MEDIA MONITORS

Transcript

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Item:	**ADDRESS BY BARONESS SUSAN GREENFIELD CBE, DIRECTOR OF THE ROYAL INSTITUTION OF GREAT BRITAIN: A DEMENTIA FREE FUTURE: FANTASY OR REALITY.** **SPEAKER: BARONESS SUSAN GREENFIELD, THE ROYAL INSTITUTION OF GREAT BRITAIN.**		

Audience:	Male 16+	Female 16+	All people
	4000	4000	9000

LAURIE WILSON: Ladies and gentlemen, welcome to the National Press Club for today's National Australia Bank address.

Dementia is commonly associated with old age, but of course it's something that can strike any of us, even in our thirties. It's one of the major contributors to causing death in this country, and yet it receives only a tiny fraction of the funding for research into chronic diseases in this country.

Our speaker today, Baroness Susan Greenfield is one of the UK's most eminent neuroscientists. She's also an honorary Australian. She was named Honorary Australian of the Year back in 2006 and she is currently visiting this country as a guest of Alzheimer's Australia.

This is the second occasion on which she has addressed the club. Please welcome back Baroness Greenfield.

[Applause]

SUSAN GREENFIELD: Well, thank you very much Laurie. It's a huge pleasure to come back again and come back to the country where I am indeed an honorary citizen, not that this helps me in Immigration at the airport. But still perhaps we can…that will… yet to come.

I'd like to start, if you like, with a story about someone called Clive. And Clive was married, and had a little boy, who was about four years old. And one day his wife came back home and Clive had been babysitting with the child, and to her horror she found Clive arguing with the four year old over who was going to have the last chocolate biscuit.

Clive was a victim of early onset dementia.

Now, I'm sure increasing numbers of people that you speak with will have stories like this. Since I've been in Australia, I've been here now just over 10 days working with Alzheimer's Australia, and everyone has a story to tell similar to that.

Perhaps the most common for the carers is, I feel I lost my dad twice over, because frequently the person who is caring, who feels close to someone

with dementia, will feel the same sense of loss as though the person had actually already died.

And yet society doesn't recognise that. Society doesn't recognise you feel that bereavement, that great space left in your life, when someone who you loved, who you're close to, who you shared decades of your life with no longer actually recognises you.

So dementia is a very serious condition.

It's facing us increasingly in the twenty-first century. As in the old days people feared tuberculosis, or cancer, or heart disease, although these are still serious diseases, they are much more containable than they were say 50 years ago.

But I feel that dementia is a little bit like my mum used to regard cancer, say, in the middle of the last century. She used to call it the C word because she thought if she even said the word she would somehow invite it into our home.

And I think that perhaps part of the problem with dementia - and the reason I'm pleased to be here this afternoon - is it is if you like still the unspoken disease, the unspoken condition, the thing that's embarrassing, the thing that has a stigma.

Thanks to authors such as Terry Pratchett, however, it is starting to be more discussed, more out in the open. And the film *Iris*, perhaps that people may

have seen concerning the brilliant author Iris Murdoch.

But I think there's a sad tale to tell from that in that with Irish Murdoch, a brilliant writer, she nonetheless was not inviolate from dementia. Dementia respects no-one. However clever you are, you will be at risk. Everyone in this room, everyone watching, can't say for sure that they will not get dementia.

Small wonder, then, that it's on the increase, because as we're living longer and healthier lives, at least below the eyebrows, so diseases of older people will come to the fore. And I'd like to stress that dementia, Alzheimer's Disease - Alzheimer's, incidentally, people often ask me what the difference between Alzheimer's and dementia - one of the presenting symptoms of Alzheimer's is dementia, but there are other types of dementia that wouldn't be classified as Alzheimer's. Alzheimer's is about 50 to 70 per cent of all dementias, but really it's dementia that we're concerned with rather than any kind of troublesome taxonomy about the conditions. Because that is what it is, isn't it. It's the loss of your mind. De-mentia; a loss of mind.

And I think what we need to do, and certainly as a neuroscientist I think I need to do in my daily work, is to try and understand what is the human mind? What is it that is so precious that if it is slipping away, why is it we're so frightened compared to if you have a heart disease or cancer?

We're not so scared because with cancer or heart disease, your loved one is still the person that they ever were. They'll still recognise you, even if they may be in pain, even if they may be suffering, they're still the person they were. With dementia, people feel, as I say, the sense that they have lost the person, they no longer can share the memories with them.

So what is it, this human mind, that we are so scared of losing that is so precious to us?

And I think now that neuroscience is starting to help us understand the basics of what the human mind is. And by understanding the basics of what the human mind is in the first place, clearly when it is lost we can also have a handle on doing research for stopping the slipping away of this very precious, unique essence of you. Because it is unique to you; for the 100,000 years that human beings have stalked the planet, no-one has had a brain, a mind if you like, like yours. Yes, they may have livers like yours, and hearts like yours, and lungs like yours, and we know this because these can be implanted with increasing facility. But who actually would volunteer for a brain transplant? You might volunteer someone else for one.

[Laughter]

But I don't think, yeah - because it is the essence of the person.

As I say for 100,000 years, you have a unique brain, even if you're a clone - an identical twin therefore - you will still be a unique individual with your own life story, your own past, present, and hopefully a future, your own identity.

And that is what we are frightened of losing because it defines everything you are; all the meaning to you and your life.

So what is it, in the physical brain? Let's get down now to the squalor of the physical brain. Let's see if we can try and understand it. I get so fed up, sometimes, when I go to parties and people offer to get me a drink, and they go away and never come back again. If you've told them you're a neuroscientist then it's the kind of kiss of death at parties.

[Laughter]

Because they are kind of philosophers who want to deal with moi and all the exotic and insubstantial, emotional, romantic, airy-fairy essence of high emotional relationships. And, you know, someone who deals with chemistry, you know, that really doesn't do it, you know.

So what I want to convince you of first is that artisans such as myself, dealing as I am with the nuts and bolts of these banal old brain cells and these squidgy chemicals, nonetheless can relate the

kind of phenomena and processes we work with to the mind.

So I don't know if there's any goldfish lovers here. But let's be brutal. Goldfish, we can't say that for goldfish can we. Goldfish don't have huge personalities, you know, and I open that to discussion if you wish. But I would suggest to you that if your kids had a pet goldfish and the goldfish died while the child was at school, you could sneak off to the pet shop, buy another goldfish, and the kid wouldn't know any different because all goldfish do is stand and flap their little fins and open and close their mouths and swim in circles, and that's all they do. So they have a very constrained behavioural repertoire, not offering much scope for individual expression. So you could therefore swap the goldfish round.

Now, you couldn't do that with a pet cat or dog. And you certainly couldn't do it, even if they might want you to, with their brothers or sisters.

[Laughter]

Now, why is this? It's because we, as a species, have developed a wonderful talent. We don't run particularly fast, we don't see particularly well, we're not particularly strong. I wonder if you now can guess what it is that we do.

Sorry, that's not an interactive question. It's a rhetorical question.

What we do is we learn. So we occupy more ecological niches than any other species on the planet because of our wonderful ability. Other animals do this but we do it better than anyone else, is we adapt, we learn from our environment.

So the whole wonderful thing about being born a human being is you will adapt to wherever you're born. Whether it's in Canberra, or London, or fifth century Athens, you will adapt to that culture, that society, that world, those values, that standard, because this is the world you are born into. And your brain after birth, although you're born with pretty much all the brain cells you'll ever have, it grows hugely. Compared to a chimp brain, which is roughly the same as the human brain at birth, the human brain will grow. Why? Because although we're born with pretty much all the brain cells we'll have, it is the growth of the connections between the brain cells that accounts for the growth of the brain after birth.

What does this do for you?

It allows your individual experience, your world to literally leave its mark on your brain in a way that it has never done to any other brain because no-one has had your individual experiences.

This is something we in neuroscience call plasticity. It doesn't mean of course that the brain is plastic, but more from the Greek plastikos, to be moulded.

And let me give you two very quick examples, just to impress you, with your own brain because perhaps you don't realise just how amazing your brain is.

The first involves London taxi drivers. And I don't know if the same could be said of Canberra taxi drivers. I don't know how good they are or whether they would be better off as the control group for comparisons. But in this experiment, London taxi drivers, those drivers of the black cab, have to pass an ominous test called The Knowledge, where they negotiate all the streets of London, and they have to remember all this by heart. They commit to their so-called working memory, the huge burden of remembering all the street names of London, the one way systems and so on. So that without recourse to a manual, and orally in this terrible exam they have to do called The Knowledge, they can actually say to the examiner go from A to B, and so on, because of their memory. So a huge burden on their memory.

And this ingenious experiment, a while ago now, using brain scans of such London taxi drivers, it was found that an area of their brain that related to memory, an area called the hippocampus, that this was bigger in London taxi drivers than in other people. A fact not lost on London taxi drivers.

[Laughter]

They've all had - and it's not that having a big hippocampus predisposes you to being a London taxi driver because the difference was more marked for the longer they'd been learning.

Another example is three groups of adult human volunteers, none of whom could play the piano. Now, if ever you get to volunteer for such an experiment, a word of advice; don't be in the control group, if you can, because they just stared at a piano for five days.

[Laughter]

However, the more fun group learned five finger piano exercises. And there was a third group, and I'm going to keep them as a surprise. Anyway the group that learned five finger piano exercises, even after five days, astonishingly, showed a change in their brain scans, in functional areas relating to their digits - even after just five days.

But the surprise group, my third group, a surprise for you, is that these people were just asked to imagine they were playing the piano, and their brain scans were the same as the people that had played it, showing - in the words of the man who developed the treatment for Parkinson's Disease, still in use today - he said, thinking is movement

confined to the brain, thinking… so it's irrelevant really, just merely the contraction of muscle.

The exciting thing is the thought that precedes it.

So here we can see that even a thought will leave its mark, change the landscape of your brain scan. So unless you've fallen asleep now, imagine already what has happened in your brain since I stood up here. Well - and I say, you may have just dozed off.

[Laughter]

Now, this is all fine. And so one can think of the human mind like this: that you are born - in the words of a great psychologist, William James - you're born in a booming buzzing confusion, and you evaluate the world by senses, how sweet, fast, cold, bright. But you can imagine that if a visual pattern presents itself again and again and again to you, those connections, like with the taxi drivers, like with the piano players, will accommodate that. They will form connections, associations, in a certain visual pattern. And if that visual pattern, initially abstract, is accompanied by sounds and colours and smells, a voice say, a texture of skin say, your mother say, then gradually you will go from recognising or not recognising and just experiencing abstract visual sensations and voices, to it being mum.

And if mum, and let's hope she does, features again and again and again in your life, like with the piano players, so those connections will form - bigger and more extensive. Mum will mean something to you that she does not mean to anyone else, to whom she will be just some generic lady.

And so in this way, you are personalising your brain. And the way this is done is as you stimulate the brain - and we know there's some experiments, even with rats - if you stimulate the brain and make brain cells work very hard, they're a bit like muscles, they grow more and more branches when they do this. And when they grow branches, they can increase their surface area, which means they can be a target for more connections from other brain cells.

So you start to see one thing in terms of something else. Instead of just seeing a bright light or a pattern that means nothing, now it will mean something.

Significance is when you can actually recognise. We say a cognitive take on the world, where you see one thing in terms of something else. You now recognise your mum, you see your mum.

And so you go from this one way street - how bright, how fast, how cold - to seeing someone or an object or having an experience that you can now evaluate in terms of what has happened to you already. It will mean something to you. You will

have a unique understanding of that. And that might be wrong or right, it might be different from other people's, it might be the same, but it's yours, it's your take on the world, it's your unique brain.

And just as you're having that experience, it is upgrading, updating that connection. So you're having this wonderful two-way dialogue between your brain and the outside world that will continue on and on.

And that, ladies and gentlemen, I would suggest to you is the human mind. It is the personalisation of the physical brain through the growth of these connections that are in constant dialogue with the outside world that gives you the checks and balances to understand and navigate and orientate and leave your own mark on the society, the world, into which you happen to have been born.

Now, you can imagine things perhaps going wrong. What would happen if those connections now were dismantled? What would happen if slowly, the branches atrophied, so that you could no longer see one thing in terms of something else? Can you imagine what that might be like? Now, you wouldn't understand so much, you wouldn't recognise so much, you couldn't evaluate things from a unique perspective. And as the condition continued, you would now be more and more confused and disorientated and therefore frightened because you wouldn't have that robust conceptual

framework that gave you a way of understanding the meaning of the world around you.

And that is what I suggest to you dementia is. It is a retracing back to childhood. Yes, you can appreciate the sun on your face, you can have a nice ice cream but you can not understand and you cannot plan ahead and you cannot remember easily and, saddest of all, you cannot recognise objects, places and, above all, people that were once very, very special to you, by virtue of the connections that they had.

And so therefore if we think about dementia, because it is on the increase, because we are living longer and healthier lives, it means that by the middle of this century, one estimate is one million people in Australia will be suffering.

Now, how many people here, I wonder each - I could ask you each an individual question. How many people like you vaguely, like you vaguely or just a bit, you know? I won't even say how many people love you in the world. But let me just suggest that - let's say 10 people like you a bit, 10 people would be worried if you, you know. So -let's hope that's an underestimate because many people have children and grandchildren. But let's just say 10 because it's an easy number to multiply by.

If a million people, by the middle of this century, are going to be victims of that condition I've just

described, multiply that by 10, that will be 10 million people in Australia who are suffering also; who are the carers, who are going through those stages of bereavement, who are no longer recognised, whose lives are devastated, who have to give up work to look after the person, and the impact of their workplace when they lose some trusted colleague and see them change to people who are upset and worried and anxious, from people who were having a sunny disposition, perhaps, before. And so it goes on.

So I would suggest it's more than 10 million, perhaps it could be even more, indirectly, 20 million, the whole population currently of Australia, all suffering, all having a lifestyle change.

And if you're not swayed by that, then what about the economic costs of looking after them? Well, one estimate here is it's going to cost by the 2060s, unless we do something, 83 billion - billion, not million, billion dollars. And what could one do with that, if one was healthy, if it was a dementia-free future? Just think of the educational facilities, the housing possibilities, that that would allow people to do that.

And so where are we? Well, we stand at a crossroads, really, about what we can do. There's various possibilities, various approaches we can take. Most of them, I'm afraid, inevitably, take up time and money and resources and therefore are not

neutral. But as someone once said, if you stand at a crossroads, take it, take all the paths.

And I would like to just, in the brief time left, outline some of the paths that we could take if we did have more money.

At the moment, cancer gets five times more funding for research than Alzheimer's, cardiovascular four times more. And yet this condition is going to outstrip those conditions, in terms of health care burden, within the next few decades.

So we can no longer afford the nicety of being frightened, of being embarrassed, of stigmatising, of thinking that if we ignore it, if we don't talk about it, then it will just disappear, it will be someone else's problem. This is not the case.

So let me just outline briefly some of the approaches, some of which don't necessarily offer the magic bullet, the silver bullet, the cure, but nonetheless could help.

Well, the first issue is that there has been no new drug for Alzheimer's developed for the last 15 years. The current medication called Aricept or Galantamine - there's other names for it - operates on the principle of increasing the availability of a chemical messenger that we know dwindles in Alzheimer's Disease, in dementia.

But that's a little bit like - although it can be helpful for the initial phases of the disease, that's a bit like stopping someone's nose running when they've got a cold. Yes, it's helpful; yes, it makes the person more comfortable; but it doesn't tell you anything about the cold or the nature of the cold or why the person got the cold.

So, yes, you can deal with some of the symptoms like that, but really what we want to know is what causes the problem in the first place and how can we deal with it.

Another approach is neurosurgery. And in the States, they're pioneering injecting into Alzheimer patients something called growth factor. Now, the problem with surgery, apart from the fact that we don't really whether this is an effective treatment or not, is that it's unpleasant, it's hazardous, it's expensive. And whilst, of course, you'd opt for that, if it could cure you and there was nothing else, let's be brutal, it's not a treatment of choice. No-one would really want to have major brain surgery, I don't think, rather than taking an oral pill.

And moreover the problem with Alzheimer's for neurosurgery is that many areas of the brain are devastated. You only have to look post-mortem at an Alzheimer's brain, and I'm sure many have, and it looks completely wrecked, completely devastated by the disease. It is not one single area that you can do a hot - sort of, target to.

Another therapy that is possible - and there's some green shoots for hope here - is gene therapy. In the UK in Cardiff University, someone called Williams has isolated three genes that seem prominent in Alzheimer's Disease, and important. And she estimates that if one could offset the effects of these three genes, that would reduce the number of people suffering - in the UK, this is - by about 20 per cent, and that would be currently about 100,000 people. Now, I know that's not 100 per cent. But again it's a start.

And the message I want to get across is that there's no single paradigm that we've all adopted, there's no single simple answer. As someone once said, for every complex situation there's always a simple answer, and it's always wrong.

[Laughter]

Yeah, so what we need to do is to let 1000 flowers bloom. And this genetic approach is a promising one. But we shouldn't get carried away by thinking that you have a single gene and trapped inside that gene is good housekeeping or being witty. And heavens, not even Alzheimer's. The other problem with gene therapy is targeting the trillions of genes that are in your body, trying to get access to those is far from straightforward, as we know from example with the discovery of the gene for cystic fibrosis in the 1990s but then the disappointment with how one harnesses that knowledge to target the gene. That again doesn't necessarily hold an immediate cure.

Another approach is stem cells; so-called regenerative medicine, where you're replacing the damaged tissue with very obliging cells called stem cells that will adapt to any environment in which they are introduced. They can be bone cells, heart cells. If you put them into the brain the idea is that they could turn into brain cells.

Now, the problem with that again is whereabouts do you inject it, and the fact that unfettered proliferation of cells is indeed a tumour. So you have to be very careful how you regulate it. And moreover, the cells will release chemicals that, if they're in excess, could give you unwarranted side effects. In the case of transmittical(*) dopamine, for example, that alleviates movement problems but on the other hand it could make you psychotic. So that's a double-edged sword.

So we have to be very careful about stem cells. And again it's an approach, something that needs resourcing.

For example, we've now found - people have found that if you incubate stem cells with kind of Cinderella cells in the brain, so-called Glial cells that previously have just literally mopped up after the neurons, and outnumber neurons 10 to one, but no-one really works on them because they're not as glamorous as the main part of the cells, that actually, incubating stem cells and Glial cells can induce something called neurogenesis, the growth of new neurons in the brain.

So that is a - and, again, an exciting approach, and one that should be followed.

Another approach because all these invasive approaches are either really in experimental stages, or they are hazardous or unpleasant and indeed have a questionable rationale are non-invasive approaches. And I don't know how pleased you'd be to hear that some recent work in the States has found another way of inducing neurogenesis in the brain - the growth of neurons - and that's, guess what, physical exercise.

And I don't just mean a gentle jog around the block, you know, twice a year when you're feeling, you know, you've overeaten at Christmas or something. This is serious jogging. And it's been shown in mice who do the mice equivalent of jogging in treadmills, and indeed now in humans, that if you take serious and significant amounts of exercise, that increases the blood supply to the brain, the more efficient, therefore, delivery of oxygen, which optimises the growth of something we never thought was possible in the past, which was that the adult brain can actually produce new neurons in indeed the area affected in Alzheimer's, one of the areas, the hippocampus, the taxi drivers area, the area relating to memory.

So that's a very exciting idea, as is of course exercising the brain. Everyone knows you use it or you lose it with muscle. Same could apply to the brain. And we were just discussing earlier about

how stimulating the brain, taking you away from just veging out in front of the telly. My own view is having an argument is a brilliant way of exercising the brain because you have to - well, that is, as long as you argue properly. You mustn't just shout at someone. You have to listen to what they say, process against the checks and balances, and within a very short time articulate some kind of killer response.

[Laughter]

I'm sure the journalists here do this all the time, but - so they may be good controls at some stage.

So the idea is the more you stimulate your brain like that. Now, of course there's lots of things on the market claiming to help, brain training exercises and so on, and I think if it does no harm, then why not? Why not try these things?

And surely how could anyone say that physical and mental exercise are bad things and heavens, let's do those. Let's fill our lives with physical and mental exercise.

My mum, who was widowed a few months ago, has now taken up line dancing. She's 83 and having a great time with that.

So I think this is just improving quality of life. But let's be honest. It is not guaranteeing you won't get

Alzheimer's. It is making your life worthwhile, it is putting your brain in the best possible shape, but sadly, as Iris Murdoch stands as testimony, as Terry Pratchett stands as testimony, these are not going to be guarantees.

So the only guarantee, really, the only guarantee, is to know the very simple question, what kills these cells? Why are they dying? We know that it is not a generic property of brain cells because you can have a stroke, and as many of you may know, you can have a partial recovery, even a full recovery with a stroke.

So what is it special, what's special about the cells that are primarily lost in Alzheimer's, and indeed in related neurodegenerative conditions such as Parkinson's? Why do they if they're damaged - instead of allowing other cells to compensate, why do they embark on this remorseless cycle of cell death?

And that's one of the important questions. It's what I personally work on. We can have questions about that if you like. But this is the cutting edge of research, and this is the research that costs money because at the moment although there are some classical ideas, sort of dogmatic ideas, really, these ideas have not led to the development through clinical trials of appropriate drugs.

And what we need to do is widen our horizons and actually, in the words of Karl Marx, let 1000 flowers bloom.

The reason I'm very optimistic that if we could give money to a wide range of research projects that were actually tackling this problem, then we could have the following scenario, and let me just paint this scenario to you. The scenario, and it's still sadly a dream scenario, comes in two separate scenarios, sub-scenarios if such things exist.

Sub-scenario A is that you could go to the doctor, rather like you might go for a routine cholesterol blood test, and the doctor, every few months, could tell you whether or not you were going to develop the symptoms of neurodegeneration in a year or two's time. Now, we know this is at least possible because we know that 10 or 20 years precede the onset of symptoms of neurodegeneration. In Parkinson's disease, for example, we know that 80 per cent of the cells lost in the relevant area have to die before the symptoms come on.

Similarly with Alzheimer's, we know that it can be decades before the disease actually reveals itself. So imagine if you had a marker of that process before the symptoms came on, then this would bring down the cost dramatically of clinical trials, and the time of clinical trials, because the subjects could be their own reference points, their own controls. And moreover it might not be for everyone but you would have the option, possibly, of planning your

life if you were concerned - and you were facing up to the reality of hearing a positive answer - you might wish to plan your cruise, plan your life in a certain way that accommodated for those few years that were left to you with all your mind and brain working at full steam.

So that's one side. Of course you wouldn't have to have this test, you could choose whether you had it. But I know it sounds macabre but in and of itself it may be useful. And having a blood test is cheap and relatively painless and fast.

Now imagine another scenario - park that. Now imagine another scenario, that we have developed a medication that stops any more cells dying. So you as a dementing(*) patient could go to the doctor and the doctor saying, I know you're confused and disorientated, you're having some memory problems, but we now have this wonderful medication - an oral medication or a nasal spray - if you take that then it won't get any worse, this will stabilise your condition, it will not get any worse.

And imagine how wonderful that would be for people if they knew. They would have to take medication every day -, that's hardly a big deal - that the symptoms wouldn't get any worse.

Put these two scenarios together now. And this is my not fantasy, but I hope a reality. You go to the doctor, scenario A. He or she says, yes, I'm afraid

there's bad news and good news. The bad news is you have an elevated marker, in next year or two according to this chart I happen to have with your marker level then you're probably going to have cognitive impairment, early cognitive impairments, memory loss, confusion.

However, the good news is, we now have this medication - scenario B - that stops any more cells dying. Take the medication now, right now, while you're fine, and that will stop any more cells dying in your brain and therefore the symptoms will never come on.

Now that, ladies and gentlemen, I'd like to suggest, is a realistic scenario. It doesn't invoke complex or expensive or hazardous or exotic or ethically compromisable(*) scenarios to do invasively with the brain.

It is something that would entail a routine blood test and then oral medication. And that would be relatively cheap to rollout, and not unpleasant for the patients. And it means the symptoms would never come on.

So that is the dream scenario, but there's one big problem with this scenario, is that both scenario A and scenario B - developing the marker, arresting the cells from dying - depend on one crucial issue, why are the cells dying in the first place?

And until we know, and no-one has yet come up with a completely acknowledged and validated theory or mechanism as to why these special cells in Alzheimer's, in dementia do die, and the way they die, how can we develop a faithful marker or a means of intercepting that process and stabilising it until we know that? And how can we know that until we have money to do the research to find out.

And at the moment, this is the Cinderella subject. This is something that we cannot afford. This is not just pointy heads in universities, you know, doing something obscure and self-indulgent. This is something that is vital to you and your children and your grandchildren. Until we have money for research, then there'll be large amounts of money and even more, a terrible toll taken on human suffering, both of carers and patients, unless we really wake up to this.

And that's why I've been so grateful to be able to stand up here before you today because I'm not a doctor. Luckily I haven't had a personal story of my own - my own family with Alzheimer's, but I am a scientist and I do plead to you as a scientist, to take us seriously, to help us because only by understanding the underlying science of dementia will we make a dementia-free future not just a fantasy, but indeed a reality.

Thank you very much.

[Applause]

LAURIE WILSON: Let's move to questions now, and I'll ask you the first one. Are you saying that really the only solution here is a significant increase in public funding for this sort of research; that is has to be driven by governments? And are - is there anywhere - any country around the world which is taking some sort of lead in this?

SUSAN GREENFIELD: Well scientists aren't picky about money, basically. That, you know, we don't - as long as it's legally acquired, most scientists actually are quite ruthless.

[Laughter]

It would be important, and it is important I think for government's to recognise. And I think the taxpayer wouldn't mind their money going to things like that, without getting too political, when you think of the things the taxpayers' money often does go on from governments. And I'm thinking my own country now, Defence spending, I don't think people would mind some of that being diverted to working on dementia. But I speak for myself there, and I speak as a UK citizen. I don't know how it is in Australia.

I think it's something where governments must recognise and take the lead as important funding priority because otherwise, why should the private sector say, why should we pick up the slack for you, you know?

Now, I think there's also two other sources of funding, and it would be wonderful if government and these other sources could work together. One is philanthropic funding. Nowadays we have individuals, younger individuals who make a lot of money out of the digital technologies, and this phenomenon wasn't really recognised 10 or 20 years ago, and it might be that they who have so quickly in their early lives acquired with great fortune, great fortune, that they may start to think about shaping the future for their children and their grandchildren.

And the third of course are corporations and the private sector. But I think they shouldn't take the burden of it. That's not to say they shouldn't sponsor and be involved. I think if you regard these high net individuals and companies, they're part of society; they too have children and grandchildren. They're going to be possibly victims as well. They need to work with government, but it has to be cohesive.

And certainly I think that government should take the lead in really raising awareness via the media, as - that's why I'm very pleased to be here today, as to this being an important issue; this being one that we can do something about. This is not like time travel, you know. It's not a problem scientifically as obscure as time travel or 11 dimensions, you know? It's not that. It's not even like particle acceleration at Cern, you know, where you're taking out huge amounts of money. The average scientist doesn't cost a lot of money, although - they have very low

salaries on the whole. You know, we're very humble folk.

[Laughter]

We come cheap. And sometimes the consumables are expensive, but on the whole we're - you know, you can run us quite cheaply, relative for what we do.

So I think that government should recognise this more, and across the world. And I certainly speak, not so much from Australia, obviously, because I don't work here, but in the UK I'm aware that there is no country at the moment that has really deviated or distinguished themselves conspicuously and largely. I know Australia's taken the lead on this, but in terms of putting your money where your mouth is and continuing to do so, I think that now needs to be addressed.

LAURIE WILSON: I'll pass to my colleagues now. Mark Metherall.

QUESTION: Mark Metherall from the *Sydney Morning Herald* and *The Age*, Baroness.

Just following on from your talking about the need for a bigger effort in this, we had about a month ago, the Nobel Laureate, Barry Marshall…

SUSAN GREENFIELD: Sure, yes.

QUESTION: …who spoke about the power and potential of the genome and what - how that was opening up avenues. And it struck me then that the proper use of the sort of information that that can provide, surely shows a way to what shouldn't be a too expensive way of trying to track down what you're talking about. Can you comment on that, but also, tell us a little more about why it is so difficult to find out why these cells die?

SUSAN GREENFIELD: Thank you for that.

QUESTION: Of course, you don't know the answer to the question. But maybe you could…

SUSAN GREENFIELD: Yeah, so I can give you [indistinct].

Okay, so I think that question is really several questions. And I'm so glad you mentioned Barry Marshall. So if we could just talk about him for a second, as a person. I'm sure everyone here knows his story, but perhaps some of the viewers might not. But he was someone who had a different idea about ulcers. Everyone thought that ulcers was caused by stress, but he thought, and had reasons for thinking, that it could be a virus. And no-one took him seriously because he was going against the dogma. He couldn't get research funding easily. He really struggled.

Eventually he used himself as a subject and won the Nobel Prize because he was proved right. But his

story is one that's, I think, a very important one with a moral to it, which is just because someone doesn't adhere to the dogma, just because they're left of field, doesn't mean to say they're wrong. And I would like to plead with that with Alzheimer's at the moment because when you have shortage of funding, people get risk averse. The research funding councils especially sitting in committee have a fixed idea as to dogma and fashion, and sometimes the Barry Marshalls of this world don't get acknowledged or helped in the way. So thank you for mentioning that.

Now the genome - is that what you were asking about? Yeah.

Genes are necessary, but they're not sufficient for brain function. You can think of a gene a bit like a spark plug. If it goes wrong, your car won't go. But if I just put a spark plug on the table, you couldn't work out how a car works, okay.

And that's how it is. You have to separate necessity from sufficiency. So, yes, you can work backwards and you can identify a gene that's gone wrong. You might even eventually, although you can't easily at the moment, make that gene function appropriately. And therefore as I've said in the case of these three that have been identified - three genes identified already, you might be able to reduce the number of people suffering from Alzheimer's. That will not tell you necessarily why these cells are dying in the first place. A bit like a sparking plug just loose on the

table is not going to tell you how an engine works; you need to know much more, you need to know the whole context in which that sparking plug would normally be operating and functioning.

So the third part of your question, which is have we any idea; yes, I have an idea, but it's a bit like saying, do you have kid. Is the kid clever at all? You know, obviously you'd bring out your own child and promote your child. And, you know, I could promote my own theory, but it's like my - like a child would be. You know, I have my own affection for it, but it's an affection, not shared necessarily as yet by my colleagues or my peers.

And my own view is that one idea could be that the cells are special because the ones that are initially lost are actually very different from all other cells in the brain. They come from a different part of the embryo, and that tells you something very interesting. It tells you that they do have the potential for being very different.

And of the many features that distinguish them from the other cells in the brain is they've retained their ability to grow again. Now, that might sound a good thing, but there are some of us who think that perhaps neurodegeneration, the slow loss of brain cells, is an aberrant form of development. It's developmental processes and mechanisms that are triggered if there's damage. But the context of the mature brain is not like that of an embryo brain, and therefore, when these mechanisms are brought into

play, they actually are a Jekyll and Hyde; they actually kill the cells rather than help them grow. I won't go into details necessarily. I'm very happy to if people want.

But that's the kind of idea that we need to have. We need to know what causes the cells to die in the first place, and I think what we do have to do is look at the clues that nature tells us.

One is that not all brain cells die, and that will be answered by this idea that there's hub of cells in the brain coming from a different part.

Another very interesting issue is that Parkinson's and Alzheimer's can often co-occur, and it may be that those two diseases have more in common than they have apart. Although they use different chemical messages, because they're adjacent in the brain, perhaps that co-pathology can be explained by if one is damaged you'll get Alzheimer's, if the other is damaged you'll get Parkinson's. If the area - if the damage is extensive, you might get both.

So that's why I pursued the particular one - idea that I put before you, but I do stress it's an idea not shared by everyone. It's speculative. But that's not a problem. I don't care if I am wrong. I do care passionately that someone is right and that we have the facility and the opportunity and the funds, in the words of Karl Popper, to test out falsifiable hypotheses, you know, to have a hypothesis that

you can test and falsify. That's the essence of science. Until we do that, people like Barry Marshall - there might be a Barry Marshall now who is not getting funded who is giving up science, and that's why it's important to have a large amount of - a wide range of funding.

LAURIE WILSON: Simon Grose.

QUESTION: Simon Grose from ScienceMedia.com.au. Those figures you quoted in your speech or the comparisons about research funding for cancer and heart disease and - I figured they're a global comparison, that's a global comparison or a national…

SUSAN GREENFIELD: No, as far as I know, there are figures that actually, I was given by Alzheimer's Australia, where it's $20 million a year for dementia and I think it's about 140 million for cancer and it's about 90 or 100 million for cardiovascular. Yes, I'm being told that they are correct numbers, yeah.

QUESTION: Okay. Like, we all know how competitive is getting funding for research. I think - like, especially medical research. If the NHMRC is able to fund 30 per cent of its applications in any round, it's - that's a high outcome.

SUSAN GREENFIELD: So that - yes. And in England, at the moment, it's one in 10 are being funded.

QUESTION: Yeah. Now, heart - research into heart disease, cardiovascular and cancer have been around longer than research into this area. So I just wonder to what extent is there a kind of pathway so that, down the track, as the kind of Alzheimer's research we're getting now comes up with pathways, that the peer groups can see this is worth putting money into, that that might see down the track the share of Alzheimer's research or dementia research rising in a response to the validity of the applications.

SUSAN GREENFIELD: Yeah. No, I mean, it's an interesting point, that everyone loves a winner and if people can start to see promising or exciting results, then clearly you think, well, this is worth funding. But I think we need to get to that first milestone. We need to have enough research in play realistically funded, not exorbitantly funded, but realistically funded, so that those of us at the coalface can actually excite others and show proof of concept and say, look, this is working, you know?

But I agree. I think the answer is that we must have perhaps relatively modest amounts of money, but seeded over a very diverse range, rather than everyone putting a lot of money into one accepted dogmatic approach. So I think that's a crucial issue as well.

And also, I think we have to realise that in science, horror of horrors, you can be wrong sometimes. That's the whole point of science. And, sometimes, people forget that. There's a new phrase that has

crept in internationally called bias-free research, which I hate, which is where you have a technique, you apply it, you get data and you can't understand or interpret the data, but the whole point is to just harvest data, you know, because that is guaranteed, you've got results, there you are, you've got your results, you've got a load of data. The fact you haven't been driven by a hypothesis or an idea, yeah, but nonetheless you've got your results. If you're driven by hypothesis and you're wrong, horror, you're wrong. But we all learn from our mistakes, and there's no such thing as a bad result or a negative result. It tells you something that's not the case, and that's very powerful, you know?

So what we need to do as well as introduce funding, we need to, if you like, work on the culture among funding and the research councils and how - I mean, let me just be very heretical with - this is something I suggested in the UK is what if one abolished research council funding and the amounts of money available, plus all the money saved on the bureaucracy of the research councils was divided up among eligible scientists, you know? In England, it was worked out, that would give everyone about 100,000 pounds a year.

QUESTION: [Indistinct] in 10 years time…

SUSAN GREENFIELD: Well, yeah, I'd say, well, this is - so then, of course, you would have some kind of way of marshalling it. But I know that's a great heresy, but I did say it on the record in the UK, so I'll say it here as well. And,

you know, someone has to say these things, so I might as well say it, that, you know, we should entertain all scenarios, in terms of - the main point is to get the science who are doing the research and doing innovative research, getting them properly funded in some way, however that - that's the important thing.

LAURIE WILSON: Ken Randall.

QUESTION: Could I just take you another step on the funding path? One of the major factors in getting money, by whatever means, is profile, and having role models is one of the major things for doing that. You talked about Iris Murdoch and Terry Pratchett, but there aren't many. And that seems to me to be probably because not many people recognise early enough that they can - that they are subjects of and can be advocates for that cause. Where is the research on early recognition?

SUSAN GREENFIELD: That's a really interesting issue, and the short answer is I don't know how much has been done in that way. What I think is very important, in terms of raising awareness, as you've said, given that some, like Terry Pratchett, is a relatively rare individual, and Alzheimer's Australia are doing this, which is getting stories from people, hearing their stories, because the more one hears the personal issues that have surrounded other people, the more you tend to identify and understand the human cost and the importance of it.

And I think that early recognition, or recognition of the disease, can come from sharing stories, hearing how it all happened to other people and then that really does bring it home to you and makes it very real.

LAURIE WILSON: A question now from Peter Phillips.

QUESTION: Baroness Greenfield, Peter Phillips, one of the directors of the National Press Club.

My colleague, as is the nature of such things, basically asked my question. But I want to go a little bit further into that. Early onset. Does research to date give you any indication of either body type or personality type which will indicate likelihood or propensity for early onset? And if it does, is there an opportunity, is there a path, is there a route, is there a methodology which might be adopted across the education system, even as early as primary or secondary education system into tertiary education? Are there workforce practices which could be introduced, that is, processes in the workplace, sort of like fire drills or something, which might be introduced as a part of industrial practice, of workforce practice, which might assist in offsetting early onset?

SUSAN GREENFIELD: Okay. Thanks for that. I think again that's sort of two or three questions rolled into one. We know that about five per cent of Alzheimer's has a strong genetic component, as opposed to so-called

sporadic, which is where it is less tightly linked. And it tends to be that those with the genetic, the familial so-called five per cent Alzheimer's, that can come on earlier. But it doesn't really obey rigid distinctions and you can have cases of people developing dementia earlier in life that's not necessarily familial, so that's not really a test.

Thinking of environment and trying to co-relate or match up the environment with mental state, there was one brilliant study - this is in the case of Parkinson's - where it was found that an island off the Pacific, and island called Guam, had a very high incidence of Parkinson's Disease in this case. And they did some very clever detective work and traced it back to something that the inhabitants had eaten, several decades earlier, during the Japanese occupation, when they were forced to eat certain vegetation, and that had contained a toxin that had then related to the much larger numbers of people with Parkinson's.

So we know occasionally there can be brilliant detective work in that way, where you do trace something that's happened to a society or a community or to an environment, that has eventually resulted in the dysfunction. But, unfortunately, those things are far from obvious, and one can't assume one will find those things. Other people think it's - aluminium might be a cause. And there are lots of ideas as to what might precipitate Alzheimer's Disease.

My own view is that there can be many different reasons why these cells are damaged, and so the crucial issue is what do we do about it, once they are because you would never eliminate all possible environmental factors, whether it's aluminium or stress or something called free radicals, which are like molecular Rambos that attack cells when you're older if you don't have appropriate antioxidants.

There's lots and lots of things. A blow to the head, a subclinical stroke, all these things might set in train or set off, and then 20 years later you have it.

But because the link between what might happen 10 or 20 years earlier, and the many different ways in which cells can be damaged because of that being such a wide scale, it's very hard to actually home in on a very precise cause or effect.

On that said, I think if we - I'd love a world where everyone goes around having arguments with each other; you know, everyone is fit and healthy and goes running all the time and playing squash all the time. I personally think that would be quite an interesting lifestyle for people but that wouldn't necessarily guarantee you wouldn't get Alzheimer's. But it would guarantee an interesting group of people.

[Laughter]

LAURIE WILSON: Take a second question now from Mark Metherall.

SUSAN GREENFIELD: Argumentative fitness.

LAURIE WILSON: [Laughs]

QUESTION: Just on that, I mean, you've spoken about physical activity perhaps having a preventative effect, what about intellectual activity? Does it still apply that people that have a varied occupation, varying challenges, play Bridge, that sort of thing, is that preventing Alzheimer's?

SUSAN GREENFIELD: Okay, again, this is a very hard thing to test because you can't do an experiment where you say, okay, let's take two people of the same age and cognitive abilities and one of you is going to play chess all day and the other one is going to veg out in front of the tellie and we'll have a controlled study on this, and we'll see if you get Alzheimer's. I don't think one could do that, you know, very readily.

Certainly there was a report in the UK newspapers a while ago that watching television just passively, going [indistinct] sitting in front of the tellie, might be linked to the lack of stimulation. Another argument is that nowadays in our society where older people are often compromised in terms of their mobility and often are bereaved and live alone, that they're not being stimulated and if they were, that might help. All those things kind of make sense, you know, that we know the brain, I say, operates on a ruthless use it or lose it principle. And

if you're being stimulated all the time, then I'm sure you'll respond.

On the other hand, someone like Terry Pratchett and Iris Murdoch were stimulated all the time, and stimulated others all the time, and it didn't stop them.

So we have to distinguish between several things. Understanding why the cells are dying. And at the end of the day that's what we have to do, and that costs money and that costs research. Another is to try and ensure your brain is as healthy as possible, that you are doing everything that you can for it. And the other is to try and minimise those kinds of effects of social depravation or people living alone.

So there's sort of three approaches which is to look after people and try and help them and stimulate them if they're living alone; on the other hand to try and promote physical and mental exercise. But, above all, we do need - and those won't get around the crucial question why do the cells die. We need to answer that.

LAURIE WILSON: Simon Grose.

QUESTION: Simon Grose. I'm going to ask you to exercise your brain by asking you a question a bit off this topic. Following on from your ongoing interest in the development of the young brain and the new ICT

technologies, there's a report in *The Australian*, one of News Limited's still reputable newspapers…

SUSAN GREENFIELD: [Laughs]

QUESTION: …today about the trend in the US primary school system for - to no longer teach handwriting, but for kids to go straight to keyboard skills. I wonder how you see that as an input into the development of the young brain.

SUSAN GREENFIELD: Yeah, this is kind - thank you for that. It is indeed a question that is related, if you like, to dementia nonetheless because if you go along with my particular interpretation of how we might understand the human mind from the level of the neurons, then you can see that dementia would be retracing the steps of childhood again. The two processes are the same but they're just in a reverse direction.

My own view with the young brain, like with the Alzheimer's brain, is you're dealing with a mind that does not have the checks and balances, does not have the conceptual framework, can be confused and disorientated. And I think therefore putting the young brain in front of a screen and a keyboard without the backup conceptual framework is a little bit like a demented person might feel. That is to say, they cannot understand and evaluate what is going on.

And just hot off the presses - and I'll mention this, given you asked that question about the young brain, to show just how sensitive the brain is to the environment, and this would also apply to older brains as well - there's a recent study. And for those of you who want access to the journal, it's *PLoS One*, that's P-L-O-S One. That's the journal. And there's a study out of China showing a very high correlation between real changes in the brain and internet addiction. And there's a very high correlation between years of internet addiction with atrophy of brain tissue. And I think - yes, I say that on the record, and it's *PLoS One*; look it up. And that, I think, starts to make us take this all very seriously. I think only now we are really realising how the environment shapes and changes the brain.

And this applies to trying to combat dementia. As we've heard, until we get the happy day when we sort out what the mechanism is, if we can understand more about the environment and creating a better environment, a more stimulating environment for old people, then it's kind of answering the same questions, and thinking in the same ways. How can we shape a better environment for our kids so they too have a sense of identity, a sense of meaning, a sense of fulfilment, just as we want older people to have.

LAURIE WILSON: Given your comments about the impact on those who simply thought about playing the piano, I thought I might ask you but I probably know the answer, so I won't; whether I - if I just…

SUSAN GREENFIELD: No, no, but they don't know the answer so you can ask rhetorically.

LAURIE WILSON: If I thought about running, would that be enough.

[Laughter]

Probably not.

SUSAN GREENFIELD: I thought about being a millionaire and that hasn't happened yet either, so - you know. And I've imagined, you know, piles of bank notes but that hasn't happened either. So, you know, it has its limits…

LAURIE WILSON: I thought I would pick up on something of a variation on Simon's question. You've been reported, and I take it as being accurate - correct me if I'm wrong - as raising concerns about the impact of social networking on young people's development, and I'd like you to expand on that. But I'm also wondering, perhaps at the other end of the scale, social networking, use of technology, is there a positive benefit there for older people?

SUSAN GREENFIELD: Yes, of course. I've often been misquoted as saying computers make you stupid, Baroness says computers rot the brain. And I've never ever, knowingly, or intentionally given a value judgement. All I've said is I'm a neuroscientist and I know the brain is shaped by the environment. If the environment is changing in an unprecedented way,

it is a given the brain will change in an unprecedented way. Whether it's good or bad is a completely separate issue.

And I think this is a complex question. It involves good things and bad things. You can unpack it in terms of social network, which I'll come to in a second, search engines, gaming. They're complex and separate issues and I've coined the phrase, which I'm very proud of, mind change to be the equivalent of climate change. And I think that now we are facing in this century, although it hasn't been recognised, a similar iconic unprecedented feature of our world where we are looking at something that we have to think about and deal with that's both controversial and it's good and it's bad, some people think it's exaggerated, some people think we're doomed, some think science can help, it breaks down into lots of separate questions. And I think that we have to embrace and look at that rather than just putting our hands over our ears and saying, oh Baroness is scaremongering. I've never done that.

But back to your social networking question, I'm looking at you now, okay, and I'm looking at you in the eye. And if I carry on looking you in the eye, are you starting to feel uncomfy?

LAURIE WILSON: Eventually perhaps.

[Laughter]

SUSAN GREENFIELD: You're a hardened press man. Now if…

LAURIE WILSON: I am a journalist [laughs].

SUSAN GREENFIELD: Okay, exactly. Now, I'm looking at you and I'm not looking at you. Now are you feeling uncomfortable as I'm talking to you? Feel a bit freaked?

LAURIE WILSON: Yes.

SUSAN GREENFIELD: Okay. So, the whole point being that eye contact is a very subtle skill that, according to how well you know the person, the nature of the relationship, you vary in terms of when you look in the eye, when you look away and so on. You learn this. You learn this as a kid when you're interacting.

Similarly, when you're socialising with someone you learn when and how and where especially you can touch them. My dad died a few months ago, and I know only too well, as I'm sure you must all do, the power of a hug. But the hug has to be given by the right person for the right length of time on the right part of your body in the right context, otherwise you get into very serious trouble.

[Laughter]

So, clearly, things like touching someone, eye contact, voice tone are hugely important, hugely important in establishing empathy with someone, understanding how someone is feeling, and above

all human relations. And none of those things are available on Facebook.

So if you are spending six hours a day or more, or your primary social vehicle is through a screen, well all you have is vision and hearing, and you don't learn how to hug someone, or when to look them in the eye, or how to interpret their tone of voice. How are you going to learn those skills?

So I think for social networking for younger people, we have to be very mindful of that, that having a friend on Facebook is not like having a friend you go for a walk in the rain with and put your arm around. It's not the same thing.

For older people, and back to older people again, again my mum, we've just bought her a computer so she's getting mental stimulation as well as her line dancing stimulation. And she's discovered the internet and she's really - at 83. And I think that's a very different thing because she already has her network of friends. She already knows about eye contact and hugging people. She already has a conceptual framework in which she can evaluate what she sees on the screen as either rubbish or good or bad, or interesting; very different from a small kid.

So I don't in any way, and I want to go on record, I have never said we should put a hatchet through all computers. They're very, very powerful

technologies, and it's [indistinct] for that reason that reason we have to harness them. But we need to decide what we want to harness them for.

LAURIE WILSON: And a final question now from Mark Metherell.

QUESTION: Should we then ration exposure our children to internet to a given age?

SUSAN GREENFIELD: Okay. I speak from experience of a lifetime smoker. I gave up smoking in 1980 finally. But the reason I smoked for a long time was people tried to ration me and tell me I shouldn't smoke. And I think the mistake many people make is that think you have regulation rather than education. And telling someone they mustn't do something is usually a green light to go and do it because it seems even more exotic and special.

I also speak as a smoker - ex-smoker knowing that people told you not to do something; it didn't put anything in its place. And the whole point is to give someone a more exciting experience, a more stimulating experience. And just to be negative, to say don't do something, but do this, do this, this is more - this is three dimensional, this has smells, this has touch, you know? That might be a way forward.

But I think just by stopping someone do something, on the whole, you might make it seem even more exotic and special. And, you know, kids are like everyone, you know. They're clever, they want to

know why, you know? What can I do instead? And it's up to us. It's easy to stop someone doing something. It's far less easy, and it's more challenging, but it's important. We must give them something.

It's like with drugs. It's alright if we say don't take drugs, but what are we going to give them? How are we going to give them fulfilling and interesting lives where they feel a sense of identity, a sense of fulfilment, a sense of pride in themselves. That's what we need to work on. Not, not to do something. But making something so special and exciting that they won't want to do it anyway, because the other thing is so much nicer.

LAURIE WILSON: Please thank our guest.

[Applause]

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