

Early Child Development: The building blocks for successful societies

To be delivered by Dr Fraser Mustard

Adelaide Thinkers in Residence public lecture & AW Jones Oration

Co-presented by Adelaide Thinkers in Residence and The Bob Hawke Prime Ministerial Centre, UniSA

Monday 19 March 2007 – Adelaide Town Hall

MARIE BRENNAN:

Good evening, ladies and gentlemen. My name is Marie Brennan and I am the Head of School and Dean of Education at the University of South Australia. Now, before we go on too much further, please can you make sure your mobile is off or silent and if you buzz, well, there will be a few people cross.

It is great to be here tonight for this latest event in this last successful Adelaide Thinkers in Residence public lecture program. Tonight is the ninth in a series of the Adelaide Thinkers in Residence presenting their public lectures and tonight we are here to listen to the presentation from Dr J. Fraser Mustard. First I would like to acknowledge that we are on Kurna land and we pay tribute to the Kurna people, the traditional owners of the land that we meet on and acknowledged their continuing embodied and spiritual relationship to this particular land.

We are joined tonight by many distinguished guests and I would like to recognise, in particular, the Honourable Jay Weatherill, Minister for Families and Communities, for Aboriginal Affairs and Reconciliation, for Housing, Aging and Disability, representing the Premier. The Honourable Robert Lawson QC, member of the Legislative Council, representing the leader of the Opposition, the Honourable Iain Evans. The Honourable Lea Stevens, member for Little Para. Ms Frances Bedford, member for Florey. Professor Denise Bradley, President and Vice Chancellor of the University of South Australia and president elect of the Australian College of Educators. Denise will assume the presidency in 2008 for two years. Professor Anne Edwards, Vice Chancellor, Flinders University of South Australia. The Hawke Centre Chair, the Honourable Basil Hetzel. Professor Lowitja O'Donoghue, the Hawke Centre patron. Commissioner Ted Mullighan of the Child in State Care Commission of Inquiry. Ms Linda Matthews, Commissioner for Equal Opportunity. Professor Michael Rowan PVC, for the Division of Education, Arts and Social Sciences at the University of South Australia. Dr Carolyn Matthews, South Australian President of the Australian Council of Educators. And of course, in particular, our guest speaker, Dr Fraser Mustard.

I first of all would like to acknowledge the sponsors for Fraser's residency, without whom this event would not be taking place. Those sponsors become parties with the Adelaide Thinkers in Residence to sponsor a speaker here. The Department of Premier and Cabinet, the Department of Education and Children's Services, the Department of Health, the Department for Families and Communities, Aboriginal Affairs and Reconciliation, University of South Australia, University of Adelaide, Flinders University and the Department of Further Education, Employment, Science and Technology. Thank you for your generous support.

Now, this free lecture is co-presented by the Adelaide Thinkers in Residence and Uni SA Bob Hawke's Prime Ministerial Centre and I thank the director of Adelaide Thinkers in Residence, Brenda Kerr and director of the Hawke Centre and Elizabeth Ho for arranging this evenings program. As your chair for this evening, I am delighted and honoured to be here to take part in this important discussion on the education and care of our children. In particular, I am really interested in the ways in which our society invests in children for our overall societal future.

Dr Mustard is one of the world's most respected authorities on early childhood development. He will discuss the impact of early childhood development on the health, wellbeing and competence of the South Australian population in the 21st century. The A.W. Jones Oration honours the memory of a well-loved educator and through the Australian College of Educators makes an ongoing contribution to educational debate within Australia. UniSA is delighted to have the Bob Hawke Prime Ministerial Centre involved in this lecture series as a

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co-presenter and key organiser. The Centre promotes active citizenship through its public learning program and plays an important role in linking the university to the community. So with all these partners, how could we not have a successful evening.

Now, unfortunately the Premier, who is very committed to the Adelaide Thinkers in Residence program is unable to be with us this evening, but he is being represented by the Honourable Jay Weatherill. Minister Weatherill is responsible for a number of portfolios, particularly relevant to this evening's subject. He is Minister for Families and Communities, Minister for Aboriginal Affairs and Reconciliation, as well as Minister for Housing, Ageing and for Disability. It gives me great pleasure to invite Minister Weatherill to introduce tonight's speaker.

THE HON J. WEATHERILL:

Well, welcome everybody and we are very honoured to have Dr Fraser Mustard here in South Australia as our Thinker in Residence. As you have heard, he is one of the world's most respected authorities on early childhood development. Dr Mustard has had a diverse career in the health sciences, research and in the private sector. In 1982 he created and established the Canadian Institute for Advance Research. Its programs have had a major focus on science, technology, innovation and economic growth, the effect of economic change on the social environment and the health and wellbeing of individuals and populations.

Dr Mustard has been a leader in Canada on the socio-economic determinants of human development and health. A particular emphasis of his work has been on early childhood and the role of communities. He co-chaired a report for the Government of Ontario on early learning, known as the Early Years Study. This project emphasised the crucial role the early years play in creating a healthy and competent population.

Dr Mustard is involved with Governments in Canada and Australia, with the World Bank, the Inter-American Development Bank, UNICEF, the Aga Khan University of Pakistan in emphasising the importance to society of early childhood development. Dr Mustard has received numerous awards for his work, including the Companion of the Order of Canada. Most recently he was inducted into the Canadian Medical Hall of Fame. Dr Mustard has already influenced the South Australian scene in a range of ways. Dr Mustard's residency takes place in the context of a South Australia Strategy Plan recently relaunched, an aspiration for improved wellbeing and prosperity for this State which now has been specifically linked to targets concerning early childhood development.

The State Government has commissioned reviews on health, education and care and family and community services during its life and each of those reviews have been influenced by the thinking of Dr Mustard, highlighting the needs of young children and their families and the importance of the earliest possible intervention. It is true to say that early years have now been put at the centre of our policy thinking. It has formed our universal home visiting scheme and the sustained home visiting program. I am very pleased to see Lea Stevens here, the former Minister who implemented that program.

It also has informed our 20 new children centres and Fraser would quickly correct me and call them early childhood development and parenting centres and we just opened the first of 20 of those centres just the other week. We are now organising ourselves, as a Government, in a way which focuses on early childhood development with an inter ministerial committee chaired by Minister Lomax-Smith, but involving health, education, child protection, disability services as all part and parcel of this notion of child development.

Dr Mustard has travelled widely during his two stints here in South Australia and I have certainly been inspired by his knowledge and experience and the way he advocates on this issue, both as a minister but also as a father. Thank you once again, Dr Mustard, for agreeing to be our Thinker in Residence. Ladies and gentlemen, Dr Fraser Mustard.

DR FRASER MUSTARD:

I am just dispatching the minister to go and look after his two daughters because he is pretty good, as I will say in my remarks, about his attendance to early child development in his own home as well as in a minister. The other thing I might say is that many of you in the audience who have met with me have been a great help to what

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I am going to try to say in my report as a Thinker, so thank you all very much for your help. You may not like what I am going to say, that doesn't matter.

I am going to say what I really think about all of you and what you can and have not done. So this little sermon this evening, it will be a sermon, it will be an oration, the Jones Oration, and they tell me I am only to talk for 40 minutes, but I refuse to do that. At the end of 40 minutes you may leave, because what I am going to do at the end of 40 minutes is say what I think you should really do, but it will all be a build up to get to that point, but I have to take you through it to make sure you can all sing from the same song book about the problem.

So there is the title that is on the slide. Now, why is there a gap in this area between what we know and what we do? It is a good question to ask yourself. There I am with my hat and gown on at the Erasmus University at Rotterdam and guess who I am talking to, Erasmus. Now, I was there as a visiting professor. I called Richard Trombly in Montreal who was there at the time, though this would be a fun slide to introduce me. Here I am in my hat and gown, being an academic, talking to Erasmus; isn't that interesting. But what Richard does is this is what Erasmus said:

We cannot emphasise too strongly the importance of those first years of the course that a child will follow throughout his entire life.

Imagine doing that way back in the 1500s. Why have we been so slow to pick up what was pretty common knowledge then amongst people? Well, this is another experience I have had, and I have had it here as well. I was asked to speak to the Provincial Court Judges in Canada that deal, in the provinces, that deal with families and children. At the end of my talk, and talking to a bunch of lawyers about a scientific subject, can't be very good and Judges could be even worse, but they gave a standing ovation at the end of the talk. And I said, "Well, why did you do that?" And they said, "Thank you for presenting conclusive evidence about what we intuitively know when we deal with dysfunctional families we put the children in limbo and we damage them permanently."

I thought that was pretty stunning. They understood exactly the problem but they couldn't do anything about it because they are Judges in a form of Government which doesn't like Judges to speak about these things. So what do we now know that changes this cycle a little bit? Here is a good parent. Now, the youngest daughter was marvellous, because Dorothy McKinnon was with me, fed her and Jay convinced me that this is a cabinet minister that understands his subject by going and having lunch and inspecting how he worked with his own family. Now, I intend to do that with all your cabinet ministers if I get a chance and write a report on them, but Jay really set the example.

So here is what he understands, and what I hope all of you know, that experience-based brain development in the early years of life sets neurological and biological pathways that affect health, learning and behaviour throughout life. Please, please understand that why I do not use the term "day care" or "early learning care" is because early child developments sets trajectories in health, learning capability and behaviour. It is a very fundamental period and everybody who works in early child development is indeed practising really significant population health, if I can use that language with you.

Now, there is a brain. Just think of the brain. That is what we are going to talk about, composed of billions of neurons and trillions of connections and so if you just think of it, for those of you who think about brains, it is composed of billions of these cells and neurons and they form connections called synapse. Now, ask yourself a simple-minded question. How do the neurons back here ever differentiate to appreciate what your eyes see because all your neurons have the same gene coding; something has to cause them to differentiate and this affects the signals from the eye that do that. That same thing is true for hearing.

The second thing is they have to communicate in neural pathways and that means forming junctions called synapses. What does that? Well, that too involves a genetic machinery, slightly different, which I will come to. So the brain is an experience-driven organ that is hugely dependent upon the quality of the stimuli that come from the sensing pathways as you develop, and even as an adult. And so when you think about that, this is not a nature-nurture debate, this is gene structure hugely influenced by environment. So it is a really inter-play in terms of today's knowledge.

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So if you think about it, there is a kid and an adult ready to talk and there is some of the sensing pathways that are involved and when you look at those sensing pathways, they interact. So when you talk about attachment, you are actually talking about the power of sensing pathways affecting the brain that form attachment, as simple as that. And so language and literacy, that is all driven again by the sounds that come into the brain that differential neuron functions so that you can actually function in language and understanding.

So stimuli switch on genetic pathways, differentiate neuron functions, stimuli affect the formation of the millions of connections of synapses in the brain. You notice the term that I am using here, it is stimuli, experience. I am not using sounds like love, nurturing or things like that, because they are all going into the sensing pathway anyway. So if you think about it that way, then it becomes fairly clear what we are trying to get at here.

So the sensing pathways. Two that we know a fair amount about. In the 1960s we discovered that children born with cataracts in the lens of their eye, when they couldn't see, obviously, and then when they corrected the cataract later on when children were older, they never had normal vision. Everyone of you in this room, if you get a cataract and it blocks your vision, if you remove it, normal vision will come back. Well, Hubel and Wiesel were smart. They said: here is the first clue that we have that there is a critical period when stimuli have to come into parts of the brain to switch on neurons to do specific functions; that is the vision story.

The lower part of the slide says the same thing is true for sound and hearing. So Aboriginal children with repeated bouts of ear infection when they are young will actually have trouble developing a sound system and will have difficulties in speech and understanding as they grow up. So pretty simple stuff but they have only just discovered very recently.

So the brain pathways are also intriguing. The higher levels of brain circuits depend upon precise reliable information from the lower levels in order to accomplish their function. So actually you go through in this early period in life, you are building this hierarchy of pathways. Sensitive periods for development of lower level circuits ends early in life as the plasticity of the more fundamental circuits – doesn't last all your life – the higher levels remain plastic for a much longer period. So this is a hierarchy of how your neurological system develops but we don't know how to change early periods very quickly at the moment or change them at all.

Now, if you think about that then, the little yellow diagram here is the sensing pathways like hearing, sound and probably touch and a few other things. They begin in utero, the differentiation. It is largely over by the age of one and it still carries on but it is pretty dynamic before the age of one. You can't develop language and the capacity for language until those pathways come into action, so it starts in afterwards. Finally, higher cognitive function which is dependent on more higher levels of neuro pathways, it kicks in later. So if you think about the story this way it is pretty explicit. So you can grow up with poor development at these earlier stages, which will create problems in the later stages. So that is those pathways.

Now, this is a term is usually called stress but I am not going to use that term. I use new language which has come forward which is called allostasis. This is the pathway that allows you to function each day and cope with the demands of the day, etcetera, etcetera. If you have too much demand and you can't cope with it, that creates an allostatic load. So high stress demand, if you have got control of it, it is not a problem. It is high stress demand that you don't have control of which is the problem. As long as you understand that, then the system will mean something to you, because there is a fundamental series of processes that affect your pre frontal brain and things like behaviour.

So the thing about it is the pathway. Here you have a sensory stimulus coming in, we call it emotion, that affects a thing called the thalamus in the centre of your brain, that is on the left-hand side, and if it interprets a snake as a snake it will fire immediately down to the amygdala which will then switch on your stress reaction, fear and all those things. But that signal also goes to your cortex back here, which is where you see things, and the cortex may say: it is not a snake it is a stick, at which point it will switch off, normally, but you have dysfunction of that pathway with all kinds of problems.

Now, what else does it do? Well, the amygdala stimulates the hypothalamus in the centre of the brain to drive down to the pituitary gland at the base of your brain which releases ACTH and the ACTH goes to the adrenal gland in your kidneys causing the outpouring of cortisol. Cortisol is a universal hormone that affects all the tissues in your body. It affects your brain, it affects your immune system, it affects your muscles. Hog farmers

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here and in my country, when I talk to them about this, understand this. They say, you never ship hogs to market under a severe stress or you will get a bad meat grade. Well, if you are working at a very difficult job with a bad boss and you don't have adequate control, this pathway may be too active and so when you go and play tennis or do some other activity you may indeed get back pain. Probably one of the most common causes of the back pain, as a physician talking about this.

Now, the nice thing about this pathway, you have another structure called a hippocampus to which cortisol also goes, and it is kind of like a down regulator; it will shut the system off for you. So if you think of that as a biological thermostat that determines how well you cope with each day and has varying effects on you, you will appreciate what this means. This is a very basic neurological function in all mammals. It is different than your cortex. Your cortex is a higher function. You have a lot more cortex than a rat does but this basic pathway is the same in rats as it is in you people so it is a very basic system and we know a fair amount about it from that kind of work.

So these are the conditions that can occur in adult life in disease that are related to dysfunction of this pathway set in early life. Behaviour problems, depression, type II diabetes, malnutrition, cardiovascular diseases, heart attacks and blood pressure, memory problems, memory loss, the immune system disorders, drug and alcohol addiction. One of the people I met with during my visit here said, these Aboriginal men, they don't understand time, they can be abusive, they drink a lot, they are addicts and he was putting them down. I said to him, those difficulties and disease patterns are exactly a product of poor early child development and your ancestors came here and disrupted the Aboriginal community and what you are seeing is disease patterns which are a direct problem of poor early child development caused by your disruption of their culture. I got through to him. Took him a while to believe it.

So how does this pathway work? Well, one of the prime pathways that controls it is touch and it comes from three lines of evidence. Rats, where you can do all the experiments which I will refer to briefly. In monkeys where - like a peer versus mother raising of monkeys; and then in humans, the attachment series basically represents the story in humans but in premature infants, when we isolated them and I ran health sciences, we put them in isolation from their mother because they were premature and low birth weight and guess what, about 25 per cent of those children, when they grew up into their early teens had behavioural problems because, guess what, they hadn't had enough touch in that very early period when we isolated them.

That led the people in Columbia, in South America, who were paediatricians to recognise that, so then bonded these infants, the premature infants, to the mother. In a nice gracious way, they called this the kangaroo technique because they thought maybe the kangaroos had known about how to do this for a long time and so this was their device to create a sort of a kind of semi kangaroo pouch to solve the problem, to dramatically change the behaviour problems of the next generation if they are brought up that way.

So back to the rats. You know, high LG means high licking and grooming. High licking and grooming mother rat will intensely lick her pup at birth and feed it, sensibly. A low licking mother, low LG, doesn't do that and they have studied these animals intensely and they have found that the high licking and grooming do a pretty good response to stress and they have reduced risk of disease and even rats will drink too much alcohol if they get screwed up early beginning. These animals don't, but the ones on the right-hand side, low licking and grooming, increased stress reactivity or increases allostasis and allostatic load all kinds of diseases and these rats can easily become alcoholics; rather neat, isn't it?

I have been looking for some very wealthy gentlemen in this town who may have a touch of alcoholism and feels guilty about it and thinks because he lacks will, I would like to meet him and explain to him his problem isn't his lack of will, his problem is how he was handled when he was very young and if he has got bundles of money, maybe he might come in and invest in our counsel. I have one very wealthy man in Canada, fortunately has a wife who has explained that to him, and he is totally onside investing in early child development. So if you have any victims, let them know, know about them before I leave.

So here is the next group. Look at those two mothers. Look at how they are cuddling their infant. Isn't that neat. They know how to do it but you know you can pull the infants away from the mothers, if you have got them in the right colony. What happens to them when you separate them? Well, here is what happens when you separate them. Infant animals grow up with their peers but not with their mother. They have the long gene, that

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is what long allele means. They won't have too many behaviour problems. But if they have the short gene, they will have significant behavioural problems and alcohol addiction. So I am going to introduce you to the gene story here: Environment Affecting Genes, and this is probably what we now an epigenetic effect.

What do I mean by that? Genes normally code specifically for proteins and we all believe that. If you have a certain gene you get a certain protein. What epigenetic effect means is it means that the systems that determine how a gene functions can have a huge effect. They can shut genes down, they can increase the speed of operation and what we are seeing here, if you have the short gene you are vulnerable. If you want to think about it, one of the processes is called methylation. If you have a short gene, that experience can easily lead to methylation of the whole gene, shutting it down. Whereas, if you have a long gene, it is going to be harder to shut the whole thing down. So this is an interesting story about resilience, gene function in an environmental exposure.

So that to summarise this, experience in methylation, that is epigenetics the other processes are gone as well, I am only referring to one, it imprints dynamic environmental experiences on the fix genomes. So mother interacting with her infant is in a dynamic sort of relationship to affect this pathway. Material behaviour affects DNA methylation. It is important, particularly in the very early years, and it can be transmitted to the offspring which is a brand new kind of concept and this is a tricky process which I won't go into time to explain to you today.

Now, here are these rats again. LG means low groom, high means high groom, and what we are doing here now is looking at the actual methylation process in the rats. The vertical scale is a degree of methylation as done by their measurement techniques, and the horizontal scale is these rats, from birth rat through to day 90 as an adult, and day 90 is an old rat, he is up around 50 to 60 years of age. If you look at this, the animals that are the high licking grooming mothers, do not have methylation of their DNA as they age. The animals with the low licking grooming have methylation and it persists. That is frightening because it says that early experience to these processes can change gene function leaving a permanent scar.

So Dr Szyf, who was of our colleagues who works in our program, the Economist Magazine catches up on hot things so they wrote an article about this story on September 23, according to Dr Szyf, epigenetic modifications in response to maternal care occur in the early critical period, early after birth. The effects are stable and consistent adulthood and that is dynamic information in a totally new biological system - regulates gene function and we have no idea about the scale and scope of it in terms of functions of neurons in your head but it does say there are processes that come in early on that modify gene function and we do not know how to change them.

So this is a study which was done in your sister nation, New Zealand. The reasons why we pick it up; these people were smart. They knew that you could detect short gene structures and long gene structures from blood cells that might be related to the formation of your pre formal cortex neurons. So SS means short genes, one from your mum and one from your dad. LL means long genes, one from your mum and one from dad and SL means you have got one short gene from one of your parents and one long gene from the other one.

They looked at the conditions of early life for these adults who were now in their twenties and they indicated a very a specific problem. They looked at sinister depression. Remember, this the behaviour process which is affected by these pathways and so if you had the short gene structure and you are brought up in adverse circumstances, we have put on here serious abuse, it could be neglect and things like that, your risk of depression is pretty high compared to the long gene people, LL, they are not at risk.

There is resilience for you in terms of an adverse environment now becoming very clear. But if you are brought up in a good environment, on the left-hand side of the slide, it doesn't matter whether you have long or short genes. So this is a dramatic example in human beings of the disease affect that can take place, using mental health problems as an example. We suspect type II diabetes and for coronary heart disease the same story will unfold in due course.

So experience in brain maturation. After sensitive periods have passed, critical mechanisms operate less effectively. So it is not easy to change those pathways later on. Difficult for subsequent experience to change initial structure and function; which means that early child development is a pretty crucial thing if you really want to do things. And so let us look quickly at some humans, enough of these rats and monkeys.

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Let us look at behaviour. Behaviour, these are the conditions that can be set abnormally in terms of that pathway that I talked, the allostasis the allostatic pathway, they are. Attention deficit disorder, autism, antisocial behaviour which gets you into the criminal justice system, depression. These actually show, in the definition of medicine, co-morbidity. Several of these problems can be occurring together in individuals so this is the brain network that causes different kinds of expression but it is all driven by that core function I showed you about your allostatic control system and how it works. So how that thermostat functions, which is set in your early life, will determine what will happen to you later on.

Now, Teicher, an American psychiatrist, did an intensive study of poor early child development and behaviour problems and he found the aftermath of poor early child development can appear as depression, anxiety, suicidal thoughts or post traumatic stress or as aggression, impulsiveness, delinquency, hyperactivity or substance abuse. I hope you are putting all that together in your heads about what we have to think about.

So the next little set on this is the Romanian Adoption story in Canada. CB in this slide means children born of middle class British Columbia parents. EA are kids adopted within four months of birth into British Columbia middle class families. RO are kids adopted after eight months in the Romanian orphanages. Now, the Romanian orphanages were not abusive but they were neglectful as all hell. So now what you are doing is looking at human development against those categories. You will see there is even an effect on IQ. The kids adopted early do better than the kids adopted late. Language score, yes, those kids adopted early do better than the kids adopted later.

Look at the behaviour story. Significant behavioural – these are kids at 10 years of age now, imagine not babies, they are grown up to 10 in middle class British Columbia homes, look at their behavioural problems. 43 per cent have problems. If you talk to those families, the families that took in the late adoptees who had been neglected had terrible times helping to work with those kids trying to get them up to the age of 10. Pretty dramatic. Not a controlled experiment in one way but matches all the other data from rats and monkey, etcetera.

Showing you the other slides, cortisol was a real culprit hormone here. Gunner did this work. She then looked at the cortisol levels at the end of the day in these children. Now, basically what you should do, cortisol levels have to fire up or you won't get out of bed in the morning, you will stay there. Then you go through the day and meet your crazy bosses and your nasty people and you go through your emotional reactions. Stuff goes up and down but when you go back to rest it should go down. But if that thermostat is poorly set it won't go down. So what you are looking at here are the sterile levels at the end of the day for these adopted children and the left-hand part of the slide, so the kids adopted early.

You will see that their level of steriles at the end of the day is pretty low. Look at the kids adopted late, the far right-hand side, they are and that partly explains the behavioural problems that are seen in these children even though they have been with some middle class family from 10 or 12 months after birth. Pretty dramatic. So that kinds of fits everything. So then some of the people who do modern imaging techniques on brains took a look at their heads and you can see on the left-hand side what a normal child's brain looks like with these techniques that they used, and you can see on the right-hand side the older adoptees from the Romanian orphanage, their readings were different. So if you don't believe that these early periods are important, this is pretty crucial evidence if you want to do anything.

So let us move to language and literacy. Now, Stattin, who is the Swedish scientist, did a very interesting study. He was looking at risk of criminality in teenagers in terms of their literacy capabilities and whatnot and he knew enough to start when they were very young because language capability starts in the first period of life, the early years, and so he has plotted the language skills in terms of – well, they do it for six months, 18 to 24 months and then track them through the school system.

Lo and behold, the kids who showed poor development of this part of the brain function at this stage, ended up being poorly literate in the school system. The school system couldn't change it and guess what, about 25 per cent of the males ended up in the criminal justice system for antisocial behaviour. He didn't attribute it the way I am doing it, but when I read it I said, "My God, this man has made a discovery" because you cannot talk to or read to a six month or 12 month old infant without holding it. And that the per verbal skills development, because of the way that works, that means that somebody wasn't talking to or reading to these infants and since

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you have to hold them to read or talk to them then, this probably is a proxy signal for identifying lack of touch, if you follow what I am saying.

It is quite dramatic. So when I go into a day care centre and find inadequate touch with infants and toddlers, I say why would the people let them come here because you are going to be screwing up this pathway, you are also not going to be building a language capability. So to summarise this for you, brain development for language starts early, largely completed by seven months. Now, you can't talk yet but just think about this. You have a bunch of neurons back here who have to differentiate the sounds and the critical period is in very early life.

A Japanese language has a different sound from an English language. If you are spoken to in both languages in this early period, your neurons will differentiate and handle both sounds and they will stay that way, which means it is easy for you to learn two languages, speak them fluently without any accent; pretty neat and pretty important. The Aboriginal community love this, by the way, because they would like to have early child development centres that allow dual use of language and I think that would be a smart thing to do if you want to preserve culture.

It also sets the capability for mastering other languages later on. Rather neat if you think about what this means and so this period of life sets the language and literacy capability for life, and I will show you that in a moment. So the OECD, that is the organisation in Paris that looks at economics in countries, uses a scale that goes from one to five. One is poor, five is brilliant and this is your capacity to understand. So level 1 in this scaling would not easily understand a prescription, about how to take medicine on an empty stomach. Level 2 is maybe all right in that but they may have problems in understanding a consent form in a hospital. Yes, they are literate, but their capacity to understand is lower compared to the level 5.

Your country and my country have 42 per cent of our population at levels 1 and 2. Now, for developed rich nations that is a disgrace, I hope you are embarrassed by it. You are not, because you cover it up, as they do in my country, but it is a disgrace. Here you are a wealthy developed country, and we know what the hell to do, why don't we do something about it? And the percentage you have at level 5 is five per cent. I would judge on the behaviour of some of your politicians you don't have enough level 5s at your political level and you are quite right. I would love to go and screen them, but I can't get permission to do that.

The other thing the OECD people do is they plot language literacy performance against some kind of environmental circumstance. Here, because you can't compare a country as easily as socio-economically. What they have picked up is the parents' level of education for these adults and looked at plotting the gradients against that so the parents would be – most of them would be gone – but what you are looking at is the gradients in literacy as done by the OECD against what their parents were like in terms of educational years and you will see it is a gradient.

The more your parents were educated, the higher your performance and look at those damn Swedes, their gradient is totally above the mean for developed countries; neat isn't it. We have got a problem, we are below that. We have got a chunk below that, that is the 42 per cent figure but I also show you Chile and the reason I am showing you Chile, because we have been doing work with them, Chile is below the international mean for this kind of screening and this true for every Latin American country but one country, and I am going to come to that country but I just wanted you to see where Chile sits on that chart versus the next chart to use.

There is our two countries, with our tails below the international mean. And you know, the great thing we could as democracies to demonstrate how in the hell you get rid of that gradient of that kind – I mean, there are the Finns and the Swedes above there; how did they get there? Genetics, well, that could be one answer. But here is the odd ball. Here the Latin American countries done by UNESCO, so it is not the same as the OECD, but look at Cuba. It is way up in 300s so it doesn't go down to where the international mean for developed countries is.

It is an odd-ball country, isn't it. Look at all those other Latin American countries besides Chile, they are all bunched together. The head of the bank for Latin America used to chat with me about: until the Latin American countries can solve that problem, they will never achieve the level of prosperity, stability and democracy that

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they would like to have. Pretty dramatic when you look at it. But even more dramatic when you look at school performance -we are having a little battle with the Cubans about this.

These are the mean values in grade 3 language done by this UNESCO screening, and what you are looking at is the means and the two standard deviations and the little hatch marks at the end of these little bars are where the second standard deviation goes. There is dear old Cuba, its mean value is two standard deviation better than every other Latin American country. What do you think they have been doing? Shipping all their crappy people to Florida? Who knows. Who knows what has been going on there but that is, you know, kind of intriguing.

So as we put this up working with Latin America we decided, well, we had better try and find out and so you had to be very careful going into Cuba because they don't trust the Americans, they regard them as an enemy and you had to make sure that they don't think you are an American. So we have been at this for about two years and this is what we have learned so far. They have a zero to six program which is not compulsory. It starts at birth. They have a community leader. In every community there are people enlisted with that know who is pregnant, know when the child is delivered and encourage them to join the centre. The kind of thing that you people do but they have got it organised and in a very sophisticated manner with a very sophisticated lot of people.

About 15 years ago only about 60 per cent of the families took part. Today it is 99 per cent because the message passes that this is a very important way to do things and people become comfortable. One of the reasons for this, all the staff are educated for four years before they come into the field. It is an impressive story and you have to know these institutions. And they are all educated and developmental in their own science which means that in effect their staff can spot developmental problems like that. You don't have to go to a health deal with these things. These people are well enough educated to handle that kind of issue with their system. It is a pretty sophisticated operation and so we think that is the reason why they have gotten to where they are but we had to then penetrate into their society to let us do a kind of a joint study.

We then ran into a fight between the people in education and the people in early childhood. The people in education didn't want us doing the kind of analysis that we wanted to do because that would be showing up that the effects in education were more related to what the zero to six people do than what the people in education do. You can imagine that. So they tried to force us. We had to have a joint agreement between the Government of Cuba and the Government of Canada. Now, the current Prime Minister of Canada is a friend of George Bush and the last thing he would want is to find Canadians doing a collaborative study with the Cubans and so we were told by External Affairs to stay away from us: we would be dynamite, we would shut you down.

So we were a bit disappointed but then, we working with a Mexican colleague who is very good in this world and is part of the left of centre politics and he has got a wife who runs a super program in Monterera. He called and he said, "Call the Minister of Education's wife." The Minister of Education's wife is a surgeon, and if you know what female surgeons are like that told me really what she was going to be like. She is in the Ministry of Health and she is a senior member of the political party. So we got her on the phone and she spoke like a machinegun in 15 minute bursts, I couldn't follow it because I don't speak Spanish but my colleagues, even those who are basically trained – educated in Spanish were exhausted at the end of an hour and her message was: get on the plane and get down here.

So down they went, just before I came here. They now have an agreement to do the study with Cuba. We think she went right to Castro and said: Look, forget about all this crappy infighting in the Government departments, do it. Which is interesting so it is going to be interesting to see what the results of this are because this may be one of the best system that has ever done things. It may be better than the Scandinavians because they had three racial groups: Spanish, Aboriginal and African and they have all been approved. Now, Castro was lucky, he had 40 years as a dictator to do this, how the hell an elected politician can do this is another questions.

Health. Donald Acheson did an Inequalities in Health report for the British Government in the late 1990s and Donald and I were Deans of Medicine at one stage in our careers and knew each other well. He came through my shop and my farm and he was doing this report and I took him through all the early child development literature I had outside of the health field and he mastered it all. Went back to his committee and they came to the conclusion in the report, which is very important for any early child development:

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Follow up through life of successive samples of birth has pointed to the crucial influence of an early life on subsequent mental and physical health and development.

And that is why, again, I come back to the term “early child development” to me that is true, because that is basically what you are geared to handling and this shows the list of diseases that can be related to early child development and guess what, most of those disorders are disorders that plague your adult Aboriginal population. And so both my country and your country have demonstrated what happens when a classic – when a certain kind of civilisation comes in and destroys another one and when you disrupt the family structure in spades, it is dynamite. So we can be proud of ourselves. We have run a very huge experiment in our two countries but very damaging to one population.

So what is the development status of children aged four to five? Now, if you want to leave now is the time to leave because I am going into the boring stuff. I am going to be with Ontario. When did the report in Ontario we were stuck. We knew what the problem was but when we asked the Government for the record that showed what the status of our children were like, they couldn't give it to us. Fortunately we had started a national study of children and youth and that saved our bacon. So this was taking that data and running it. Looking at vulnerable children in ages four to six against the social economic status of the families and we had the statistics – Canada people were part of this so it was easy because we had the census files which we could use and you will see there is a perfect gradient. Ontario does a little bit worse than the rest of Canada but the rest of Canada includes Quebec which actually has some very good early childhood programs.

40 per cent at the poor end are in trouble, but 12 per cent at the Margaret McCain end - she was my co-chair and that is the McCain Foods woman - and she was smart and she knew all about the poor early childhood of the McCain men in spades and could be sympathetic to what this argument meant for her social class. But if you look at the difference between minus 1 and 1 is about where your middle class is, lower middle class to high. So if you mathematically analyse this the number of children in difficulty is - the largest number is actually in your middle class and that is why we were totally against targeted programs which tipped the tail end of that story and firstly having Margaret McCain as the co-chair was a godsend for me.

So this is the vulnerability in Canada using a technique that you people are using, your national longitudinal study, which I must say I took some pride in stirring your Government to do when I was here in 1999, some people will tell you that story as well, how I wandered around Canberra talking to people. This is the EDI, which is a measurement technique we use at age five when the kids come into the school system which basically – you can set the same kind of measures and you can see a perfect gradient in our country in terms of this test and social indication by income. So Q1 is low income, Q1 is high income and it is a gradient. What causes that gradient is an interesting question and there is your gradient which is the AEDI, this is the EDI converted to Australian language and accents, etcetera, so you can use it reliably. We think it is pretty reliable, doesn't get confused with Canadian accents and you will see that you have got the same gradient function. So that is pretty impressive.

So what does that mean? Well, it means this, you have got a problem. So now if I go and look at your communities, this is the AEDI applied against communities that you know. Basically, you don't want figures above 10 per cent, the way this is done. You want them below that. If you can get them down to five per cent if you are smart. Just look at Roxby Downs, well, that is not bad. Port Augusta is a basket case. Ingle Farm is a problem. Salisbury East now is not bad. Alberton is interesting, people say that is surprising. Well, it may be surprising. Croydon Park and then Seaton.

Now, we have John Glover and his colleagues look at this data, they did this weekend for me, to look at the actual school performance of the schools in relation to the performance of children going into the schools. Now, obviously the sampling of the kids going into the schools is not the kids that are in the kids but probably reflect cohorts that came in three years earlier because that is the grade 3 testing and guess what? Exactly what we find in Canada. Schools with a fair dump of kids who were vulnerable at this stage when they come into the school systems, the school systems cannot crank up performance very much and we know that in spades in our country.

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Schools can work at it and they must work at it but they really cannot bring the performance levels up to the levels that they would have been at had the children come in with proper development in that period. I can't use the term "pre school" in this country because it means something different than in my country, highly effective zero to six program and that is the bottom line message you should all go home with.

You have got problems in this country. You have got 42 per cent of your adult population today below the OECD category 3 which I think is important for today's knowledge based economy. So what does it mean in terms of numbers of children? This is at age five. About 25 per cent of the children in Southern Ontario in Canada and in South Australia and I guess in Australia, are vulnerable at age five. That turns out in the Province of Ontario to 40,000 children each year are coming into the school system vulnerable. You're a small region, you have only got 5000 but 5000 is still a damn big figure and you should be, as a society, disgraced that you are putting 5000 children into this situation because you are, as a society, just like my society, doing that.

If this was people becoming sick, surely you would raise a fuss about it, wouldn't you? Well, why in the hell can't our societies understand that we took to purifying water and putting in sanitation because of its affect on disease and health. Here you are seeing early child development, and which we know a fair amount about it, why don't you have a collective program to get at that the same way as you do with the water supply? Very simple. I expect things to go here. This is a smart audience. You must be all level 5 pluses. So let us look at the issue of parenting.

Again I show the gradient and so what we were able to do with our longitudinal study using an assessment of parenting that they could pull it from the data and then we could look at the vulnerable children story. So authoritative by this jargon of this technique, is good parenting, authoritarian is not quite as good, permissive is less good, irrational is dysfunctional. So what this says to you, good parenting is only about 33 per cent of the population. Remember the middle class story that you saw.

So the next figure shows you the prevalence of children vulnerable by parenting style for Ontario. Remember that vulnerability chart I showed you. In the permissive irrational, it is 43 per cent of the children are vulnerable and I bet you know that the low socio-economic class has pretty poor parenting structures. There is some good, thank goodness. When you go up the very good, the Margaret McCain end, you still have close to 20 per cent of the children coming from that end that are vulnerable. So this says parenting is important as all hell when you are trying to do this which is an important reason why we proposed coming down here.

What do you do about today? So today's world is different than 150 years ago. All the women in society changed. Your State allowed women the vote. If I was a male dominant, I would say that was a stupid thing to do, look at the mess it has created but nevertheless, when I was in Cambridge I read the Cambridge Report or whatever it is, about the debate the learned academics had about whether women should be given degrees, this is after the Second World War, and I read the most horrendous crap I have ever read – well spelt out by the distinguished scholars of this place but you women were full of all kinds of flaws and reasons why you couldn't have degrees. Can you image that? That is not so long ago in my life. But now you have moved on into the world. You have moved into a knowledge-based society because now it is not just physical strength, it is intelligence which is hugely important for a society and thank goodness women have moved in.

The social economic circumstances have changed, the family dynamics, the family structures have changed. So how do you take what I have been telling you and do something for the future because it is essential that you do. You have the chance, as a society, as a community – this is a good place to live, you have got a real advantage over Sydney and Melbourne, by the way, and even Perth, this is an attractive place – if you could build it to have a high quality population you will be very dominant in this century but you have got to chore to get there, if you understand what I am trying to get at in terms of moving – the Economist Magazine wrote an article about the demands for talent and the way that they were trying to dragoon talent to certain sites. Well, you should do that as well. You have got an attractive site to do it if you can get everything together.

So what do we provide here? What are the best results? We know that stimulation of the brain occurs 24 hours a day so having a centre-based program is okay but you have to involve the parents because they have to know what it is that you should do. We found when working with the Canadian parents, that they would live to be part of a four year centre based program that starts early, certainly at birth, involves the parents, uses home visiting as a system with qualified staff in neuroscience and development. That is what we are arguing for in my country

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because of the importance of this and the qualified staff is, because if you think about what they do in terms of the downstream stories on development, they have to be recruited with the same standards of quality and paid at least at the same rate as you pay teachers; you don't have any choice if you are going to do it.

So that is how we came up with this marvellous scheme of early child development training centres, provide full day, full year, non parental care - yes, they can do that - amalgamation of education and health programs based on primary school centres. Now, you have got a bit of tension here between your different ministries. In the field, there are people funded by your different ministries through diverse programs who are actually trying to do what I am talking about but they are troubled because they have different master funding them with different rules. And I am going to say this in my report, you have got chaos out there and people who really are smart and want to do it so the Government – I am sorry, Jay has gone – get your act together and create order out of chaos. Do you hear what I am saying? You have got to find some way to do that and to build the linkages and realise that the people you are going to put into the field here are people who can handle what you conventionally do in health.

Why would you put this subject in health, in a ministry that is concerned with health care, come off it. Why would you even put it in education the way it is structured, although it has got a better chance to move. What you are basically talking about is a ministry of human development, all the way through, which hits at all these agendas. Now, that is too big a change for a political party to take, but I would just like you to think about that in terms of how you organise yourselves for the future.

The other thing you must do, because parents must take part in this, this is pretty bold – Swedes only go to 16 months but I decided from what I now know, you should provide 18 months parental leave with income support followed by one day weekly for each parent, for both parents, until aged three to be involved in the early child development parenting centre. You think about brain development and think about what this centre can do to help the child, the infant, but also the parents. That is about the right schedule that you need in terms of what we now know.

That is interesting, you are a basket case in the lead that you give to women who have a new baby here. Mandatory, they say. You can have 12 months off. Come off it. It depends whether your employer will pay you, for heaven's sakes. That is atrocious in today's world. I hope all you men in the audience understand that. It is time you got off your rear ends and got your Government to do something about it.

So the staff should be well educated and trained. Need to understand neurological and biological sciences and pay skill the same as for teachers. That little simple demand there has got huge ramifications for your universities. I am not impressed that you are all there at all levels in your universities and you damn well should be because this story affects economics, it affects psychology, it affects health sciences, etcetera. Anybody here from Flinders? Hold up your hands? I spoke to the medical school which I helped set up with problem based learning. They had never heard about this subject before, that is a disgrace. So I am just, you know, being rude but that is the truth. Thank God there is somebody in the back agreeing with me all along.

So the other thing that I found here the Courts – coming back to my own Court justices – would welcome early child development parenting centres because when you have a dysfunctional family you could actually the infant, toddler or child, to be part of a centre and whatever caregiver would be assigned to go with that person, you could do it by Court order, but there is no instrument in your community to do this at the moment. So they like that sort of theory. So the cost, no, it is not going to be cheap but the cost in Ontario for the zero to six crowd, with the staffing that we have needed, would be about \$7500 per child; that is slightly more than what we fund in the public education system.

Federal Reserve Bank in the United States has got some active people looking at this because this is important to the United States as it is for your country and my country. They estimate it will costs then US\$9500 to do this and they believe it should be done. My estimate to you people, because you are like Canada, you can probably do it for 7500. So if I were your Government, I would take two or three of the sites that I have been to – one of them is Port Augusta – find the money and do it now and find the money entirely from the State's budget. Get the Commonwealth people out of your hair in terms of their day care nonsense.

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You really want to put it in place and make it first class. Staff in that community are absolutely superb and they come from different disciplinarians, and they want to do it. So that is going to one proposal. I am also going to suggest you do Kaurna Plains, I mean that is a natural. People are there ready to do it and a few other places that we will mention. So the lucky thing you have in this State, you have got regions ready to go. It is going to take some work to do it and I am trying to persuade the Premier that if he can make this go, you can change those EDI values for Port August from 42 per cent to 20 per cent or less in four years.

If you do that, then when you go to the next election you can say: we are now really taking major steps to improve the future, confidence and quality of our population, because he can't wait 25 years to get elected but he can certainly do this. Whether they will do it or not, I have no idea. I think Sally Brickman's parents are here tonight, and I just want to tell you that Sally is in Perth now, but she comes from Adelaide, and if I were the family and the people in South Australia, I would recruit her back here to help you do you AEDI program, because she was the person I worked with the first time to have it applied I Australia in Perth, just wanted you to know that, a little lesson for all of you.

So Barriers. Economic, yes. Lack of understanding, public and professional, yes, it is hugely important. The poor man from The Australian was trying to interview me about what the hell I was going to say and I felt sorry for the poor devil. He was trying to master this subject on a telephone call. He didn't have much of a clue. He was smart but lack of qualified staff, you have to beef up the whole system for a quality of staff and you have to also put in programs to allow the people in the field to upgrade their skills to be registered and recognised for it.

The State as the nanny? Why do we want the State to be babysitter for lazy women, that is a thing that you have to fight. No commitment of equality of opportunity for all young children: as a State you still have not expressed that across your State. You are different from the Scandinavian countries who do that so you have to become non Darwinian in this story. You have to follow the philosophy that you are going to guarantee equal of opportunity for all young children.

So the simple lesson here is the brains malleability, it is that blue line, you learn that. The yellow line is your cost. Look at the amount of investment that you put in before the age three. It is bad. This is actually done by one of my American colleagues, a psychiatrist trying to plot it. So that is the political battle you have to face, to get that shifted. Heckman, who is a US economist who has looked at this:

We cannot afford to postpone investing in children until they become adults nor can we wait until they reach school, a time when it may be too late to intervene.

He has done a very thorough analysis of all the programs in the United States, what they cost and their effect. This is an economist saying this. He also got a Nobel Prize which lets him get away with saying this because he upsets most of his friends.

Here is what the crazy Swedes do. This is expenditure per child, from birth to 17 years of age, by age of child. Look at the chunk of money that they are spending up to the age of six. Now, how in the hell does that country get there? Their wealth space is the same as our societies. Who on earth got them to commit money from the citizens to do this? This is the challenge that we face. Your country and my country are not poor, we are rich. We just misallocate the money and we just don't take the commitment to help put something that is important for societies.

So The Economist really wrote about this in an article about communities for the future, etcetera, and they talked about this. They said:

Give everybody a fair chance. This means investing in childhood nutrition and pre school education.

Pre school there means zero to six. Even the magazine is up to speed on that.

So what does this mean for your country, your State, your country, my country? If you do this, you will improve the health and wellbeing of your future populations in spades. You will improve the ability and the competence and capability of populations, hugely important for a knowledge-based world. You will help continue the evolution, not my language, of democratic, tolerant, pluralistic sustainable societies and it will improve equity in

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health, literacy and income. One of my colleagues in Canada, did a CBC lecture in 2004, he said: we are continuing to experiment in civilisations, that is what this is all about. If our civilisations are going to survive and not get caught in conflicts and wars, we are going to have to do something about upgrading the skills of our populations and their competence.

So the can the of Government of South Australia has put in place quality, universal and accessible early child development training centres that will be world leaders? They will be world leaders in providing equality of opportunity for all young children. And your State could or your country and my country, demonstrate how to do it and that is the challenge I throw up to all of you.

So there are two pilots projects I put in who I think are ready to go right now if somebody will organise themselves to do it. Finally, this is the final segment I am going to leave with you, in my country, since I have had to do this repeatedly since 1994, nobody really takes up the message and I am getting too old go around and chase and base people, we have created a council on early child development parenting. It is three years old, it is not Government, but it is drawn from all sections of society, the business, the private sector, people in other roles. Its task is to work at getting the whole community to understand this. Selecting people to be fellows in communities who can convey the message – we don't trust the universities to be able to do this by themselves by the way, they are pretty good but you have to use your community to do this – to help facilitate the developments, keep contact with the Governments and its job is to stay at this continuously because when you have a change of Government, eight years from now, you have no guarantee that Government won't slide back into right wing economics and what not in terms of this proposal.

If you want to make it move, you have to start creating an organisation to do this. Unfortunately, in my brief stay here, I have found enough victims, as I call them, who I think would like to do this and hopefully they will come together and do this and I think if you contact the Thinkers Office, they will let you know where it sits if any of you want to follow up on it a little bit more. So that is the end of the sermon for tonight. Thank you very much for listening and now go home and do the things you should do. I am pleased most of you stayed, nobody left as I can see so thank you very much.

MARIE BRENNAN:

You don't get that often. Thank you. Thank you very much Fraser. Now, before I offer the formal vote of thanks on all our behalves, I would like to invite Dr Carolyn Matthews, the South Australian Branch President of the Australian College of Educators to present Fraser with the A.W. Jones medal. Thank you.

CAROLYN MATTHEWS:

You may have noticed that the presentation tonight is subtitled: The A.W. Jones Oration and the A.W. Jones Oration is a biannual public lecture. That is a significant event in the calendar of the Australian College of Educators. For those who may not know, the Australian College of Educators, or ACE as it is commonly known, is a national professional association of educators. Its members are drawn from every sector of education including pre school, school, tertiary and TAFE. All educators are welcome to be members of ACE and you can discuss the benefits of this membership with ACE members who are here tonight and who will be out in the foyer following this lecture standing by the banner, I am told.

Dr Alby Jones was a founding member of the Australian College of Educators nearly 50 years ago. His career was wide-ranging. He was a teacher in rural and city schools and was one of the old school inspectors. But Alby is particularly well known in South Australia when in 1970 he was appointed Director General of Education. Alby was a significant reformer and his freedom and authority memorandum had a lasting influence on many of us who are here tonight.

Alby held a number of honours, including the Order of Australia but over and above his significant honours, what Alby brought to education was his warmth, humanity and a deep understanding of learning. Even as Director General, Alby was often to be found in schools, unannounced, I might add. He really enjoyed interacting with young people. He would walk into a school, freak the teachers out, and start talking to the kids. He used to ask them their opinion on a range of educational matters.

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It was a very unusual approach he had particularly for a Director General. The A.W. Jones Oration honours Dr Alby Jones for the wonderful educator and person that he was. The A.W. Jones medal is awarded every second year to an educator who is making a significant contribution to education and at this point I would like to thank Satisfac who has provided the medal. It is with pleasure that I present the A.W. Jones medal to Dr Fraser Mustard.

FRASER MUSTARD:

Thank you. This is a distinguished honour in my life to get this because I have never really been given any awards by anybody from education ever before, except a few degrees. To get this after a splendid three months stint working with you in South Australia is really quite a privilege so thank you, very, very much.

MARIE BRENNAN:

Now, Fraser, we will give you another clap in just a minute, but I do want to say a few words on behalf of us all because a Thinker in Residence is no use at all unless they actually spur the rest of us to think and then to act because thinking without action might give you great pleasure but it doesn't change anything. I think Fraser's challenge to us tonight is only going to be as good as the action and the thinking and the talking and getting out of our silos to work together, to take up the kinds of challenges that you have given us tonight actually requires a lot of us to swallow our expertise and work with each other. And that is a really hard thing to do.

Fraser, you do have an amazing way with words and a capacity to speak truth to power, which is fairly unrivalled, especially up here and I particularly like to commend you for the fact that you spent such a lot of time, not only linking with the higher up movers and shakers but the movers and shakes on the ground. We have to find a way to link both levels and we are the people that have to do it, not Fraser. Fraser's job is to shake us out of our complacency, to give us some work to think with and I have to say it is not often I take my sermons laced with biology, but I have to say this has been one of the most challenging sets of talks that I have ever been to and all of your presentations, Fraser, you managed to make us uncomfortable and that is a very helpful thing. It is not enough to go away fluttering: wasn't that fun, wasn't that interesting. Fraser will not have done his job unless we all do ours. So I think that is our real challenge and I think you for the hard work, the intellectual work, the social work, the greasing of the wheels, political, personal, social, economic, to try and put us all together so that we might be able to take it up. Thank you very much.

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