



Cognitive Science Online

*A journal published by the
Department of Cognitive Science, UCSD*

Vol 3, Issue 1, 2005

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Column: Interview with Annette Karmiloff-Smith



Professor Annette Karmiloff-Smith is a highly influential developmental and cognitive scientist who has made significant contributions to our understanding of normal and abnormal development. She received her PhD from the University of Geneva, where she studied with the father of developmental psychology, Jean Piaget. She has been the recipient of many awards including most recently, the European Science Foundation Latsis Prize 2002 for Cognitive Sciences and she has been awarded an honorary doctorate from the University of Louvain. Additionally she has been elected a Member of the Academia Europaea, a Fellow of the British Academy, a Fellow of the Royal Society of Arts, and a Fellow of the Academy of Medical Sciences. Currently, she is Head of the Neurocognitive Development Unit at the Institute of Child Health in London, where she directs cutting edge research on neurological and genetic bases of cognitive development in typical and atypically developing populations.

This interview was conducted by **Arielle Borovsky**.

CSO: What first brought you to study development and then abnormal development?

Prof. Karmiloff-Smith: I was living in Geneva, Switzerland and working as a simultaneous interpreter for the United Nations different organizations. I was bored because I was always repeating other people's thoughts and not allowed, as interpreter, to have any of my own. So I decided to go back to university and origin thought of medicine, particularly child psychiatry. I was therefore often in the university bookshop looking at books under "P" Psychiatry and naturally also noticed those by Piaget on Psychology. Well, one day he walked into the bookshop (I recognized him from photos on his books), picked up an ordered book and crossed the UNI building. I followed him and audited his class. I was utterly amazed. Un coup de foudre! Psychology turned out to be much more than measuring reaction time. For Piaget it included epistemology, logic, philosophy of mind, philosophy of science, etc. I was hooked, signed up that autumn and did my degree (licence) in psychology at Geneva University. There I developed my absolute passion for research. After a number of years working on normal development (with a gap in between working for years in the Palestinian refugee camps in Beirut) and doing my PhD in Geneva, I

moved to London to the Medical Research Council's Cognitive Development Unit. There, several colleagues were working on autism and Down syndrome, so I got to learn a lot about atypical development...and to criticize the non-developmental way which it was mainly studied, which brings me to your next question.

CSO: You have often criticized application of a static model used in adult neuropsychology to developmental disorders - Could you tell us more about this?

Prof. Karmiloff-Smith: If you study adult patients, you are studying a brain that has developed normally until the brain insult in adulthood. Hardly surprisingly, the adult brain is highly specialized, so when brain injury occurs, it can seem as if the brain is very modular. But that logic cannot simply be transferred to the understanding of development. The brains of children who have genetic disorders do not develop normally from embryogenesis onwards. This means that a tiny impairment early on can have enormous cascading effects as development proceeds. Moreover, it will have differential effects on different emergent domains depending on the problem space in the domain. So, what looks like a specific impairment in, say, a five year old, may actually involve slighter impairments elsewhere in the system if properly tested for. Furthermore, although, say, vocabulary seems to be the only domain that is impaired in a child, much lower-level impairments in, say, attention or eye movement planning may subsequently impact on the domain of language learning. So we cannot conclude that a gene is, say, directly implicated in language. It may be implicated in some lower-level process that itself affects language learning. Hence, why it is crucial to study children developmentally.

CSO: What do you think the next step is in the study of development?

Prof. Karmiloff-Smith: Definitely far more in-depth longitudinal studies to compare to the cross-sectional studies. But the longitudinal studies must be hypothesis-driven not mere observational. Also we need to better understand what the full details of the child's environment consist of. And all studies should start from birth, or even from final months of pregnancy during which a lot is learned in the auditory modality for instance.

CSO: What are the most important things that we have learned from studying the biological bases of developmental disorders? At this point, do we need new theories or more data?

Prof. Karmiloff-Smith: Paradoxically, the most important thing we have learned is that developmental disorders are developmental! Without a developmental perspective on gene expression, the motor system, language and cognition, scientists draw the wrong conclusions. From my neuroconstructivist perspective, we do not need a new theory but far more detail to fill in gaps in the existing theory that I espouse. Here I find computational modeling of much relevance. How are genes expressed, how do genes and environment precisely interact, what is the child's detailed environment etc.? The data we need are cross-domain data: the study of multiple domains longitudinally to separate domain-general changes from domain-specific ones. Cross-sectional data cannot address this crucial issue.

CSO: You have done a great deal of research on genetic, behavioral and neurophysiological factors in development using several populations. Having become an expert in so many fields, do you think there is one particular field that is most promising, or lagging behind another?

Prof. Karmiloff-Smith: No, one field will never solve the problem of human cognition. It is only via interdisciplinary approaches that we can advance the field. But it is impossible to become an expert in so many fields (I am not!), so intense and fruitful interdisciplinary collaboration is vital.

CSO: As a very successful woman scientist, what advice would you give to other women now who are starting to follow the same career path?

Prof. Karmiloff-Smith: Don't forget that you are a woman! You can be a top scientist and a mother, if you want to (I have 2 daughters and 7 grandchildren and love it), and you can be feminine and intelligent! Students often think that successful female scientists must be boring blue stockings. On the contrary. Don't let men (or women) put you down. And don't ever put yourself down in public. I have heard women say things like: "this isn't really a theory but..." and then go on to develop a sound theory. I have never heard a man say such things. Also, you should develop a strong theory and don't give it up too easily, but do be ready to modify it if the data scream for you to do so! Don't be arrogant and be a good listener to others. Learn to delegate, and promote your students as much as you can. They need you. Above all, only do research if you feel passionate about it - you have to work very hard (8 days a week) it is physically and psychologically demanding, and the data aren't always kind! But it is such fun.

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