many cases it is difficult to attribute either a particular individual study to only one fundamental question. Discussion of one of the four questions often raises questions relating to the other three.

Behaviour and the psyche cannot be understood from the point of view of a single focus of inquiry since the areas in question are in reality closely intertwined with one another. The first three lines in *italics* of paragraph A, columns 1-4 are mutatis mutandis also applicable to biological sciences, psychology, social and cultural sciences (respective life sciences).

Association of disciplines to the levels of inquiry (paragraph C / column 1) after Riedl (1984); behavioural examples B/1: (endorphins) Panksepp 1981; B/1: (friendly behavior) Lorenz 1977, Ridley 1997; B/2: (children) Bischof-Köhler 1989; A/3b: (familial proximity) Hamilton 1964, (attractiveness) Frank 1988; B/3b: (friendly behavior) Eibl-Eibesfeldt 1970, 1990, Frank 1988, Goodall 1986, de Waal 1982, 1996; B/4: (brood provisioning) Eibl-Eibesfeldt e.g. 1990. Table after Medicus 1995.

Table 3: A systematic of human sciences, their inquiry and results

Table 3	Questions Concerning **Proximate Causes**		Questions Concerning **Ultimate Causes**		
	(1) **Causation**	(2) **Ontogeny**	(3) **Adaptation** (a: ecological | b: intraspecific)		(4) **Phylogeny**
A) Examples of ethological inquiry and associated disciplines	● *How do behavior and psyche "function" on the molecular, physiological, neuroethological, cognitive and social level* - and ● what do the relations between the levels look like? ● How are genetically programmed (hereditary) behavior patterns (e.g. 'instinctive' drives and inhibitions), learning, intellect and culture, as well as ability, volition and conscience entwined with one another and ● are there differences dependent on the species, age, gender and behavioral realm? ● How do perception, subjective internal mentation and behavior correspond with the environment?	● *Which developmental steps and which environmental factors play when / which role?* I.e.: ● What are the ontogenetic bases of behavior and learning? E.g.: Which effect have ● hormones and ● reafferences for ● maturing processes and ● imprinting-like steps? ● How are instincts and learning intertwined with one another? ● What is learned?	● *How do specific faculties of perception, subjective internal mentation, learning and behavior benefit the performer?* E.g.: ● Which evolutionary alterations occurred in persistent phylogenetically earlier traits, caused by the selective pressure of more recent behavior patterns? ● What are the costs, what the benefit of a behavior pattern for example (a/b):		● *Why did structural associations evolve in this manner and not otherwise?* Specifically: ● Which behavior was a prerequisite of which new form? ● What consequences do older traits have for further developments - e.g. for ● synergy and antagonism in hormones and transmitters, ● neuro-anatomical structures and ● behavioral traits? (space-time-struct.) ● Which traits are homologous, which analogous
			(a, ecological:) ● concerning caloric intake and energy expended?	(b, intraspecific:) ● in relation to familial proximity and ● social attractiveness?	
B) Examples of behavior	● Endorphine levels rise during grooming in enactor and recipient. ● Expression: emotion - enactor - recipient relations. ● Friendly behavior patterns are adversaries of aggression, they can be furthered culturally. Unattractive behavior patterns such as wanton aggression can be culturally inhibited.	● Children recognize themselves in a mirror at 20 months of age. This is one of the foundations of social cognition, for example of being able to take another's perspective as a prerequisite for cognitive altruism and cognitive cooperation.	Social bonding is advantageous for ● protection against predators, ● collective hunting, ● building larger structures.	● Friendly behavior helps to develop and maintain bonds as a basis for reciprocal support, e.g. during parental care and aggressive interactions.	● Parental care and mother-child bond were phylogenetic preconditions for social bonds. Within this development in addition to their original function, elements of brood behavior became elements of social behavior, e.g. kissing & billing and grooming & preening.
C) Level of inquiry (e.g.: atom, molecule, cell, tissue, organ, individual, group, society) with examples of scientific disciplines	**atom, molecule**: Biochemistry, **cell, tissue, organ**: Neurophysiology, Neurobiology, **organ, individual**: Neuroethology, Neuropsychology, Neurology, Behavioral Physiology, B. Endocrinology, B. Genetics, B. Immunology, Chronobiology, Psychiatry, Psychosomatology, **individual, group**: Ethology, Sociobiology, Behavioral Ecology, Psychology, Psychotherapeutic Theories, Pedagogy, Earliest History, **society**: Sociology, Law, Political Science, Economics, History, Cultural Sciences, Arts.	**organ, individual**: Developmental Neurology, Neurobiology, **individual, group**: Ethology, Developmental Psychology, Psychotherapeutic Theories.	**individual, group**: Ethology, Behavioral Ecology, Socio-Ecology.	**individual, group**: Ethology, Sociobiology.	**cell, tissue, organ**: Neurobiology **individual, group**: Ethology.

(II) GENDER DIFFERENCE

Preliminary Remarks: In human beings, both sexes have qualitatively the same behavioural repertoire. They share individual gender differences with many other vertebrates. Behavioural differences result solely from the different frequency and / or different intensity of the behaviour (Ploog et al 1967). Above all, they emerge when individual behaviour characteristics are or were associated with a selection advantage in the phylogenesis.

Of course, in the case of human beings (phylo-) genetic behavioural dispositions can be reduced or increased by learning (i.e. “instinct-culture-interlocking”). In addition, innate dispositions can be controlled and steered by understanding and volition. In relation to psychosexual dimorphism, behavioural differences are frequently found in connection with other variables, such as residence (town or country), social class or membership of a particular culture (e.g. Schiefenhövel 2004). The possibilities to influence them by learning and volition can vary according to the different features of behaviour. What are known as "culture-independent universals" are (not quantitatively but) qualitatively relatively stable: The mood qualities and probably also the understanding of human facial expressions are innate and universal. If this were not the case, there would be a diversity of facial expressions as is the case with languages. Sexual shame is also a human universal (Eibl-Eibesfeldt 1990).

The question as to which differences are innate and which are the results of upbringing arises repeatedly in connection with gender differences. The extreme positions, on the one hand that everything is innate, or that everything is acquired on the other, cannot be supported ethologically. On the contrary, a comparison of species and cultures will show that genetic programmes as well as learning and volition exist in close relation to one another. On the basis of the four fundamental questions, individual aspects of this more differentiated and more complex perspective will be discussed on a case basis.

Under no circumstances should "culture-independent" and "natural" forms of behaviour be rated as morally "good"; there are therefore also no moral animal role models here (i.e.: Hume’s law: one can’t derive an “ought” from a [e.g. biological] “is”). This four aspect perspective of human behaviour must not be misused to confer moral legitimacy on varieties of human behaviour nor may it excuse them. A lack of knowledge about the distinct mental characteristics of the other sex can lead to false evaluations and prejudices between men and women. The large number of gender differences is one reason why partnership and sexuality are vulnerable to conflict. For that reason, it is worth looking at as many aspects as possible without prejudice.

There follows, the fundamental questions of biological research will be explained, taking as an example the psychology of gender differences and some of its variants.

(III) THE FOUR ASPECTS

(A) Proximate Causes

(1) Question about Causation i.e.: Cause-Effect-Relationships in Behavioural Processes

How do behaviour and psyche "function" on the chemical, physiological, neuropsychological, mental and social levels and what are the relations between the levels?

Within the scope of (behavioural) physiology, inter alia, hormonal and neuronal aspects such as the influence of social and ecological conditions on the release of certain transmitters and hormones, and the effects of such releases on behaviour, are examined.

Everyday Display Behaviour*:* In all cultures it can be observed that men make a greater effort to impress and "show off" in a more dominating form than women do when flirting and courting and that this male behaviour can be "triggered" by women. It fits this dominance aspect that men in industrialised societies usually drive bigger and more powerful cars, that they decorate them with symbols of strength and speed, e.g. spoilers and wide "racing tires" more often than women and that they have a greater willingness to take "impressive" risks in traffic (too risky behaviour does not attract women - but it might intimidate male rivals). The question of gender difference can hardly be answered if one only focuses on the direct cause-effect-relationship, as one could ask about psychoendocrinological causes and learning disposition (see below.)

Pornography: The sexes deal differently with pornography. It is a well-known fact that a great deal of money can only be made with men. Among other factors, female sexuality is more tied up with social "ifs and whens" than the male. So within the scope of this basic question, differences can be ascertained in the reactions to pornography, but the causes for these differences also have to be sought primarily on the basis of the fundamental questions discussed later in the text.

Psychoendocrinological Aspects of Sexual Violence: The media repeatedly reports sadistic, sexually motivated crimes of violence that have grave consequences for the victim. The perpetrators are only men. Some men can be sexually aroused by fantasies about violence toward women or other sexual partners. In this case, the question is whether this gender difference is caused by nature or nurture and how the two areas are linked.

From the perspective of the first basic question, findings from the fields of behavioural psychology and psychoendocrinology indicate a certain biological component. A lack of the male sexual hormone testosterone significantly reduces the sexual drive in men (Fox et al 1972). (On the other hand, increased testosterone levels do not usually lead to increased potency.) Treated with anti-androgens, which reduce testosterone in the blood, many men who have committed sadistic and violent sexual crimes relapse less often even if the violent goal continues to exist. As soon as these men have a normal testosterone level again, the risk of recidivism increases.

One can therefore examine the link between hormones and behaviour and use it for a great many explanations (Ellis 1986, Gray 1971). The male sex hormone, testosterone, plays a role in behaviour throughout life, from embryogenesis to old age (Money et al 1972). However, the proximate explanation of such causal connections between testosterone and behaviour does not answer the questions why the effect of testosterone in this connection is "this way and not that way" and what is its adaptation value within the scope of normal behaviour (see the questions below).

(2) The Question of Ontogenesis

The question is: Which inner developmental steps and which environmental factors have what effect and when? There are genetic reasons why certain forms of human behaviour world-wide almost always occur or come to maturity in more or less similar periods of life. Ontogenesis therefore follows an internal plan (cf. Medicus 1992). The chronology and quality of this inner plan can only be influenced to a limited degree. For example shyness with “strangers” as well as stubbornness in early childhood and also accent-free acquisition of a language occur at very specific ages.

Embryonic Testosterone Induction: During ontogenesis, certain periods play a very special role in the maturation and learning processes with regard to mental gender differences. Testosterone, for example, which is produced by the embryonic testicles, influences the maturation of the nerve system: After puberty, pituitary gonadotrophin is released constantly in men, provided a testosterone induction took place on the hypothalamus during embryogenesis. In women this takes place in a 28-day cycle if there was no testosterone induction. Embryonal testosterone induction is probably also partly responsible for the type and extent of post-pubertal sexual stimulation that can be achieved through visual stimuli: Photographs or close ups with, for example, anonymous genitalia can only therefore have a stimulating effect on men (Money et al 1972).

Infantile Development and Socialisation: In terms of the connection between sexuality and excessive and intentionally sadistic violence, the question of ontogenesis does indeed help. Perpetrators always have serious personality disorders, usually as a consequence of a lack of bonding during childhood. However, where the external conditions for both sexes are largely the same, the causes of this gender difference remain unclear. A highly disturbed woman never tries to increase her sexual lust through deliberate sadistic violence concerning serious harm or death to the victim (e.g. “lust murder”).

Bonding in early childhood has far-reaching consequences for socialisation and also affects those areas of behaviour that only mature after childhood. It is interesting, for example, that children develop a post-puberty erotic aversion to people that they knew well for a long period of time in their first five years of life. Sexual attraction between siblings is therefore extremely rare as are marriages between children who attended the same kindergarten at the same time for a longer period, as Shepher (1971) showed in Israel.

Post-natally, testosterone plays a large role in terms of the maturity of the libido and sexual drive in men, especially after puberty.

(B) Ultimate Causes

(3) The Question of Adaptation

Questions regarding the adaptive value relate to the function and purpose of a behavior.

Preliminary theoretical remarks: The number of its offspring constitutes an empirical measure for the adaptive value of an individual, a phylogenetic "experience value" regarding the "usefulness" of inherited qualities. As Darwin already knew, each individual constitutes a compromise between different selection conditions, between conditions within a species and ecological conditions. Today, behavioural ecology (a) and sociobiology (b) focus on various aspects of the adaptive value within the field of ethology.

(a) Question about the Adaptive Value to the Extra-Species Environment i.e. to the kind of ecological niche created by the individuals: What are the costs, what are the benefits of a form of behaviour, e.g. in terms of energy intake and consumption? Brood care is an example of an adaptation where ecological conditions can play an important role. Some environmental conditions or ecological niches could only be used and shaped in the evolution of the species because the species cared for their broods. In some niches the young animals need both parents to care for them. This is the case with most birds for instance and other monogamous species, e.g. 12% of primates (Dunbar 1988, Krebs et al 1981).

(b) Adaptation Value within a Species: What are the costs, what the benefit of a behaviour pattern, e.g. in relation to familial proximity (cf. brood care) and social or/and sexual attraction?

The question of the adaptation value of a characteristic within a species is the main aspect of socio-biological research (e.g. Hamilton 1964, Trivers 1971). Here the "cost/benefit ratio analysis" towards other members of the species and the degree of kinship play a major role. In the context of gender differences one must distinguish between the adaptation value a) among those of the same gender (e.g. rivalry between males for a female) and b) toward the other sex (e.g. characteristics that are attractive to the other sex).

Darwin (1871) recognised that there are characteristics that are not adaptations to the extra-species environment of the animal, indeed, in some cases they can even reduce the adaptation value in the extra-species environment. Many birds, usually male, have conspicuously colourful feathers that can sometimes even hinder flight. This can be dangerous when predators hunt such birds. This frequently magnificent feathering is the result of female preferences, we talk of sexual selection. The distinctive features of the human female body form, caused by the distribution of fat that men find so attractive, are in part the result of sexual selection. The two selection conditions are closely related: Whether the male or the female makes a selection e.g. concerning the colour of feathers, that is influenced by ecological selection.

The roots of gender difference go back to the differences between the egg and the sperm cell and their economy. Despite the production of a surplus of sperm, the costs in terms of time, energy, building materials and risk for the male is generally a great deal lower than for the female. Female reproductive success is limited by the resources time and food; that of the male by access to fertile females willing to mate. It is also true for humans that the minimal possible costs of reproduction for the man are extremely low, namely an ejaculation, and that, under natural conditions, the woman cannot avoid pregnancy and breastfeeding. The differences between men with regard to the contributions that can be made per child are correspondingly greater than is the case among women (e.g. Symons 1979). As a result of this difference, greater differences in the reproductive success of men due to rank, status and possessions are possible than is the case with women. One consequence of this is the greater orientation toward competition with display behaviour and boastful bluff among men. This might also be a reason why one tends to find men in high-ranking positions.

Mutants are either promoted or hindered (within ecological limits) by the number of their descendents through the selection process. It therefore follows that in the animal kingdom those males have a selection advantage that, first of all, can oust rivals (Lorenz 1972), who, secondly, seek a female and, thirdly, court the female intensively and strive to mate. For the males of many species it is an advantage if they are able to move rapidly between these forms of behaviour. Forms of behaviour between which one can switch rapidly within relatively short periods and which, to some extent, can also be mixed, both in terms of their motivation and expression, are known as "functional proximate" forms of behaviour and moods (Lorenz 1983). The functional proximity between the behavioural forms of rivalry and sexuality in the male sex manifests itself in very different variations depending on the species. Introspectively, we can also experience for ourselves how certain moods and emotions are mixable (e.g. among men this is more likely to be sexuality and dominance, or sexuality and aggression), while others are not (life-threatening lack of breath and sexuality). The sado-masochistic spectrum is also an example characterised by a functional proximity of dominance, submission (especially in a deviant context) and sexuality. One aspect of functional distance between fear and sexuality is male impotence, which, in some cases, can be triggered by subjectively experienced anxiety (e.g. through "neurotic" fears; Lorenz 1972).

Effects of the Different Costs of Reproduction: Against this background, it is understandable that from an evolutionary-biological perspective it can be advantageous for men if they react to female attractions quickly and without many "ifs and whens," at least when there is no intention to bond (Symons 1979). This inclination is exploited by the porn and advertising industries. In contrast to this, among many animals and humans those members of the female sex have selection advantages if they engage in partner selection and respond to male desire with female restraint (or coyness) until they are able to make the best possible choice.

Female Preferences when Choosing a Partner: Over the course of the phylogenesis big strong males developed among many kinds of mammals as a consequence of the rivalry among males for females. This trend can be strengthened even more by female preferences: Females who have mated with strong and dominating males can have a selection advantage. If the male characteristics are hereditary, these females have high chances of having more descendents over several generations through strong sons because the sons are also more attractive for other females and are more likely to be superior to other male rivals (Buss 1985). This could explain how display behaviour has become a component of animal male courtship behaviour, even if phylogenetically it is derived from the threat-display behaviour (against rivals; Lorenz 1972). The courting and mating male shows both rivals and females "what an impressive guy he is." Interpreted anthropromorphically, male display behaviour during courtship in many animal species is often apparently "threateningly" directed towards the partner. In spite of this apparent "threat," a female in the wild can generally, even if it is weaker, choose her partner (female choice) by either removing herself or signalling sexual willingness by lingering. Under natural conditions, serious injuries or death amongst females have only been observed in connection with male mating and sexual behaviour in exceptional cases (e.g. among certain frog species). When this occurs in the animal kingdom it is, in nosological terms, a different phenomena to deviant human sexual behaviour

"Principle of the Antithesis": Characteristics that offer advantages for intra-species communication for the sender and the receiver are selected towards signal clarity (Darwin 1872). Consequently, in many species there are tendencies in the opposite direction between the two sexes . These contrary characteristics ("male scheme" and "female scheme") can be attractive for members of the other sex (Medicus et al 1990).

(4) The Question of Phylogenesis

Why did structural associations evolve "this way and not otherwise" phylogenetically?

Preliminary Theoretical Remarks: According to Darwin, phylogenetic development is caused by mutation and selection (he used the terms "variation" and "*natural* selection"). Accidental mutations create new variants (mutants); within certain ecological limits, selection favors or hinders such mutations via the number of reproductive offspring. As many characteristics are retained over the course of evolution, each organism harbors characteristics of various (phylogenetic) ages (e.g. Kummer 1991, Lorenz 1977, Medicus 1987, Medicus et al 1990). This applies equally to anatomy and behaviour. Reconstructing the phylogeny of a species often makes it possible to understand the "uniqueness" of recent characteristics: Earlier phylogenetic stages and conditions which persist often also determine the form of more modern characteristics (example, see below).

Against this background, the following questions arise according to Lorenz (1977): In which sequence did certain accomplishment qualities develop? Which characteristics were the phylogenetic preconditions of what new characteristics and what consequences do older characteristics have for further developments? How have (phylo-) genetically older characteristics changed under the selection conditions of younger ones and which ones have been "lost?" And in completion to the proximate mechanisms one can ask: Which functional consequences have phylogenetic younger traits (e.g. cognitive abilities) for older (e.g. “instinctive”) ones? An understanding of these phylogenetic connections is helpful when discussing the question as to which comparisons and conclusions between animal species are permissible, provided that there are things that can be compared, including the human species.

Species comparison does not allow any compelling conclusions to be drawn from one species about another or about human beings in the sense that if a characteristic is so marked in one species then it must follow that this will be the case among others. We must therefore avoid making direct inferences about human beings from animals and assigning human attributes to animals. Biologists ask: which accomplishments can be traced back to a common original form (i.e. homologies) and which developed independently from one another or convergently (i.e. analogies).

Ad Homologies: Those characteristics that continue to exist in a more or less similar fashion over the course of further evolution in various development lines (in spite of function changes), respectively, those with a shared (phylo-) genetic origin are known as homologous characteristics. Examples include social skin care and the kiss among primates.

On this basis, homology conclusions such as the following can be drawn. Different phylogenetic degrees of relationship can be identified and phylogenetic trees drawn up on the basis of the number of evolutionary similarities. Moreover, in many cases the "this way and not otherwise" of anatomical and behavioural characteristics cannot be explained by functional constraints, but they can be interpreted through an understanding of phylogenetic preconditions (e.g. extremities skeleton; human facial expressions). This also holds true in many cases in which the functional reason for the development of a characteristic (e.g. brood care) is different to the function showed later on in the phylogeny (e.g. elements of brood care behaviour as well as dominance aspects within human courtship and sexuality).

Culture-independent universals in behaviour (e.g. human facial expressions) and similarities in animal-human comparisons are an indication of phylogenetically acquired programms.

Ad Analogies: The second form of similarity results from convergent developments. These convergent "solutions" as adaptations to certain conditions are known as function similarities or analogies (e.g. the “camera”-like eye among octopus and vertebrates). The following analogy conclusions can be drawn: Analogies are an indication of regularities of (firstly) selection and adaptation value and (secondly) the phylogenetic sequence of preconditions (examples of this follow in the text).

Behavioural Examples in Relation to The Basic Question of Phylogenesis

Brood Care and Inner-Species Communication: Every biologist knows that gatherings of birds and mammals, for instance, pigeons, sea-lions and primates, do not only show aggressive or submissive but also friendly behaviour towards adult members of their species. We can also observe aggressive or submissive behaviour in marine iguanas (and other reptiles) lying next to each other in the sun, but they show no friendly behaviour towards each other. Inspired by these observations on the Galapagos Islands Eibl-Eibesfeldt (1972) developed the theory that care for the offspring is a phylogenetic prerequisite for social bonds; he further concluded that over the course of the evolution of social bonds, elements of care for the offspring became part of the (friendly) social and sexual behaviour of adult organisms (e.g. kissing and billing derived phylogenetically from feeding of the young). As neither iguana ancestors nor modern iguanas care for their offspring, this species lacks the decisive phylogenetic prerequisite for friendly behaviour (as well as for reciprocal altruism or for reciprocal helpfulness). As it is highly probable that the now-extinct reptile that was the common ancestors of birds and mammals (respectively primates) did not display brood care behaviour, billing and kissing can be regarded as convergent developments or analogies; social skin care and the kiss among primates are homologous.

Viewed solely from the perspective of proximate causes (ontogenesis and causation) it is impossible to say if infantile sexuality flows into brood provisioning (as Freud postulated) or elements of brood care into social and sexual behaviour (as Eibl-Eibesfeldt recognized); the crucial arguments in this context are the phylogenetic ones.

Orientation of Display Behaviour: For some species it was obviously incompatible with the selection conditions that emerge within the framework of the bonding between mates to permanently direct male courtship displays (seen anthromorphically) all too dominantly and "aggressively" towards the partner. As a result of pair bonding (possibly in relation to the connecting function of behaviour patterns from brood care) this form of dominance courtship behaviour has undergone a change in terms of its orientation. The female partner is no longer (seen anthromorphically) "threatened" by display behaviour, instead, the courting male threatens away from her (Lorenz 1972). This is an example of how younger characteristics (pair bonding) can alter phylogenetically older characteristics (display behaviour directed towards the sexual partner). In a species comparison, convergent (analogue) developments can be found (according to Lorenz) both with regard to pair bonding and the orientation of male display behaviour, namely in the case of the greylag geese and human beings. A gander courting with display behaviour, for example, carries out fake attacks into an empty space and then returns triumphantly to his "beloved."

Dominant male courtship behaviour can therefore prove useful in two contradictory functions: Firstly to keep *rivals* at a distance and secondly to attract *females* as a male protector. This dominance aspect can result in flirting men pretending to be stronger and more self-confident than they are in reality, while women frequently act as if they were more in need of protection and more unsure of themselves than they are (cf. principle of antithesis). As a result, one usually pleases the other sex more in flirt situations, which

facilitates the first approaches between new partners (Feierman 1990). It is remarkable that women can feel attracted by male display behaviour while men tend to react aversively. This difference can be explained phylogenetically. Perhaps these fundamental connections are the reason why among equal ranking men and women, the men are very often treated as higher ranking by members of both sexes (Symons 1979).

This inclusion of phylogenetic preconditions in the discussion explains distinctive features of the "this way and not otherwise" of human sexuality (e.g. elements of “brood care” within it) and behavioural differences, namely why male courtship display behaviour and signals of love can occur simultaneously.

Communication Among Primates: In addition to brood care elements, elements of sexual behaviour also flow into the social behaviour of a number of primate species. Phallic displays (e.g. among squirrel head monkeys) and (anger) riding (e.g. among pavians) became gestures of dominance among certain primate species, and the female presentation of genitalia a gesture of submission (e.g. among pavians). If these signals are used in a social context, then the animals are not sexually motivated as ethogical motivation analyses suggest. Phallic display and riding as well as "female" presentation is done by members of both sexes. In some non-human primates, both forms of behaviour can take on an important communicative function if social tensions arise and thus help prevent social damage. During hominisation both forms of communication have been lost phylogenetically; exhibitionism might be an exception, there is no evidence for a corresponding female relict.

Deviant Human Sexual Behaviour: The combination of dominance, violence and sexuality among individual men, and the attraction that particularly violent (e.g. sexual) criminals can sometimes have for individual women, becomes more comprehensible with a knowledge of phylogenesis, even if life-historical influences and conditions always play a role too. Exhibitionism can be seen as an example of the relationship between sexuality and dominance. In connection with the *violating* aspects of dominance sexuality discussed earlier, the phylogenetic connections also explain why, among women, personality disorders of a comparable magnitude do not manifest themselves in an aggressively-destructive sexuality

(IV) APPENDIX: METATHEORETICAL ASPECTS OF TABLE 2

“Hardness” of Data and Theories

Principally it is advisable to confirm and to consider data and theories as well as possible. Reproducibility, counterhypotheses, statistical aspects, and consistency with the results of neighboring disciplines play an important role here.

Data and theories can show varying degrees of “hardness” according to the field of focus in the structural model (Table 2). The various “hardnesses” are yielded by the variously complex diversities, e.g. depending upon the reference level being examined (cell, organ, individual, group). In general, for example, results in neurobiology are harder than those of psychotherapy. The demand for mathematical describability and measurability is not equally relevant for all fields. Most especially with respect to complex fields, a transdisciplinary openness is a conditio sine qua non for the development of a basal transfacultary consensus in human sciences.

Terminology and Reference Level

Many concepts and terms are only useful on certain reference levels and lead to confusion when applied on the wrong ones. The expression, “the egoistic gene,” for example, leaps over several reference levels at once: for egoism is a property of individuals whose egoism may be genetically influenced. (Molecules /) genes themselves, though, cannot be egoistic. If one overlooks the fact of this terminological shortcut, making the so-called “egoistic gene” a concept, then this would be a case example of a “personification” of molecules, i.e. a so-called anthropomorphism.

Attribution of Freedoms in the Transdisciplinary Dialogue

It is noteworthy how the notions of freedom differ, depending upon which reference level is at the center of focus; for instance, the relatively deterministic ideas of many neurophysiologists and neurobiologists are difficult to reconcile with those of psychologists and sociologists, who usually

are ready to "grant" us more freedom. Ethologists' ideas place them in between.

Every reference level has its own regularities and degrees of freedom, which are not necessarily deducible from the more basal ones.

From an evolutionary perspective, accomplishments are made in the process of higher development, which open up new freedoms (Lorenz 1977, Medicus 1987).

Each Reference Level is in Principle Equally Important.

The practice and the self-perpetuating momentum of "ratings" by impact points grow out of a failure to appreciate this fact. (Scientific journals are rated in terms of impact points, the value being dependent upon how often the article is cited over a period of two years.) Nor is the evaluation of the "validity of a discipline" directly proportional to the validity of the results which it can achieve.

Swiftness of the Flow of Information

The time necessary for transdisciplinarily relevant and well-confirmed knowledge to become common property of the human sciences grows longer i.e. in direct proportion to the waxing complexity of the theories and reference levels in question.

The time differences encompass several orders of magnitude. The swiftness of the flow of information – e.g. from the attainment of knowledge to its application – is greatest in genetics and pharmaceutical research (only a few years). The complex relevance of ultimate causes is still unknown in some areas outside the realm of biology 150 years after Darwin, and the naturalistic fallacy (Hume's Law), 300 years after Hume.

(V) SUMMARY

From a historical viewpoint, the following transdisciplinary aspects crystallized: an "ideographic" aspect in which several humanities "cumulated" at different faculties of the universities (cf. Tab. 1), secondly a "systematic" aspect in which the topics are put in order (Tab. 2, 3) and a "nomothetic" aspect in which theoretical principles for a common transdisciplinary basis and a "Theory of Human Sciences" will be developed. The reference framework for those disciplines that deal with the functions of the nervous system has a very simple basic structure: It becomes clear when, based on the matrix with the four *central questions* of biological research *(causation, ontogeny*, adaptation, phylogeny), one asks and at the same time takes into account the *reference levels* (e.g. cell, organ, *individual, group)* at which the questions are aimed (Table 2 and 3). This "bio-psycho-social" four-question orientation framework is the basis for an transdisciplinary consensus and for a consistent networking and structuring of the scientific results. In this framework, as exemplified, *disciplines* with a reference to the performance of the nervous system, their *questions* and *results* can be allocated and intertwined with each other. In terms of epistemology, since the answers to the reference planes and to all four central questions must fit together without contradictions, misconceptions can thus be revealed by inconsistencies. This four question perspective could provide us with the knowledge of the nature of human beings that would enable us to better understand certain phenomena that are lived and experienced unconsciously and without reflection.

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