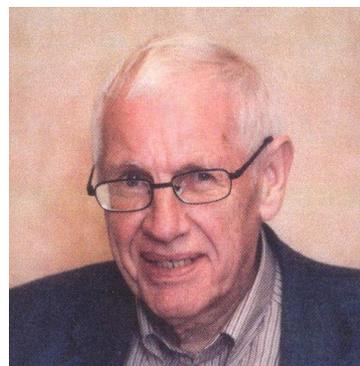


## **Ingvar Lundberg**

- 9/30/1934 in Stockholm
- B.A. (1960) University of Stockholm, Ph.D. (1964) Fil Dr Umea University

### **Major Employment:**

- Umea University – 1989-1995, Professor of Developmental Psychology, 1990-1994, Vice Dean of the Faculty of Social Sciences
- Goteborg University – 1995-Present, Research Professor



### **Major Areas of Work:**

- Reading and writing
- Learning disability including dyslexia and mathematical difficulties,
- Language development

## **SRCD ORAL HISTORY INTERVIEW**

### **Ingvar Lundberg**

Interviewed by Annika Dahlgren  
At the Department of Psychology, Göteborg University  
November 1, 2005

**Dahlgren: SRCD oral history interview, Professor Ingvar Lundberg interviewed by Annika Dahlgren both at the Department of Psychology at Göteborg University first of November 2005.**

**Before starting this interview, Professor Lundberg, I would like to say some words that I feel really honored to be the one who is--has this possibility to do this interview with you, because you were one of my very first teachers at the University of Umeå Department of Psychology almost 40 years ago, and one of the persons that I remember most of all from my study period. So really this is a special occasion also for me. Professor Lundberg, would you please describe your family background, along with childhood and adult experiences that might be of interest?**

Lundberg: I was born in Stockholm in the year 1934. That's more than 70 years ago. I grew up in a poor neighborhood with a high criminality rate, lots of abuse, delinquency, and lots of children. Our own family consisted of six children and a mother with serious health problems, and I had to spend long periods during my childhood in various sorts of institutions outside the family. My father was a ward at the mental hospital with a very low income, and irregular working hours. During my early years I attended many different schools due to my periods in institutions, but I was encouraged by my teacher to apply for secondary school, and managed the entrance examination and was awarded various scholarship. But still, I had to work from early age to support myself, and my first job was at the shoemaker by the age of ten. From the age of 15 I was a mailman, and I also worked at the printer's office. Eventually I had to enroll in the army, and then I was trained as an expert on cryptal techniques, that is, codes and ciphers, and I even was appointed a teacher of this skill. And before I went into higher education, which was very uncommon in the quarters where I lived, I actually had a job as a sales manager for a firm in the ad and marketing business. Yeah, that was my background before I started my career so to speak.

**Dahlgren: And so what about early adult experiences could you tell us about that have been of importance to your intellectual development, collegiate experiences, for example, and so on?**

Lundberg: Yeah, I was trained as an elementary school teacher, because university studies was definitely not within my economic reach, and the availability of scholarships was unknown to me these days. So I

was trained as an elementary school teacher and taught in schools in the capital of Stockholm for about four years, primarily boys at the age of 12 to 14. But at the same time I started at the university on courses in psychology, sociology, political science, mathematics and education, and I was appointed teaching assistant at the psychology department at the University of Stockholm and took my so called licentiate degree in 1963, which was then these days roughly equivalent to an American PhD. And I also wrote a thesis on perceptual learning. I'd also worked with psychophysics and scaling in Gösta Ekman's lab, and published a paper on an extension of psychophysics, also to include memory quantities. So at this lab I was trained in experimental methods, scaling, statistics, and of course, perception. Developmental psychology did not even exist these days as a separate field, at least at the University of Stockholm.

**Dahlgren: So where did you find your interest in child development? What are the origins of this interest?**

Lundberg: It was actually at a meeting with a book by Flavell on the psychology of Jean Piaget in the early '60s. It was indeed a strong experience. None of my colleagues these days seemed to take an interest in child development, but still Gösta Ekman in psychophysics and Mats Björkman, who was then a learning psychologist, both have meant a lot for my further development. And I participated in an extended series of seminars with Mats Björkman, and we discussed James Gibson and also his wife, Jackie Gibson, a lot, Donald Hebb, and more and more Egon Brunswick and his probabilistic function ideas. But still, we were far from developmental psychology. My training and my background as a schoolteacher, however, kept me on a sort of sidetrack all the time, which eventually would lead me towards developmental psychology. For example, the Swedish National Board of Education was about to introduce set theory into basic mathematics education in the school system, and I was asked to join a working group to penetrate that issue, and my training in mathematics, as well as my earlier teacher education was relevant in this respect.

**Dahlgren: So you would say then as research mentors Mats Björkman and Gösta Ekman were the primary personalities--**

Lundberg: Oh definitely--

**Dahlgren: Are there any political and social events that have influenced your research?**

Lundberg: Yeah. By the end of the '60s and the beginning of the '70s we felt, many of us, an increasingly hard pressure from some students and the general public to demonstrate or to prove the relevance of our academic work in the ivory tower. And I had been much inspired by the cognitive revolution and the new psycholinguistics. Attention, short-term memory, item and order information was then the focus for my experimental work. So the step was not especially long to face the educational challenge of understanding learning disabilities, which certainly was a very relevant issue. I found actually reading to be a real challenge. I could cite actually the words of Edmund Huey, which I have written here, "And so to completely analyze what we do when we read would almost be the acme of a psychologist's achievements, for it would be to describe very many of the most intricate workings of the human mind." And these words inspired me a lot. It's certainly not a political challenge, but it's an intellectual challenge. But the political dimension was that people who fail to acquire an acceptable level of skill in this field run certainly a serious risk of being losers at the labor market and as participants in a democratic society. And of course, my background and my childhood played a part in my decision to try to devote my energy to explore these highly relevant social issues to help young people to take the steps into literacy in a better way. And I realized that this is not just an individually related problem; it's also a social problem of dignity. Yeah.

**Dahlgren: So would you characterize the development of your ideas in the field of child development as evolving in a rather straightforward fashion, or in a way that you would rather describe as involving sharp turns in theoretical views of research style?**

Lundberg: I would not regard it as a very dramatic change, because I all the time had my interest in developmental processes, and I also found that the research tool was the methodological tools that I had acquired during a rather extended period of training. Also, these tools were relevant for my study of learning and learning disabilities. My first step in my research career was taken a very long time ago,

actually already at the teacher's college under the mentorship of Carl Ivar Sandström, and we looked at gender and age differences in spatial localization among school children from the age of eight to fifteen. And the theoretical inspiration for this work was provided by Herman Witkin and his ideas about cognitive styles, field dependence, and field independence. So my next step after some years as a schoolteacher in Stockholm was taken in 1959 with Mats Björkman, and I started to apply psychophysical scaling techniques to the study on memory. I thought that if a percept could be related to a physical quantity with a power function, a special mathematical function, why could not memory magnitude be related to perception magnitude with the same kind of function. And it turned out to be a very good fit, and you could also study the changes in parameters of this function as a function of time. So I thought this was interesting, fascinating and fun to do this kind of work. But focusing on memory, then it wasn't too big a leap to go into learning, and especially perceptual learning and ask the question, what is actually learned in perceptual learning. Was the learning process a question of cue detection and differentiation, or was there a component of verbal association involved? And I approached these questions in a series of experiments where the possibility of applying information theory which was in vogue these days, to quantify the stimulus complexity and the response patterns. The fourth theme also concerned information processing, and was inspired by the new cognitive psychology at the end of the '60s, and then the theoretical issue in focus was now the distinction between item information and order information. And in a long series of experiments at the psychology department at the University of Umeå I think I quite convincingly demonstrated that temporal order, spatial order and item information were independent to process, and the recognition or identification of an item is less different from the processes involved in temporally and spatially relating the items to other items in a sequence. This is still very basic research, but is tied to the classic problem of serial order and behavior. And I've noticed these days that quite a few people are very interested in this issue. It has been a sort of revival of it, and sometimes I'm tempted to go back to it. Yeah.

**Dahlgren: Should we go on?**

Lundberg: Yes.

**Dahlgren: Yes? When you talk about this research I can't help commenting that I remember this very well from our work at the department of psychology in Umeå. If we turn to other personal research contributions, what were your primary interests in child development at the beginning of your career?**

Lundberg: It's still related to my experience as a schoolteacher and the reading of Piaget, first through the introduction by Flavell, but also then reading himself. I actually saw him at the World Congress in London. I think it was in 1969, and he was, of course, a very remarkable person, and very inspiring, and he played some part in my development. But also, the fact that I had come across young pupils at my school who seriously failed in becoming literate, although they seemed to be reasonably gifted in other fields. So that was really interesting to try to explore why some children have such difficulties in acquiring literacy, and of course, and this is a question closely related to language and the psycholinguistics had come in vogue these days, so it was quite natural to think in terms of child language development and aspects of child language which should have a very clear relevance for reading, for example, the phonological aspect of language development. And then during these days I think these forces all converged towards my current and long lasting interest in literacy and language in development.

**Dahlgren: And so what continuities would you say in your work are most significant or what shifts occurred?**

Lundberg: I don't think a major shift occurred. Let me try to elaborate a little bit on this point. During the '70s secondary education had become available to a vast majority of the Swedish population. The labor market had become more knowledge demanding as new techniques had been introduced, civic life increased in complexity, urbanization, new media, information technology, the enrollment of women in the labor market, increased mobility across borders, etc. It changed living conditions dramatically for most people, and I saw that the basic prerequisite for functioning in society and for success in further education and on the labor market was a high level of literacy, and those who failed to reach this level ran serious

risks to stay outside. And considering this increasing societal importance of reading and the advances in the scientific basis, it was then quite natural that reading research became a rather hot field in the '70s. As in many other countries, research on reading and spelling had typically and traditionally been the responsibility for educational departments, not psychology, but in education the response to the zeitgeist was turning away from the individual learner to the general system of education in society, philosophical issues and macro sociological analysis rather became in vogue. And the increasing diversity of the educational system also marginalized reading instruction in the view of many educationalists who had to face many new problems and challenges related to secondary education. So an experimental psychologist with interests in cognition, in psycholinguistics, in learning and child development could--they could now easily fill the empty space left by educational research. And the final converging force here was, of course, also related to my involvement in textbook writing together with Mats Björkman and David Magnuson in the '60s. During these days the publishing houses had been influenced by art directors, copywriters, designers and other people from the ad business in the design of school books, and now we came right into this and asked ourselves what makes a readable text, and so our interest in reading came also this way, because it was quite natural to ask what--how should you write, how should you arrange the page, the text page, typographically and how should the interaction between pictures and text be organized in an optimal way. So then I became quite aware of the lack of research in this field, and I also felt that psycholinguistics had the potential of bringing about a contribution. But this psycholinguistic orientation also brought me into contacts with researchers in phonetics, such Björn Lindblom, earlier in Stockholm, but later in Austin in Texas, and Gunnar Fant at the Royal Institute of Technology in Stockholm, and later the Haskin's group under the leadership of Al Liberman in New Haven and his wife, Isabelle Liberman. They had a very strong influence on my thinking about basic issues on the causes of reading difficulties. Yeah, as I somewhere expressed it citing the Duchess in Alice in Wonderland, "Take care of the sense, and the sounds will take care of themselves." That's the natural thing in oral language development, we're focused on the sense, and the sounds take care of themselves. But when you're about to learn how to read you have to focus on the sounds also, because they don't take care of themselves. You have to be explicitly aware of the basic building blocks, and this was the starting point, and that has been the continuous effort over the years, to reveal how this actually works.

**Dahlgren: Could you please tell us some more, go on on the same line?**

Lundberg: Yeah. I started to do research on phonological awareness and how it's related to reading acquisition, and how this attention to the sound structure of the spoken language is related to later success or failure in learning to read. Actually, this association is one of the most robust findings in developmental and cognitive psychology. It has been replicated over and over again, not only in Swedish, but in many languages of the world. And yeah, we actually have few examples of more robust fact and finding in our field, so in that sense it should be regarded as sort of success story. A commonly held view is that reading instruction is a necessary prerequisite for the development of phonetic awareness. However, we have demonstrated that this can be developed, at least in Scandinavia, outside the context of formal reading instruction without the use of letters or other elements of early reading instruction. It's actually an advantage to do research on this matter in Sweden and Denmark, because we have a late school start, and we have lots of quite healthy and gifted seven year olds who can't read, but we can discover phonemic awareness among them before they actually have learned how to read. And we have also demonstrated that it's possible to instruct them so that they acquire this awareness during the preschool years, and those who have enjoyed the benefit of this stimulation practice and games, they profit from it in the sense that they do not run the risk of failure to the same extent. We actually have looked carefully at the risk children, who we predict should have big difficulties in learning to read, in normal circumstances, but when they had the opportunity to develop this phonological awareness before they started school they actually were prevented from developing problems. And then this is also sort of a practical finding, which is extremely important, but theoretically, yes, it has its significance. We've demonstrated that the effects of our program were very specific and not a general stimulation effect that involved mathematics, or vocabulary, or any other aspect of early development, but it was focused directly on phonetic awareness. When we followed these kids through four school years and we could assess reading and spelling on several occasions, they still outperformed comparison groups on each of twelve points of measurement indicating thus the beneficial affect of this preschool program. But this longitudinal approach, when we repeatedly measured the same thing over and over again, paved the way, of course, for looking at growth curve analysis, and in growth

curve analysis you look at the individual trajectories over time and look at the intercepts, or slopes, or other parameters, and you see that there are individual differences. Some individuals have a fast accelerated development, others are very slow, and then you can ask the question, how come. Why are some individuals so fast and efficient in their development and why are some others so slow? So the variance in this parameter, the slope parameter, could be accounted for by reference to various background factors like socioeconomic status, preschool experiences, health, intercept and so on. So this is an interesting tool for exploring developmental issues, but then we face a very difficult problem to do repeated measures of the same thing. It can either include test/retest problems, but it could also be the case that we are measuring different things at different levels of development, so the scale properties must be questioned. Do we--are we dealing with a uni-dimensional aspect of functioning, or is it multi-dimensional, or is it a pattern that is changing over time? These questions all are very basic, and very difficult, and not very well solved yet, but we are interested in looking at it. And we also can see that phonological awareness involves different components. In some big studies, including more than 1,500 children in preschool and grade 1, we tested rhyme recognition, syllable countings, initial phoneme identification, phoneme deletion, phoneme synthesis and phoneme counting, etc., and in a principal component analysis we could extract three basic factors; one phoneme factor, one syllable factor and one rhyme factor. And these are separate predictors of early word reading ability, and of course, the phoneme factor is the most powerful predictor, not unexpected. But it's important to have this big data set to be able to examine the dimensionality of this concept, and we should do more about looking at dimensionality and then see if this changes over time, but we haven't so far done this. And of course, we are very close now to look at the issue of developmental dyslexia, and the genetic background, and the neurobiological substrate, but also looking at social dimensions, and what consequences there are when a person is suffering from this functional weakness. And we think that this is a rather specific weakness, which come to manifest expression in reading problems, and especially diagnostic is the phonological problems characterizing these individuals and their resistance to treatment, the persistence of their weakness over time, and once we have a good phenotypic description of this, we are in the position to have a closer look at the biological, the genetic background. And we have found that, of course, there is a strong heritability, but we think that the inconsistencies in the research field here as far as the genes involved are concerned, it must depend on poor phenotypic specification. And one of our efforts here has been to develop a set of good criteria for the phenotypic delineation of this, and then we can go on. But--because if you just make a cut off in the lower end of a not very well specified dimension of reading skill, you can come up with all sorts of problems, because poor reading can be caused, of course, by ADHD, poor attention, which is something different, poor task orientation, which in turn has a relation to perhaps child abuse and neglect, poor conditions during early life, and that is--I don't think we should call this developmental dyslexia. Another common course of problems is, of course, that you speak another language at home as compared to what you do in school, and that is an extra burden, of course. And then you should not disregard poor instruction. If you have a very poor start in the system you can end up with problems. And to lump all these different kinds of problems into one kind of box that you label dyslexia is certainly very misleading. And yeah, we have developed a large number of different indicators of poor phonological functions, and all these factors we are discussing now are what I call "proximal factors" and they are, as I said before, not sufficient as explanations of reading disability. They are all embedded in social, cultural and educational frames, which might strongly influence the functional levels of the proximal factors. We are so--yeah, I don't know what to say more about this. There's a lot to be said about linguistic or language functions, cultural conditions, quality of educations, home conditions, and the degree of informal literacy socialization at the preschool level, all this varies a lot, of course, and should be explored much more. But in summary we can conclude that a very large number of factors determine the level of achievement in reading. A number of proximal factors are more directly involved in the reading process whereas some frame factors influence the operations of the proximal factors. A necessary prerequisite for reading comprehension is the ability to quickly and accurately identify written words verse in the text, and poor word recognition is typically a dyslexic problem, which most often is related to poor phonological functions. And in order to understand a text, you should also know the meaning of the words in the text, so poor vocabulary is a strong limiting factor in reading comprehension. And we know from various studies that vocabulary has a genetic aspect, as Dorothy Bishop has demonstrated, but it's also strongly influenced by the living conditions in early life. So already by the age of three we have very dramatic differences between children from various social strata. Another important aspect is, of course, syntactic skill, and this is also of course, highly correlated with vocabulary, word knowledge, schemas, metacognitive strategies, manipulation of processes and so on. All this brought me also to have a look at

the international scene, and by looking at the world as your laboratory where the school conditions, the age of school start, the traditions, the historical backgrounds are different in various countries, and when you look at achievement differences across countries your task is to try to explain the variance in achievement between countries. And when you understand what factors are involved in creating differences in achievement across countries, you might have a deeper insight, which can have direct implications for your measures, political measures or educational measures in school. So I was closely involved in the IEA studies, the International Association for the Evaluation of Educational Achievement, and we established the headquarters in Hamburg, and I was a member of the steering committee, actually very actively involved in designing the test instruments, all sorts of aspects of scaling, rasch scaling techniques, all my psychometric earlier training was relevant here, and all my training in--as far as reading was concerned. And I remember I was sitting in Singapore taking in suggestions for texts and items from various countries, and tried to establish sort of pilot test, which would be double the size of the final test at least, and then go into item analysis and constructing a valid international instrument for comparison reading achievement across countries. That was a challenge, a real challenge, because you had to face culture differences, culture biases, gender differences, and school culture and differences, and still come up with something which is useful and valuable. And I think we succeeded, at least if we look at the meaningful relationships between achievement scores and background factors that we had to look at. And this work, which included some 30 different countries, and some 250,000 students, and 10,000 teachers, was really a big, big effort and took very much of my time, and of course, it's not really development psychology, but we compared eight, nine year olds and fourteen year olds and had, of course, was very much inspired by all knowledge in developmental psychology when you compared the achievements across ages. I should like to mention one thing more here, because my interest in the heritability of reading achievement brought me to the Church examination records, and in Sweden we have a unique system, because in--already in 1686 there was a royal decree saying that each inhabitant, each citizen in the Swedish kingdom should be able to read for themselves in books. And this was a sort of general decree in the protestant countries, but it was very successful in Sweden, indeed very successful. Within 50 years a vast majority, almost all adult Swedes were able to read without having a formal school system. It was earlier than in other countries. And I won't go deeply into this, but it's interesting to see how carefully the priests--or they aren't priests. They are--priests are catholic--here we have protestantic--ah, let's call them priests, they had the responsibility of recording the reading performance, because they had annual examinations with the--in the villages, and those who failed lost their civil rights. They weren't allowed to marry, they weren't allowed to witness in court, and so it was a very hard pressure on people, and failure in a social context was also a disgrace that people tried to avoid, so they studied very hard and learned how to read. But then some people were--did not succeed very well, and then you could follow over successive generations how poor reading occurred in those families. And I studied families from the beginning of the 18<sup>th</sup> century till the end of the 19<sup>th</sup> century over a period of about 200 years and found many examples of typical heritability, which is not just a social heritability, but probably a genetic heritability, because they jumped over generations sometimes. But I could not specify a single or simple genetic model for this inheritance, but later on studies with the modern molecular genetic techniques it has been possible to establish the fact that it is heritability involved here. Yeah, and to sum up a little bit more, I say that my and other's, of course, research seemed to indicate that reading disability can be predicted, and can be prevented, and can be cured with proper instructional techniques. I have also been involved in newer biological studies. We were one of the first to use the MRI techniques, and we did it in Norway, and we could establish that 15 year old boys with dyslexia in Norway showed a typical symmetric pattern of the plana temporale in the language areas of the brain, whereas the majority of normal readers have asymmetric plana temporale with a bigger size of plana to the left than to the right, and this has been replicated by other people. But I should here also mention in this context the Rodin Remediation Academy, which is an international academy of scientists with interests in language impairments and dyslexia, especially the newer biological aspects of it. Among the 100 members of this academy there are seven Nobel laureates, and then the impressive row of highly respected scientists from various fields. And the idea is to arrange international conferences and seminars, which we have done a lot of, and published books related to these conferences. However, the cultural perspective is always there in my thinking, and I think also my involvement in the IEA gave me many opportunities to think in terms of cultural factors being involved here, because of course reading is a cultural skill. It's not a natural skill and it doesn't develop like walking or talking; it must be supported by explicit instruction in the culture context. And so it's one extremely important aspect, which I'm increasingly aware of and increasingly interested in. Yeah. You want to--

**Dahlgren: I think--yes, I think that here we can really see and appreciate the great impact of your work in this field of reading and literacy. And if we want to know more about this, Professor Lundberg, what would you consider published or unpublished manuscripts that best present your thinking about child development, and in your own field which of your studies seem most significant?**

Lundberg: Oh, that was a difficult question. I think I have some 250 items or so in my CV, and picking out one or two there--I published a book together with my colleague in Norway, Torleiv Høyen, on dyslexia. It appeared in English a few years ago. It's called Dyslexia: From Theory to Intervention or something like that. I think this work quite well mirrors some of my views, but not all. I think also my study, which is widely cited, on the effect of a preschool program on later reading achievement, which I have referred to in this interview, has played some role, especially because it has some methodological advantages, which I was aware of some 20 years ago, which is rather conventional by now, and I developed I think quite early, earlier than most people, at least in reading research, path analysis theoretical tools. Path analysis was applied already 30 years ago, and then I think that these articles from 1980 and 1988 on the development of phonological awareness as related to reading best represents my thinking.

**Dahlgren: And the dyslexia book you mentioned first, I know that very well, and it's really a good start introduction in your field. Let's turn a little to your experience with the research funding apparatus over the years. Can you give some comments on your participation in shaping research funding policy and so on, implementation?**

Lundberg: Yeah. A long time ago I served the Swedish Council for Research on Humanities and Social Sciences. Unfortunately, these days the support for basic research seems to have decreased, at least relatively speaking, over the past decade. Instead more research money has been allocated to the European Union or to various foundations in Sweden devoted more to applied research. And I was also on the board of the Swedish Council for Working Life and Social Sciences for a rather long period of time. I chaired the section responsible for research on childcare and handicaps, and still I spend part of my summer vacations in the company of research grant proposals, which I have the responsibility of reviewing. So in this sense I've been quite actively involved in research funding, and I think I still am, but now in the capacity of the reviewer rather than being active on the board.

**Dahlgren: So that's about this. Turning now to your institutional contributions, in which institutions have you worked? You have mentioned a few of them already.**

Lundberg: Yes, I said I started out at the department of psychology at the University of Stockholm in 1959 till '67, first as a teacher--teaching assistant, later as university lecturer, and by the end director of graduate studies. Then I moved to the department of psychology at the University of Umeå where I stayed for a long period of time, until 1993 or so. First I was university lecturer there, and then professor of developmental psychology, and I also had responsibilities at the faculty level where I was vice dean and other assignment at the University. For example, I was for a period chair of the board of the university library, for example. Then I had an affiliation with Bergen University in Norway at the faculty of psychology where I was what they call professor two in educational psychology for two periods, that is, six years, in the '90s. Then I was docent as they call it at the Åbo Academy, the educational faculty in Vasa, Finland, and now I've been affiliated with the department of psychology in Göteborg for about ten years, eleven or twelve years maybe, and I've been involved in a research program on communication disability and social adjustment. Yeah.

**Dahlgren: During these years you have been a teacher of child development research, and you have supervised a lot of students. How would you describe your experiences as a teacher of child development research?**

Lundberg: Yeah. I have taught quite a few courses related to my field of specialty. Actually, this morning I taught a course on child development, and I focused on early child language development today. It's I think maybe I've served close to 100 semesters, and I have never in my supervising capacity or my class teaching capacity felt any particular tension between teaching and research. The doctoral students have

most often very actively participated in my research programs, and when I have those regular courses, and lecturing, and examinations sometimes I have felt some stress on my tight schedule. But most of the time I felt that teaching is an integral and necessary part of my general intellectual pursuit, and meeting young people asking provoking and often very relevant questions is absolutely necessary for doing good research according to my view.

**Dahlgren: Thank you on that. And what are your experiences in applied child development research? Could you describe that?**

Lundberg: As I have perhaps repeatedly emphasized here, my work in child development has always had an applied dimension. I always tried to develop improved diagnostic tools to be used in school, improved teaching materials. I have also been involved in counseling at the governmental level where my research experience and knowledge of the field has obviously been appreciated. However, the pressure to come up with practical implications all the time has sometimes seemed too hard, and that has required some patience for my part. So as far as applied research is concerned I think I have done my share.

**Dahlgren: Let's shorten out on to your experiences with SRCD. When did you join the society?**

Lundberg: Actually, I never joined the society, and I have no experiences actually. I only attended one of the conferences, and that was in Baltimore I think 25 years ago. So it's not a real good exponent of the SRCD.

**Dahlgren: Okay. Then we will go on to the field. And please could you give us some comments on the history of the field during the years that you have participated?**

Lundberg: Yeah. There are continuities as we have seen here, the remarkable resistance of the phonological hypothesis over the years, I started to formulate it in 1976 I think, that's 30 years ago, and despite many attacks, it has still survived. And the wide recognition of reading as a language activity, and the remarkable achievements in research of early language development, that's two scientific success stories. We know much, much more now about the early linguistic precursors, and what's happening very early in life. Actually, I wrote a book on language and reading in 1984. That's a long time ago now. But it's still useful. People tend to find it useful. And the basic ideas I expressed there seem to have been supplemented with much more detailed results, but the basic ideas seem still to hold. But for my own part I have to confess that I now pay much more attention to socioeconomic and emotional factors. I had a sort of governmental assignment to review research of child abuse and child neglect, and this has certainly opened my eyes and made me realize the power of good caring and early stimulation. But at the same time I had the task of reviewing research related to the Swedish twin registry, and which has made me very much aware of all of the hereditary factors in child development, and the concept of what they in twin research call shared environment is in need of much more elaboration and precision, and I have developed the concept of niche picking a little bit to appreciate the interaction between genes and environment. And through my son's criticism of the variable approach in developmental psychology has also impressed me very much. He has made me aware of the extreme complexity of the developmental process, although predictions on group level is possible, individual prognosis is much more difficult. And we know a lot of risk factors, and resilience factors, and protecting factors, but we don't know the mechanisms for their operations, and that is a problem. We could specify a number of factors protecting the child, or being--risk factors, but as long as we don't understand how they operate, the mechanism involved, we have a very superficial knowledge. Yeah.

**Dahlgren: So what are then your hopes and also your fears for the future of the field?**

Lundberg: My fear is that due to the limitations of the human information processing capacity, and the ever-increasing amount of knowledge, people will be too specialized. They tend to dig their holes deeper and deeper, and lose their possibilities of creative side views. There's also risk that the focus on one or a few variables will prevent the insight of the necessity of systems approaches to developmental issues, so the increasing specialties is a threat I think. On the other hand, the developmental, new, powerful, analytical tools will permit much more complex analysis. I mentioned growth curve analysis as an

example, which will do the intriguing process of development more justice. And I also see the development of technical tools for unobtrusive observations in natural settings, and technical tools for functional brain imaging applicable on small children with high temporal as well as high spatial resolution is very interesting and gives maybe hopes for the future.

**Dahlgren: So now, Professor Lundberg, we are coming close to the end of this interview. And could you to finish with please tell us something about your personal interests and your family, and especially ways in which they may have had a bearing on your scientific interests and contributions?**

Lundberg: Yeah. I have a total of--oh, let's call it six grandchildren, and they cover the age range from four to twenty one. They give me study and valid input and inspiration for my own work in developmental psychology. My oldest son is a rather successful professor of biology, and a specialist in mathematical modeling, and his insights into systems theory and non-linear processes have been a continuous source of inspiration for me. And we often discuss evolutionary aspects of child psychology; even child neglect seems to have evolutionary aspects. And my interests in biology, including plant life and birds, give me many opportunities to think of human being as part of the natural system subjected to the laws of nature and evolution. On the other hand, my interest in history, art and literature sharpen my insights into man as a meaning creating being, as an interpreter in a given historical and cultural context. Cultural evolution is indeed a relevant concept. So to sum up, two perspectives must be held in mind simultaneously. Man is both a biological being and a cultural and social being, who interprets him or herself and her situation in this world. Yeah.

**Dahlgren: Thank you, Professor Lundberg, for this interview. Thank you very much.**

Lundberg: Thank you, thank you, Annika.

**End of Interview**