

UNITY AND DIVERSITY – THE WILLIAMS SUBJECTS’ MESSAGE

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Abstract

Williams subjects, due to a genetically based neuro-developmental disorder from birth, besides various medical problems, demonstrate a dissociation between cognitive and special linguistic processing, and a dissociation within language modules, language domains, and language mini-domains with reference to different languages. This dichotomous profile results from a deletion on one chromosome. What other genes on the same chromosome, not yet identified, or other genes on other chromosomes of the human genome, may be responsible for the same or similar or any other cognitive deficits and/or interactions of cognitive *and* linguistic deficits, and as such may reveal the specific processes located within specific modules, domains, and/or mini-domains across different languages and cultures, we do not know. What we need, however, is a unified consilient approach engaging the sciences and the humanities to integrate knowledge from various sources of investigation. Key-words: Williams syndrome – metaphors – consilience.

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Metaphors of Mind

If it is correct “that abstract concepts are largely metaphorical” and “that the mind is inherently embodied” (Lakoff & Johnson, 1999, 3), one might attempt to approach this Conference’s abstract topic *Unity and Diversity* and this special psycholinguistic Symposium’s subordinate topic *Studies on Unity and Diversity in Communication* by looking at some of the metaphors that have been proposed to conceptualize psycholinguistic phenomena, and to conduct psycholinguistic inquiry into the workings of the mind.

In their informative article “*The evolution of mental metaphors in psychology: A 90-year retrospective*” Gentner and Grudin (1985) examine the variation and progress of metaphors in the description of mental phenomena between 1894 and 1975. The project on which their article is based also aimed at the classification of mental metaphors according to the underlying analogical base domains. The mental metaphors found in a selection of contributions to the leading psychological journal *Psychological Review* were defined as “nonliteral comparisons in which either the mind as a whole or some particular aspect of the mind (ideas, processes, etc.)” are “likened or explained in terms of a nonliteral domain” (Gentner & Grudin, 1985, p. 182). The result of this research, as may be expected, documents remarkable shifts in the categorization of the analogical source domains used to describe mental phenomena in American psychology during the period mentioned above.

In this present paper we are not so much interested in the historical perspective of Gentner and Grudin’s work, nor in the implications, the quality or potential improvement of metaphorical language as a reflection of the general development of scientific methodology and reasoning during that time. We should rather focus on our topic, the Unity-Diversity dichotomy as being reflected through the application of certain mental metaphors concerning psycholinguistic phenomena.

Gentner and Grudin (1985, 184f; selection and emphasis is mine) categorize the 265 different metaphors they have found in their corpus into four major categories:

TABLE 1. Four major categories of metaphors

Category	Example
The animate-being metaphor	"ideas struggle with one another." (W. James, 1905)
The neural metaphor	"Thinking is neural impulses shifting along <i>associative</i> fibers from one area to another." (J. L. Dashiell, 1925)
The spatial metaphor (such as the <i>conduit</i> metaphor)	"Habitual connections between ideas . . ." (J. L. Dashiell, 1925)
The systems metaphor (such as the <i>computation</i> metaphor)	"Serial iterative operations . . ." (P. A. Carpenter & M. A. Just, 1975)

As a result of the developmental analysis of their corpus the authors come to the conclusion that the *animate-being metaphor* in course of time decreases considerably, whereas the *spatial metaphor*, although varying in dominance, is never dropped. This is no wonder if one considers the fact that "spatial-relations are at the heart of our conceptual system" (Lakoff & Johnson, 1999, p. 30). The *systems metaphor*, originally only playing a minor role in course of time more and more achieves a leading role, obviously an expression of the expanding insight into the complexity of the task to model the mind in analogy to basic metaphors.

Gentner and Grudin's research naturally does not cover the dramatic increase in the most recent assessment of mental activities in accordance with the *neural metaphor* in the light of the brain sciences. And neither have they been able to anticipate the recent development and prominence of the *spatial metaphor* as *conduit metaphor* and/or *container schema*, or, in a different vein, as *connection metaphor*. The same is true with the evolution of the *neural metaphor* and *systems metaphor* in connection with the most recent modelling of connectionist systems or the dramatic progress in analysing the human genome and

identifying various mental phenomena as being governed by genetic dispositions.

In this context they come back to an earlier argument by Gentner in that the explanatory strength of a metaphor rests on three principles: precision, plausibility, and systematicity. Yet maximal precision or plausibility or systematicity of metaphors in psychology at the same time may suggest "false credibility" as well. This problem is illustrated with the frequent unspecified use of the *computation metaphor*, whose particular specification at the same time may be responsible for the sacrifice of "a sense of richness that is possible with metaphors that are not fully specified, that retain a degree of vagueness" (Gentner & Grudin, 1985, p. 191). A certain fuzziness, in other words, appears to be a desirable characteristic of metaphors dealing with the *complexity* of psychological phenomena.

This position in Gentner and Grudin's article quite interestingly corresponds with Weimer's critical remarks concerning George Miller's famous article "Towards a third metaphor for psycholinguistics," published as early as 1974 in the Weimer and Palermo volume. In his concluding chapter Weimer focuses on the immense *complexity* of psycholinguistic phenomena since "higher mental processing involves comprehension as well as computation which is unsufficiently modelled through the *computation metaphor*," as proposed by Miller. In the end Weimer comes to the sceptic conclusion, "Perhaps the most important thing we can learn from this volume" (*Cognition and the symbolic processes*) "is how little we really know about the mind and its place in nature. Perhaps a future volume will be able to present a more sophisticated and complete view of our ignorance" (Weimer & Palermo 1974, p. 440). More of a quarter of a century later we seem to know today more about the mind and the unity and diversity of its inherent structure and processes. There can be no doubt that the research on the WS has contributed to this remarkable gain in our knowledge.

George Miller in his article "Towards a third metaphor for psycholinguistics" (1974) distinguishes between two recent phases in the history of the psycholinguistic study of child language acquisition,

- phase one (in the 1930s and '40s), guided by the *association metaphor*, and dealing with the developmental acquisition of vocabulary by language learners, and

- phase two (during the '50s), guided by the *communication metaphor*, and dealing with the developmental successive stages in the acquisition of grammar by learners of language.

Whereas the *association* metaphor stands for "a special chapter in the psychology of *learning*" (Miller, 1974, p. 401), the *communication* metaphor signals an intermediate stage in the direction of the processing perspective, but does not incorporate meaning. Miller's argumentation for a third metaphor for psycholinguistics, the *computation metaphor*, aims at the study of "what a person *is doing* when he produces or understands linguistics signals" (Miller, 1974, p. 404). "To focus on what people are doing helps narrow down our search for a new metaphor. Whereas the first metaphor" – the association metaphor – "led us to look for connections between words and things, and the second" – the communication metaphor – "led us to look for rules characterizing acceptable signals, the third" – the computation metaphor – "should lead us to look for procedures involved in using language" (Miller, 1974, p. 404).

All three metaphors, to be sure, on different levels describe what Miller assumes to occur *within* language learners, or to put it differently, they are the embodied expressions of a container schema perspective.

Miller, in this article, is interested in a historical development over a period of about thirty years, a shift in perspective from *learning* or *acquiring*, expressed through the *association* metaphor, to *doing* or *processing*, expressed through the *computation* metaphor at the time of the publication of his paper, the mid-'70s. Terminologically he does not clearly differentiate between *acquiring* language and *processing* language yet.

The main focus of Robert Sternberg's book *Metaphors of mind*, as the subtitle *Conceptions of the nature of intelligence* suggests, is a compilation of historical and contemporary theories of intelligence, as they have been "guided by underlying metaphors of mind." It basically

assumes that “to understand the theories and their interrelations properly, one has to understand the underlying metaphors” (Sternberg, 1990, p. IX). Although we are not focusing on the concept of intelligence, Sternberg’s perspective and his discussion of a wide variety of metaphors remarkably contributes to the discussion of this paper’s topic, *Unity and Diversity*, as well. This particularly concerns his method of categorization and listing metaphors according to their *loci* of intelligence within a virtual space. In following the various expert contributions to the 1986 Symposium on contemporary viewpoints on the nature and definition of intelligence Sternberg and Dettermann in 1986 identified three main *loci* of intelligence, “intelligence *within* the individual, intelligence *within* the environment, and intelligence *within* the interaction between the individual and the environment” (Sternberg, 1990, p. 36). This threefold categorization provides the levels of description for the respective metaphors of mind guiding the relevant theories of intelligence. These levels of metaphorical description of mind,

- looking inward *within* the individual,
- looking outward *within* the environment, and
- looking inward and outward *within* the interaction between the individual and the environment are of particular relevance for us.

Metaphors of mind, belonging to the first category are

- *geographical* metaphors, viewing the mind as a map,
- *computational* metaphors, viewing the mind as in information processor,
- *biological* metaphors, viewing the mind in terms of the operations of the central nervous system,

- *epistemological* metaphors, viewing the mind in terms of internal organizational structures.

Metaphors of mind belonging to the second category are

- *anthropological* metaphors, viewing the mind in terms of cultural differentiation,

- *sociological* metaphors, viewing the mind in terms of the effects of socialization,

Metaphors of mind belonging to the third category are

- *systems* metaphors, viewing the mind in terms of a complex interaction of various cognitive and other systems.

This categorization of metaphors of mind underlying Sternberg's seminal book on the conceptualization of intelligence is part of a much wider discussion taking place in the '90s, dealing with the problem of levels of investigation, distinguished as levels of *analysis* and levels of *organization* and their integration under the general topic *brain* and *cognition*. "The hope that biological and cognitive levels of investigation might be integrated has had a long history. Once it became evident that the operations of the brain were essential for thoughts and actions, discovering the biological basis for mental functions was an abiding objective. A number of developments have improved the prospects that some of the biological mechanisms underlying cognition may be discovered in this century (. . .) These developments suggest that it is now possible to begin to integrate levels and to construct theories to explain functional properties of neural tissue" (Sejnowski & Smith Churchland, 1989, p. 301). This task of integrating levels of organization *within* the individual with those *within* culture and cultural differentiation, and *within* the boundaries between the individual and culture is governed by the container schema. "When we conceptualize

categories (. . .), we often envisage them using a spatial metaphor, as if they were containers, we also impose complex hierarchical systems on them, with some category-containers inside other category containers. Conceptualizing categories as containers hides a great deal of category structure. It hides conceptual prototypes, the graded structures of categories, and the fuzziness of category boundaries" (Lakoff & Johnson, 1999, p. 20).

Needless to say, the preceding discussion of earlier and contemporary metaphors of mind and their possible integration may be seen as an attempt to integrate biological and cognitive constructions of the inherent workings of the mind in order to shed light on the theoretical and methodological implications of *Unity and Diversity*. This is in line with our assumption that we might get some essential insight into this topic from the lesson Williams subjects may teach us now at the beginning of this present century.

Consilience and the Williams Subjects' Message

Analysing its objects of investigation through dissecting them into their constituents characterizes classical scientific methodology. It is the consequence of a perennial historical development of dealing with the ever increasing organizational complexity of reality. But such theoretical and instrumental fragmentation may at the same time appear as an artifact. Synthesis and integration between various sciences and their subdivisions, and, on a higher level of theorizing, between the natural sciences on one side and the humanities and social sciences on the other after all may promise a more appropriate holistic view to cope with this complexity. Coherence of scientific questioning within and across levels of natural and social organization and within the human mind may promise a deeper approach to gain insight into the problem of Unity and Diversity. Construction of coherence, *Consilience*, may be the "key to unification" of knowledge (Wilson, 1998, p. 8). Such a "belief in the intrinsic unity of knowledge (. . .) rides ultimately on the hypothesis that every mental process has a

physical grounding and is consistent with the natural sciences" (Wilson, 1998, p. 96).

Wilson's vision of a consilient holistic theory of the human mind, of human society, and of the ultimate structure of human knowledge and knowledge acquisition, reaching from the genetic and neuro-functional to the cultural level, is expressed in the following passage, which may serve as the conceptual framework for the following resumé of the Williams subjects' message.

"Culture is created by the communal mind, and each mind in turn is the product of the genetically structured human brain. Genes and culture are therefore inseverably linked. But the linkage is flexible, to a degree still mostly unmeasured. The linkage is also tortuous: Genes prescribe epigenetic rules, which are the neural pathways and regularities in cognitive development by which the individual mind assembles itself. The mind grows from birth to death by absorbing parts of the existing culture available to it, with selections guided through epigenetic rules inherited by the individual brain" (Wilson, 1998, p. 127; emphasis is mine).

Williams Syndrome (WS), often also referred to as Williams-Beuren-Syndrome, is a genetically based neuro-functional and neuro-developmental disorder, present at birth. It affects males and females equally. It is found in all ethnic groups in countries all over the world. Estimations concerning the number of cases vary between maximally 1 in 20 000, may be down to 1 in 50 000, live births. Some of its physical, mental, and phenotypical features were first independently described by J. Williams et al. in 1961 and A. Beuren et al. in 1961, 1962, and 1964. Its genetic origin was first discovered by A Ewart et al. in 1993 and expanded in 1994. Their seminal work describes a micro-deletion that involves the elastin gene locus in a very high percentage of WS cases. This deletion may also effect contiguous genes such as LIM-kinasel.

Elastin, a protein, is the main constituent of elastic fibers. WS patients lack one band (7q11.23) in one of the copies of chromosome 7. This band may contain 15 or more genes. Not all of them have been identified yet. Thus it may well be that some of the physical and mental deficits in WS subjects may be caused by deletions of additional genetic information and/or the interaction of any genetic items of information not known yet.

Williams subjects occasionally suffer from an insufficient structure of the cerebral cortex, of heart and blood vessel problems, such as aortic stenosis, elevated blood calcium levels (hypercalcemia), low birth weight, slow gain of weight during infancy, feeding problems, dental and kidney abnormalities, musculoskeletal problems, developmental delay, and a striking discrepancy between chronological and mental age. A frequently observed sensitivity to rhythm and sensitive hearing (hyperacusis) among various WS patients may be one of the reasons for their surprising musical performance as singers and players of musical instruments (violin, accordion). Many WS show dysmorphological features, that is, elfin-like faces, characterized by a broad forehead, a small upturned nose, a wide mouth with full lips, a small chin, and a certain "puffiness" (swelling around the eyes).

Williams individuals are likely to exhibit impulsive social behaviour which enables them to initiate, foster, and sustain intense interpersonal relations, not only with their parents, siblings, or peers, but quite often with unknown people when first meeting them, such as medical doctors, experimenters and researchers. This astonishing social behaviour may be due to their highly developed ability to perceive, recognize, and memorize invariant facial features in canonical and uncanonical perspectives. It gives great pleasure to talk and interact with them even if done for the first time. What is surprising is their positive influence on family relations and an almost total absence of stigmatization, so often experienced by disabled people and their families in the public. Despite their occasional need of medical help WS children, adolescents, and adults in most instances lead active lives, preferably within the private context of their parents' homes.

Their unusual hypersocial behaviour, however responsible for the establishment of social contacts it may be, is probably neurofunctionally caused by an atrophy of the amygdala, a small neural structure beneath the temporal lobe, which is crucially responsible for the recognition of faces in that it contributes to the adequate perception of invariant and variant features of faces in communication.

Physical and mental symptoms vary considerably among WS subjects. They exemplify, in other words, symptomatic *diversity* on certain genetically based levels of investigation and description, and *unity* on higher levels of investigation and description aiming at a coherent systematic classification. This is the Williams people's message. Actually no two individuals are totally alike. Reading skills, for instance, are highly variable. Some of them learn to read comparatively well at normal chronological age. Others begin to read late and their reading skills remain poor for the rest of their lives.. Little seems to be known about the acquisition and development of written language; their perception and production of speech definitely needs more research across different languages and cultures.

What is most interesting for us in this present context is the dissociation between cognition and language, and the dissociation of language generation in general and partial islands of linguistic competence among WS subjects, in particular.

Williams subjects show severe deficits in various nonverbal visuospatial cognitive tasks:

- They utterly fail to perceive and copy the simplest structures, such as simple rhombic gestalts or capital letters ("D" or "A") (Delis Hierarchical Processing Task). Their reconstructions of ordinary animals or objects, such as elephants and bikers, resemble deconstructed reductions of unified gestalts to crucial basis elements, such as "nose" (trunk), mouth, eye, ear, and head in the case of elephants (Bellugi et al., 1994), or a person riding a bike, represented only through its wheels, chain, and pedals (Bellugi et al., 1992). Whether such deconstructions, undoubtedly symptoms of cognitive deficiency in the case of Williams children, may be related to similar configurations in modern painting

and as such be interpreted as the expression of deeper insight into elementary structures of gestalts, remains an open question, worth to be discussed.

- They develop only rudimentary skills in arithmetic and canonical tasks of cognitive developments, such as seriation or conservation.

Until only recently Williams subjects have been assumed to exhibit a remarkable advantage of verbal performance over such nonverbal cognitive tasks. They have been supposed to produce intact spontaneous speech fluently across various types of oral discourse, narration, and the reconstruction of picture stories in accordance with rules of syntax, correct choice of words, etc. It has only been conceded that such an advantage of verbalization versus nonverbal cognition might not be expected within their early stages of language acquisition. But, generally speaking, no serious deficits in the oral production of WS subjects have been admitted, for instance that at least some of their verbal utterances are “peppered with florid, erudite sounding vocabulary items” (Karmiloff-Smith, 1997, p. 247), neither found in the verbal productions of other mentally retarded patients, nor, in those of normal subjects, either.

Crystal, a 16-year-old Williams adolescent, provides an excellent example of the verbal presentation of her self (reported by Rossen et al., 1996):

“You are looking at a professional book writer. My books will be filled with drama, action, and excitement. And everyone will want to read them. I’m going to write books, page after page, stack after stack. . . . I’ll start on Monday.’
Crystal can spontaneously create original stories – she weaves a tale of a chocolate princess who changes the sun color to save the chocolate world from melting; she recounts with detail a dream in which an alien from a different planet emerges from a television. Her creativity extends to music; she has composed the lyrics to a love song.

Crystal describes a meal as 'as scrumptious buffet,' an older friend as 'quite elegant,' and her boyfriend as 'my sweet petunia'; when asked if someone could borrow her watch, she replies, 'My watch is always available for service'" (quoted from Pinker 1999, p. 260).

In the light of this sample more should be known about the pragmatics of other Williams subjects' discourse and the possibility of a dissociation from normal children's verbal perception and production and their way of speaking and presenting themselves in ordinary oral discourse

Fodor in his famous volume *The modularity of mind* (1986) suggests that the mind may consist of genetically based, independently functioning and informationally encapsulated special purpose modules, that is, systems running their own computational programs. Such self-contained systems, the *modules*, only process specific data from specific lower level knowledge sources. The speech module, the visual perception module are examples Fodor mentions in this context. A *diversity* of special computation instead of a general *unity* of computation according to this theoretical approach takes over specialized tasks.

Researchers following Fodor's proposal of specialization have introduced the concept of special *domains*, responsible for the processing of specialized units of the mind, such as the *syntactic domain* or the *semantic domain*, following lower level *linguistic* categories of language (syntax, semantics). This notion may be taken as a further step in an attempt to explore and describe the *diversity* of the mind as seen in the light of *linguistic* descriptive terms. In such a vein A. Karmiloff-Smith and her associates (1992, 1995) have introduced the concept of *mini-domain*. Within larger *domains* such *mini-domains* represent even more refined subsets of the language module. I shall use this distinction in the following resumé of an important aspect of their work relating to specified aspects of the verbal performance of Williams subjects.

The remarkable social behaviour of Williams individuals, an important component of which is their verbal ability, for a long time has been held as an indication of an intact or almost intact general language “module.” Such a claim of intactness of linguistic proficiency covering various linguistic tasks would imply, for instance, proficient morphosyntactic rule application.

The concept of an uninhibited intact language competence located at a unified language module among Williams subjects has been seriously challenged, as we have seen, by A. Karmiloff-Smith and her associates in favour of a concept of dissociation of different linguistic domains and dissociation of different mini-domains in the perception and production of language.

In the *first part* of their experiment Karmiloff-Smith et al. (1997) analysed the *receptive* skills of twenty British monolingual late adolescent and adult WS subjects on a standardized grammatical morphosyntactic test (TROG). These subjects had a median verbal IQ of 66 and a median performance IQ of 54. In the TROG Test subjects listen to simple lexical items (nouns, pronouns, prepositions, etc), phrases, and sentences and are asked to identify one of four pictures that represents a certain equivalent morphosyntactic structure.

The WS participants in this experiment showed comprehension problems with a number of certain grammatical test items. These results closely correspond with the performance of Italian speaking Williams subjects.

The *second part* of Karmiloff-Smith’s experiment was based on *production* data focusing on grammatical gender in French. In this language, as in other highly inflected languages, such as Italian or German, there is no substantial concordant agreement between grammatical versus natural gender in article-, noun-, and adjective-morphology. That is to say, natural gender does not regularly determine grammatical gender. Languages such as French are characterized as complex arbitrary systems of gender attribution which during language development must be acquired by rote. This is a complicated time consuming task normally productively achieved by first learners of

French as late as 4 and 5 years of age. Although gender attribution is not based on semantics, it may be guessed probabilistically on certain word endings of nouns. Such probabilistic “rules” are sometimes used by second language learners. A lack of gender attribution is a safe indicator of language loss for first language speakers in a foreign language context.

The experimental group participating in this second part of the experiment consisted of 14 monolingual French speaking WS teenagers with an IQ ranging between 51 and 67 and a median chronological age of 15,9 years. 18 normal monolingual speakers of French with a median of 5,1 years of age were chosen as the control group. In a complicated procedure all participants were shown real words and nonce words related to differently coloured pictures of objects and animals in order to test their capacity for gender assignment due to the article or anticipated “regular” word endings. Williams subjects, although considerably older than the control group, made significantly more errors in attributing correct gender agreement in comparison with the normal group.

Gender attribution and gender agreement in the morphology of French articles, nouns and adjectives as well as word order in real and nonce words in this experiment is revealed as a characteristic mini-domain in the production of French, an island of linguistic processing within a larger domain, which falsifies the concept of a unified language module and unified domain of morphological processing in French. This experiment rather discloses certain significant deficits in gender attribution and concordance within a mini-domain of morphological inflection Williams subjects have to cope with. This is a grammatical phenomenon first language speakers and second language learners of English are (almost) not confronted with. This may explain why the previous analysis of English production data has not provided similarly convincing insight into the diversity of language processing within mini-domains as shown in the productions of French speaking Williams subjects.

Conclusion

Williams subjects, due to a genetically based neuro-developmental disorder from birth, besides various medical problems, demonstrate,

- a dissociation between cognitive and special linguistic processing, and
- a dissociation within language modules, language domains, and language mini-domains with reference to different languages.

This dichotomous profile results from a deletion on one chromosome. What other genes on the same chromosome, not yet identified, or other genes on other chromosomes of the human genome, may be responsible for the same or similar or any other cognitive deficits and/or interactions of cognitive *and* linguistic deficits, and as such may reveal the specific processes located within specific modules, domains, and/or mini-domains across different languages and cultures, we do not know. What we need, however, is a unified consilient approach engaging the sciences and the humanities to integrate knowledge from various sources of investigation. This appears to be the message we may gain from the present state of the art concerning the verbal and social behaviour of Williams Subjects embedded within, what we might call, the Williams culture – in each case being an integral part of a larger consilient culture.

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