MEDIA MONITORS

Transcript

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Item: **ADDRESS BY PROFESSOR JOSEF PENNINGER, INSTITUTE OF MOLECULAR BIOTECHNOLOGY DIRECTOR.**

INTERVIEWEES: PROFESSOR JOSEF PENNINGER, INSTITUTE OF MOLECULAR BIOTECHNOLOGY DIRECTOR

Demographics:	Male 16+	Female 16+	All people	ABs	GBs
	N/A	N/A	N/A	N/A	N/A

KEN RANDALL: Ladies and Gentlemen, welcome to the National Press Club and today's National Australia Bank address.

You may know - I hope you know that this is National Medical Research week, almost at the end of it, but it's still part of the week, and we are able today to welcome one of the world's most distinguished researchers Professor Josef Penninger, director of the Institute of Molecular Biology at the Austrian Academy of Sciences in Vienna. He's also a professor of genetics at the University at Vienna and a full professor of immunology and medical biophysics at the University of Toronto and an honorary professor of the Chinese Academy of Sciences in Beijing.

Apart from that, for two years in a row - it does sound quite a good work load doesn't it? For two years in a row he was named among the 10 most cited scientists in the world and he has a truly

extraordinary list of awards and honours from around the world.

And I must say the most recent of those is the 2009 Medal of the Australian Society for Medical Research and I'm pleased that the Minister for Health, Nicola Roxon, is here to make that presentation of the medal to him. Here's the minister.

[Applause]

NICOLA ROXON: Thank you very much Ken and thank you to the Press Club again for being involved in such an important event and congratulations.

Can I just make a couple of acknowledgements; first of course to His Excellency the Ambassador for Austria; Dr Sarah Meachem who is here, the President of the presenting host, if you like, of the award today, the Australian Society for Medical Research; Professor Warwick Anderson the chief executive of the National Health and Medical Research Council. I notice there are a couple of my other colleagues here from Parliament; ladies and gentlemen.

I'm really delighted to be here to present such a prestigious award, the Australian Society for Medical Research Medal for 2009. And I wanted to take the time to come today, in what, you were right, it's a very busy day, not just because I needed

a breather and was hoping for lunch, but actually because I really do want to acknowledge the status of this award and of course have the chance to meet such a distinguished researcher.

But I think it is actually very important for our research community that such an award is acknowledged and the work of so many people in this room is acknowledged. So it was important from my perspective, and the Government's, to be here to do the presentation and to hear of course what you have to say.

The medal, if you like, is the Australian Oscar for medical research, and honours really don't get much higher. The Australian Society for Medical Research is the peak body representing Australian health and medical research, so it's the ultimate accolade that's being presented today from Australia's research community and only goes to the best of the best.

Many of you would know it's an annual prize awarded to an eminent local or international scientist, based on their contribution to medical research and their advocacy on behalf of health and medical research.

The first medal in 1998 went to Professor Peter Doherty, one of only 10 Australian Nobel Prize Winners, so it's a very distinguished award indeed.

The 2009 medal winner is a very worthy addition to this AMSA hall of fame. Professor Josef Penninger, who you are about to hear from, is the scientific director of the Institute for Molecular Biotechnology of the Austrian Academy of Sciences in Vienna.

That might be a mouthful, but let me put it another way, because he's had the distinction of being named as one of the 10 most promising scientists in all fields of science, one of the 10 most interesting people in America.

[Laughter]

I can confirm that Paris Hilton was not on that list. He made the list of the 10 most cited scientists in the world two years in a row, and he was named the Austrian Scientist of the Year, and these are just a number of the accolades.

Medical research, of course, isn't a popularity contest but it does seem Professor Penninger is doing something right. And over the years he's produced a steady stream of groundbreaking studies across the breadth of immunology and that's, of course, his area. But his main focus of work is on cancers, heart and lung, autoimmune and bone diseases.

Yesterday I spoke at the Heart Foundation's campaign to raise awareness of heart disease in

women, so it's very humbling to meet a man who is working on the frontline to unlock the key to this disease.

But I need to also tell you that I know that Professor Penninger has studied art history as well. So if he hasn't won enough accolades, apparently he can also tell us about his opinions of art and culture. I was particularly taken with a quote from the professor, who said back in 2004 at the Keys Memorial Lecture at Trinity College in Toronto; All great discoveries occur when scientists wander off the beaten track pursuing unpopular, unknown ideas, or merge knowledge from disparate fields.

So I believe that we can apply such wisdom to many human endeavours. We should all be looking outside the box as I know many of you are and not afraid to wander off the beaten track. It might be a lesson I take back with me to the Parliament, perhaps some of our colleagues will as well.

This award to Professor Penninger is because he has been particularly instrumental in fostering collaboration between medical researchers in many countries of the world, not least of all in Australia. This is something that the Australian Government is particularly keen to promote and foster in our medical research work.

In short he is a fine recipient of this ward - award and I'm very proud to present it with him. I do have

to tell you I feel a little bit like I'm presenting an Olympic medal because I'm told that I should put it on you.

So if you would like to stand up while we congratulate the Professor for this award and we'll see if we can get it on.

[Applause]

KEN RANDALL: Thank you very much Minister. Congratulations Professor.

Will you now please welcome Professor Josef Penninger.

[Applause]

JOSEF PENNINGER: So I am a little speechless. It's a great honour to get this medal of the Australian Society of Medical Research.

Honourable Nicola Roxon the Minister for Health and Ageing; Professor Warwick Anderson; Ken Randall president of the National Press Club; and members of the press, ladies and gentlemen it's - I thought that when I got the phone call they'd dialled the wrong number and they'd actually mixed up our countries.

[Laughter]

And I was really taken by this, because as a young student I actually went travelling in Australia and I went to Longreach and in Longreach I went through town and there they actually had a sign for a boat tour which really struck me; interesting. So I went on the boat tour in Longreach and the local policeman sang Waltzing Matilda to me…

[laughter]

…and I thought what a great country…

[laughter]

…and I just fall in love with Australia.

And this prize today is not just a testament to somebody like me - I just got lucky in life for being at the right places at the right time - it's a testament to all the great people I had the pleasure to work with, all the students, all the post docs and also all the people internationally who basically provided us with materials that allowed me to do my research and also many people in Australia, over the years, we have been working with. And I have to tell you that Australia has truly outstanding researchers and Australia has excellent research institutions.

And of course, as already read out, people who have won this medal before like Peter Doherty and many others who are also in this room who have had made outstanding contributions, not only to

research in Australia, but honestly to research in the entire planet.

So I'm actually from a little village, and our village was famous because the least kids went to university. So I'm a little farm boy and the idea was really that a little farm boy, like myself, has no business to be at university and my mother basically stepped down her foot and said you know let's stick this little kid into boarding school and see what's coming out the other end. So this is what came out of it.

You might know Ilya Prigogine, he won the Nobel Prize for Physics and Ilya Prigogine once wrote you can actually, well he can calculate, mathematically calculate, the life of humans and I think Ilya Prigogine would have really had a hard time with me. Where I came from and you know my journey to actually stand here in front of you and can address you here.

I actually went to a little school, in a little town. One day the sun was shining in the local park so I thought I had to rescue the world, you know I had this epiphany. And so I studied medicine at the University of Innsbruck and actually the first foreign scientist that I ever met was from Australia, a guy called Richard Boyd from Melbourne.

And Richard, and also other people, actually infected me with a virus. And this was the virus of

curiosity, the virus of wanting to find out how the world works, the virus to figure out how the seasons happen, the virus of research and everybody who has ever caught this virus knows it's essentially impossible to get rid of it and it's probably one of the best viruses to have because it actually allows me, and allows people who do research, to you know become eternal children.

So the other thing I found in getting into research is I found all of a sudden something I really loved. In many times we respond to things because we're scared of things. We're scared of the swine flu going around here in your country. We're scared of what somebody else might say about us. We're scared about opinions of people. But I think what's really important is that we find something that we truly like, and I believe if we find this one day then we actually will do well and maybe make one day a contribution to the world.

So when I finished studying in Innsbruck, I went to Canada to the University of Toronto - where I am still a full professor - and the reason was I went there in 1990 and at this time Oliver Smithies and Mario Capecchi had actually just published a new technology which two years ago won the Nobel Prize for them. The new technology to take stem cells from animals, from eyes, and be able to basically shutdown the gene number 12,012 in the stem cell and out of the stem cell create a new organism - a new mouse - and this really gave us,

for the first time, the opportunity to ask the question what do genes actually do in our bodies?

Well what do genes do in the body of a living organism which is walking around, social interactions, that everything works and this was an intriguing possibility and so I went there to learn the technologies and actually became - and moved from being a MD. And I also worked for awhile in Africa which was an interesting experience to actually see how kids can suffer and how medicines, simple medicines, can make a difference in the world.

So I became a genetic engineer, if you want, and learned these technologies. Of course we had no idea when we started at this time that five or six years later Dolly happened, where you could actually clone. We had no idea that nowadays through new technologies that you can actually take a little piece of skin, reprogram the skin cells to become stem cells.

So these technologies have really opened up an entire new world of medicine. So that one day, but there will have to be a lot of research have to be done, one day it might be possible to actually take a piece of skin from somebody who's had a heart attack, reprogram the stem cells, make new cardio cells and hopefully repair them. But there will be a lot of investments to be done and basic research to seal a promise and that will have to be seen if we can live up with it.

So being in Canada there was actually a big biotech company, the largest biotech company in the world, which gave me my first independent position. And it was quite interesting for a little scientist, coming from a little village, to work with these guys because basically they said we'll give you a lot of money and the only obligation you have is that you should be faster than the others and just do it better.

[Laughter]

This was of course nice, you know, if you know science, how you permanently struggle to get the next funds, not knowing what we should do in two years. So these people basically gambled on me and said you know there is this little guy from Austria, we think he might have some talent, give him some money and see if he can deliver.

And what we did is actually we made knock out mice; so take stem cells, change genes, asked the question what do these genes actually do in a real animal. Some of the genes that we hit, for instance the gene called the dream gene which controls pain, so all of a sudden we had a mouse which could not feel pain any more. We hit a gene which we called Sybil(*). It's not really important how they are named but it actually turns out these mice can spontaneously reject cancers, including skin cancer, exposure to sunburns

And one day we hit the gene called Drakelike(*) and when we mutated it in the animals, we actually got the mouse which had a changed head, didn't have any teeth any more, so the mice didn't really look healthy. And it turned out they'd actually hit the master gene for bone loss.

So there are hundreds of millions of women who have osteoporosis because there's bone loss in the entire body, and people with rheumatoid arthritis, because of inflammation and bone loss, people get crippled. Little children who have leukaemia and survive leukaemia have bone loss because of the leukaemia. People who travel to space have bone loss, asthmatics have bone loss, people with HIV infections have chronic bone loss. Diabetics lose their teeth because there's local bone loss. Their teeth are falling out.

And all of a sudden, a little mouse, and of course the research of many other people, it was, you turn on the lights switch, and all of a sudden, you could rationally explain all of these diseases.

So in essence, they have found the molecule which tells the stem cell to become a bone-eating cell, and it's like a funnel. You can find hundred reasons for bone loss, and you can throw them into the funnel and grind them up, and all you have to go through is one molecule, and also its receptor.

And of course having opened this door, it gives us, it gave us, the opportunity to make a rational therapy for literally - diseases affecting literally hundreds of millions of people, and actually an American company has done this now. It did studies on more than 10,000 women already, and have now applied for FDA approval.

So the data which have been published now is that two injections of this medicine might be sufficient to basically control osteoporosis in the world. So this came out from the little mouse we studied, and got lucky, being at the right place, and also got lucky to work with right people being in the right industry, who actually pushed that project to the next level, because it basically was more - it cost them more than a billion dollar and 10 years of development to bring this possibly on the markets.

So if this actually works, it might come out later this year. And of course knowing that it's a bottleneck of the central molecule for these diseases, there might be some interesting propositions, for, of course, many other people who suffer bone loss.

For instance, we published a paper that we could completely shut down crippling rheumatoid arthritis in animals, and clinical - early clinical studies show that this also holds too in humans.

So when we did this, you know, we got in the press, or I got in the press a lot in America, and people called it the famous osteoporosis chain. And so the Austral Academy of Sciences came to me, around 2001, and said if I could imagine to come back to Europe again-and this was quite interesting because it was actually before I got my position in Toronto, as an independent investigator, I wrote an application back to Vienna, and I still have this letter I got back at home, and it says we are completely uninterested in your research.

[Laughter]

And it was probably one of the best things which happened to me. So somebody out there, if you are rejected, you know, who knows, it might actually be the best thing which ever happened to you.

So they got me back to Europe, and the reason was they say, you know, we gave you a lot of money-at that time, it was 7.2 million euros-you can do with the money what you want, so you can hire whoever you like, and you can introduce your philosophy of science into this institute.

So we started to do this, and of course it was interesting because all I had before was doing my research, and all of a sudden, I became the head of an institute, basically the first employee of something which might happen in the future. The question really was how do you actually do this?

How do you create out of nothing, more or less, an institution of science which might play in the champion league of research?

And I think there are two ways to do it: either you have so much money you can just buy the best people, so this is the Chelsea or the Real Madrids of our champion league world, or you actually put all your money in the best young talent. So you find the best young talent, bring them to your place, provide them with the best infrastructures possible, give them complete academic freedom and financial freedom, and physically let them loose. Letting them loose is of course with advisory boards, with Nobel Prize-winners who control that getting loose is not getting too loose.

[Laughter]

So in essence, the idea was to create a scientific candy store and hire around the candy store the best young minds in the world, and just let them eat the candy. And it's actually, it started five years ago, and last month alone my guys, the people I hired, had two papers published in *Nature*, two in *Cell*, another one coming out next week in *Science*. So as a little place in the centre of Europe starting out five years ago, from a hole in the ground, they think we did reasonably all right.

And the other thing is, if you look at it through, why would they actually invest into sciences? For a

country like Austria, and I think it also applies to Australia, so why would you want to do this?

The Americans put lots of money into science; the Chinese put lots of money into science; and of course how can we actually manage to stay competitive? I think the only way is, in my opinion, to develop our own talents, give them the chance, give them the fighting chance, to be successful. And I think it's maybe a nice metaphor for Australia. You probably do not know who was - came in twentieth in the last Olympics in swimming, but you all know the gold medallist. So I think we should put our money to give the potential gold medallist a chance to win the gold medals in science in the future.

Of course, we also need a system of good universities which educate the people and have a broader system, and create the pyramid that the really good talents can emerge. And they create some true centres of excellence, and put your money in there.

So we also created, for instance, the first open laboratory for children in our country, and when I checked in the hotel it was actually quite nice. But in Canberra there is also open level of choice where kids can come and explore science, and think it's very important to teach the children how great science is, and what you can actually do with it. You actually don't have to grow up afterwards, and still be able to buy yourself a little house.

So in Vienne, we decided to create a full - the first library for drosophila, for fruit fly, and actually it was created by an Australian who was hired to Vienna, called Barry Dickson, and Barry did brilliant work. He created 20,000 transatlantic fly-lines, and the idea was, and the idea is, this allows us to mine the entire genome of one organism for certain diseases. And so my poor students for the last five years, I actually had to do literally millions of experiments to make an entire genome map for heart failure.

We developed a new pain models in insects, so we have hundreds of new genes which control pain. We did actually obesity screens, so we have skinny flies and fat flies. We gave them nicotine-as you might know, plants actually make nicotine, because it's a natural insecticide originally before we started smoking it. And so this is what we created and so why we are doing this.

To use systems genetics, and actually combine it with human genetics to find variations between humans but, of course, variations are a mathematic probability that says you might have the chance to develop something one day and we, of course, come from fly and realise a fly's a fly, but we compare the data. And I should say that 70 per cent of fly genes, you can find in humans again, and so we are finding new genes.

For instance, we found recently a gene, when we changed it in animals we get the mouse which is entirely skinny. Doesn't get fat any more.

Another gene we've been working on and found in flies was actually a gene called ACE2, angiotensin converting enzyme two, which turned out to control heart failure, diabetic, kidney failure. But what actually was interesting is ACE2 turned out, and we did the first experiment, and we were to be the essential receptor for the SARS virus.

So we got, by a coincidence and serendipity basically, fall into viral research, and we all know the outbreak of the SARS virus, which scared a lot of people, very similar what's happening now with the swine flu virus outbreak. And so we actually found if the receptor for ACE2 is switched off, there's no infection any more, and the animals were completely healthy.

But the beauty of the study was actually that it turns out that ACE2 protects us from lung failure. And we believe one of the reasons why the SARS virus became such a killer virus was that it hit the wrong molecule, so the SARS virus came along, found the ACE2. ACE2 went down and so we lost protection against the virus.

So we thought, maybe the virus actually has shown us a new medicine for lung failure which affects lots of people. There is no medicine out there, and

maybe we can learn from the SARS infection and develop a new medicine for lung failures, and of course you know these are the same diseases which killed 50 million people because of the Spanish flu, which was the worry for the bird flu, for other flu outbreaks, as well as for anthrax and bioterrorism, and so we thought, let's learn from the virus and like in diabetes where there is not enough insulin, and you have to substitute insulin. So the idea was there's not enough ACE2 which is substituted, so we give in animals, and it indeed worked.

And we actually put this now into humans and in three weeks we are testing it out in humans. Because one lesson from the SARS outbreak was, if something like this comes along, there are three things which are really essential.

One is a very good public health system that defined and picked up people infected early so you can take them out from the population, do whatever measures are necessary for whatever circumstances you live in.

The second one of course is try to develop the vaccine against these viruses, because there might be viruses we don't even know might be coming in the future.

The third things is what do we actually do when people are infected and in the hospital and suffering acute lung failure.

And so we believe that there is still a lot of research and clinical testing to be done. But the SARS virus might have been actually lucky for us, because it could have shown us a new medicine.

And maybe at the end, some philosophical statements. So history, and I strongly believe in this, was defined by countries which have special technologies. So if you read the old Greek literature, the key to this in all the histories, the country which had the best technologies, basically, was running the show.

And you know, when our automotives, automobiles, were developed, this created huge industries, and every time has its special technology. And I believe the time we live in nowadays is actually the times of genetics and biotech. So biotechnology, when we can learn things where we could not even dream about some years ago, where we can actually find genetic underpinnings of diseases.

Other people have started to change bacteria to make biofuels, so I strongly believe that biotechnologies will be the dominant force of this century and probably beyond, and will extend in the century all aspects of our lives, in terms of health, looking into susceptibility, making new medicines which are geared toward special people.

And of course the question then is for governments, where do we put our money, and of course one very

important thing is to make a strategic plan for the future to identify the places which would make sense and, of course, genetics, health research, and biotechnology is clearly one of the places we should put our money.

The other thing is of course in times of crisis, investments - and many studies have shown that investments into science create most jobs. And investment in science actually is the place which creates wealth for the future.

So during the Great Depression in the '30s of the last century, Teddy Roosevelt actively invested in sciences. And this was one of the reasons why the Americans were dominant for long times in special technologies.

So I think, especially in these times, there's one place people should not save money, and this place is to invest in research and innovation, and every company knows if you don't innovate, if there's nothing new every few years, you will probably be blown out of the water and somebody else will take over. I think this is essential for the development and wealth of the nation.

And of course there are little things for health research in Australia, for instance when I travelled around which could be done, for instance, to not only invest in talent but actually give them a real career structure, give them a chance in their careers.

What the European Union is doing now there's the European Research Council give them fully funded research grants so basically if somebody's good enough to get money then also the university should get the money to hire the best people, because if you hire the best people and it costs you money it doesn't make any sense. And of course make a true strategy because we cannot invest in everything, but there are some places and some centres of excellence which make indeed sense and I would put all the money into that.

And as a last statement in closing, I think science is not only a responsibility to create new things and create new industries and, of course, also a responsibility to create knowledge by itself, to be curiosity driven and be academically free. But it actually has also a great responsibility I believe for society. And this is - science allows us to ask a little word and I think this little word is more important than any bomb(*) on this planet and this little word is: how does it work and why are things happening?

Science gives us the freedom to doubt and I think the society which has the freedom to doubt is a great society.

So thank you again for giving me the Australian Medal of Science. I am deeply honoured. I love your country and I think you already have a great place; great scientists, great institutions. It might take a little more to stay permanently in the champions league. Thank you.

KEN RANDALL: Thank you very much professor. As usual we have some questions from the media members today.

The first one's from Nyssa Skilton.

QUESTION: Good afternoon professor. Nyssa Skilton, *Canberra Times.* In this tough economic crisis we're seeing a renewed push for scientific research to result in financial outcomes. I was wondering from your point of view what advice would you give to other researchers who may be embarking on this journey to travel from scientific research to actually creating a product on the market?

JOSEF PENNINGER: This is a difficult question because I think there are lots of good ideas in the world, but very few actually really translate to an economic output. And the problem, at least in our field of biotechnology, is that great ideas for many, many people, but the big investors are not buying ideas.

Even patents you have to have a patent that you can buy yourself a nice dinner in the evening, so even patents have become cheap.

But the big investors get in very late and the big pharmaceutical companies get in very late. So we have this big hiatus - this big problem - between the idea and actually taking it one day to create a new company and to really develop new medicines. So I can only speak for my field now.

So I think this is where governments have some obligation to put the money and create infrastructures where we basically take objects from scientists and to tell you honestly, I'm a basic researcher and I'm not very good at developing medicines. It takes other people with other knowledge and other interests. So governments have I think obligation to take these ideas, put it in a proper infrastructure, finance them well and give these ideas a chance to develop further and develop them further to a stage that basically the big investors and the big pharmaceutical companies come in because for them what we are doing is much too early. We have lots of ideas and I think some of the ideas are also very good, although some are not so good.

But I think this is a real problem - how do you create out of basic research [indistinct]? But I - before I came here I was actually stopping in Singapore and Singapore you all know they're investing a lot of money in research now and it has a very specific reason; because some years ago they tried to attract the big pharmaceutical companies to come to the country to put their headquarters there, do the drug screens there, and somebody from Singapore last week told me they did not come.

And the reason was because the company said, well, where are your ideas and, secondly, where is your workforce? So the Government of Singapore had to invest actively a lot of money to create Biopolis, to create places of great research to

develop local talent, create places of education where the big companies can recruit. And what's happened now the big companies are all coming.

So I think the idea, you know, - and I experienced this in my own country; somebody came up with the idea Austria must now become a place of biotechnology. It does not happen. You know you can build the airport, something Richard Feynman once called cargo cult culture. So basically the South Seas after the World War in the little island build an air strip with a terminal and even put the terminal building and put somebody in there because they hoped like in the Second World War that the American airplanes would land.

And so lots of government create these airfields of research infrastructure and hope good research with land and out of good research translational research will happen and companies will happen.

So we have to find an instrument to make this happen and I think this is - we have some ideas how it works. For instance, we suggested a national centre for drug development where the best ideas of the entire country come in and put them in the hand of people who really know what they're doing [indistinct].

But I think this is a very essential point, because researchers are very good at finding new things but we're not very good to translate it.

Companies are very good to translate things but we're not talking properly to each other and I think there's a huge potential, not just to make money so the huge potential to create - you know create, really, drugs for people to help them.

QUESTION: Simon Grose from ScienceMedia.com.au.

I have a question that follows on a bit from this. Your Institute of Molecular Biotechnology is jointly funded through the Austrian Academy of Sciences and a pharmaceutical company - Boehringer Ingelheim, I think that's its name - which shows to me that the Austrian Academy of Science has a much more active role in the research sector of Austria than our Academy of Science has in Australia. I'm just wondering if you could sketch the role of the Austrian Academy of Science in your country.

But secondly, you talked about the candy store for researchers and you talked about fundamental research, but you've got a commercial partner, a joint funder. I just wonder how you handle the intellectual property that your research comes up with so you can keep the fundamental freedoms but also give your commercial partner the returns that they're looking for?

JOSEF PENNINGER: So actually our set up is we get - we are 100 per cent daughter of the Austrian Academy of Sciences and we have a contract with Boehringer Ingelheim

so they get right of first negotiations. So if you find something they can look into it very early but they have to buy it from us like anybody else. So they're actually not investing in us.

There are some complicated reasons how it ended up like this. But also the Austrian Academy of Sciences is in essence something like Max Blanc Institutions or the Howard Hughes Institutes in America. So in essence our institute has now become the largest Howard Hughes Institute in our country.

Now the academy's interesting because I'm actually the youngest member of the academy so you're elected for the rest of your life. We have less members below 50 than above 90…

[Laughter]

…but the academy actually is the largest funder of science outside of the university.

So we as an academy get a lot of money and then distributed to certain topics. So it's actually a very interesting notion how you can fund research. And one of the institutes the academy has funded was our institute when we started plant genetics institutes and institute for medical - molecular medicine, institutes for space research, institutes for cranking mechanics and it all became very successful.

So the academy is a very interesting instrument. It's kind of like an old Eastern European academy, you know, actually on one hand people are being elected into it, but they're also working as a funding body. So we can maybe discuss afterwards what they really think about that.

I actually believe academies should be academies and funding bodies should be funding bodies. They're two different issues. You don't really want to mix up but that's a personal opinion.

And about IP rights, actually what Boehringer Ingelheim does for us is everything we find they give us the money to protect intellectual property which is quite nice because it actually - it's very expensive at the end of the day to have a lot of patents and maintain the patents. So Boehringer Ingelheim does it.

I decide what should be patented, not the lawyers, which is also nice because lawyers might decide very different what I want to be patented. And if a third party, a third company comes in and wants to buy our ideas, they have to make an offer and Boehringer has six weeks to basically buy it by themselves.

So at the end of the day our institute and the academy and of course the Government putting in the money always - always gets their money back.

KEN RANDALL: So have you had any commercial products yet?

JOSEF PENNINGER: This molecule, the SARS receptor, was a spinoff of our institutes. It's a little biotech company that's our first foray into...

QUESTION: Jon Millard, Arts Sound FM. Professor Penninger, the search for a cure for cancer is being compared with that for the philosopher's stone or the pot of gold at the end of the rainbow - highly desirable but probably unachievable.

Given that cancer is not so much caused by the cells losing their ability to control mitosis, as is happening in us all as we haven't with all sorts of cells, but rather the ability of the immune system to be able to clean up those cells and eliminate them, and given the diversity of those cells and the diversity of the responses in the immune system, do you think such a quest for a cure is really achievable?

JOSEF PENNINGER: So you're asking for the Holy Grail?

QUESTION: Yes.

JOSEF PENNINGER: So first cancer and I actually would subscribe what you said at the beginning, it will be very tricky to find a general drug which blocks cancer.

Its - cancer is like Canberra or Sydney, you have lots of highways going downtown and I think

cancer research is actually finding these highways and we might also learn how to block them. But we all know there are lots of ways downtown and that's the problem of cancer, how the cells are set up. There are lots of ways to go downtown and to become a cancer cell.

But there are also some really interesting new developments. For instance, it has become fairly clear that for instance hormone replacement therapies might be one of the main reasons which drive breast cancer.

I was actually discussing this research in Adelaide two days ago about this and in some places apparently it seems to be more careful to prescribe these hormones - cancer - breast cancer incident has gone down by 20 per cent.

So clearly there are some things of lifestyle where we can still learn a lot from it. And there are other things, as you mentioned, the immune systems so the idea is that every day thousands of our cells become cancer cells, but if our immune system's actually working to see the cancer cell, it's not normal, go there, kill it and so be okay.

So actually what fascinates me in biology is that we're mostly okay. I mean it's actually stunning if you can see that at every day millions of our cells die and millions are born and I still think tomorrow, at least hopefully.

So the immune system certainly plays a role in surveying the environment and seeing cancers.

So I mentioned in my speeches molecule we hit some years ago called Cbl-b. It's a molecule called an isreliegis(*) and we had some data and we actually just were - we had some inkling this might have some control of the immune system for cancer. So we actually gave our mice a tumour and we thought we can vaccinate them and so on. And to our huge surprise our mice spontaneously rejected the cancers.

Then a group in US has shown the same thing. The - you can actually give the mouse tumour. If you give them a lot of sunburns you get 100 per cent skin cancer. When we shut down, our chamber spontaneously kill the skin cancer cells. We did now the same thing for breast cancer, for pancreas tumours, colleagues in America they did for leukaemias, for other tumours.

So there might be indeed molecules in our immune system which we can learn from and of course the idea of the Holy Grail, and one should be really careful to talk about this, could be that we find these molecules and then basically change them, take away the molecular breaks and basically make our immune system hot against the tumour cells and give them a chance to kill the cancer cells.

So I'm actually very, very excited about the data we got and other people's - always works - we were very surprised about this. But now this will take 10 years I mean to be honest to develop if we can ever develop it.

But there might be some interesting opportunities. But I also think this won't, you know, solve - this won't be the Holy Grail. There's probably no Holy Grail out there to treat cancer unfortunately.

QUESTION: Laurie Wilson from APAC - the Australian Public Affairs Channel. The more successful you are and the further you go down the path that you're proceeding of course the more ethical issues are raised and debated around the world.

I'm wondering how you see the state of that debate internationally now, and obviously there is strong opposition to much of the work that is being done by people such as yourself, opponents obviously of genetic manipulation, the creationists in the United States. How much of an impediment do you think that is to the work you're doing? Is it holding you back and as I say how do you see the state of the debate?

And I had a second question but I might come back.

JOSEF PENNINGER: So yeah, I had once an interesting experience back in Canada. Actually I was once a target for animal rights activists and, you know, it was okay for

myself and actually nothing every happened, but when the police came and showed me how I should react when somebody wants to attack my little children. So this spooked me out a little bit to be honest. So I had to change house and unlisted my phone number.

But at the end of the day it has not affected us and I'm always very upfront what we are doing. And actually people really understand us, so I think and I honestly mean it and I want to explain this to everybody, that what we do to animals - and it's not nice to give an animal arthritis - but if you actually find a way to actually block that they're crippled and then translate this knowledge into human medicine and I think this is what I can justify for myself ethically why I am doing this.

I'm actually a member of the World Economic Forum, the Young Global Leaders and this - the last time in the rooms I was in a discussion, I was involved in a discussion on religion and sciences and one of the people on the table was actually the Grand Mufti of Bosnia and Herzegovina, basically the highest religious leader of Bosnia. And he said - you know I gave my speech. how we take stem cells and we make a new mouse and tried to figure out how life works - and the Grand Mufti, sorry I'm speaking German - the Grand Mufti actually said, you know, you scientists have it completely wrong because if there's a God or whatever we believe in and this God has created this world then he must have certain rules of creative genetics. He must

have created stem cells and actually what you guys in science are doing, as good scientists you observe the world and you're basically allowed into this little - few God allows you to look into and if God allows you to find stem cells there's actually no ethical issue whatsoever.

So I honestly believe, you know, if somebody believes God has created this world and he must have created it in a way that we can find stem cells, use them one day, and I think there's not much to add to this.

Of course there's always this issue of embryonic stem cells and I think this has been really misrepresented. I believe we need embryonic stem cells because we need to do the research on them and we need to do the basic research. I'm a strong opponent to open up all research in embryonic stem cells and it will not be a moral or ethical issue if somebody one day comes really up with a cure for something because nowadays we can actually take pieces of skin, take cells, reprogram them back to stem cells, maybe repair genetic defects or whatever you want. And then basically take your own cells from your own skin as a stem cell, repair them and put them back in your own body.

So we need embryonic stem cells for research to figure out how things work. But for the implications of medicine in the future I think this will be not a big issue whatsoever.

QUESTION: My second question just to pick up on the candy store reference again that Simon Grose also alluded to, you made the point that you get the best and brightest young students and scientists and let them loose but not too loose and I'm just wondering about how you set those boundaries?

JOSEF PENNINGER: No, the boundaries are fairly simple because if we hire somebody we hire them for their talents and of course they will have to propose what they want to do. So they're not entirely loose because we have a focus, we know what we want, so based on the focus, you know, we want to invest in certain topics and in these topics we find the best people so this is the first thing where we don't let them too loose so we don't do everything in the world just because somebody's great.

And once a year we have our Scientific Advisory Board coming to us. There were two Nobel Prize winners, last year winners of the Lasker award from the US. They come in, look at every project, talk to every student and all - all the scientists and basically give them scientific boundaries. They're not there to kick out people from institutes but to build an institute, give you an idea if you might be on the wrong track. You might focus on something, you might, you know, drop your project because you're not competitive, this is what they mean.

Keep them - allow them academic freedom but also give them guidance where they might be misguided, not by me but by people who really understand the

business. And who actually - but people who can look behind the mask, you know, where it doesn't matter if I smile nice or if they like me, people who really understand what's the business of science and what's good science and what's bad science.

So actually I made a big effort to put these people in my [indistinct] report and I also made an effort to not choose anybody of my friends because, you know, if they're good enough then we should stand up to the best people in the world.

QUESTION: Tony Melville, director of the National Press Club. Clearly we need more scientists and it's always a struggle to get more people to get into science degrees.

I'm just wondering what sort of advice you give people thinking about embarking on a career and also what sort of encouragement, what sort of advice, would you give to young scientists already?

And secondly, unintended consequences in science? There's always fears about what research could lead to. I think there's even some discussion that the swine flu could have been manmade. I know that I saw one theory and that made me worry. How much do you worry about that?

JOSEF PENNINGER: So yeah, young scientists are very important to me and, so yeah, whoever wants to get into science, go into science. Whoever has a love for arts go into

arts because I think what's very important to find something we really like and then do it because, you know, if we lose 10 years at our jobs at least we have fun doing it, so instead of waiting for a career which might never happen.

So my advice is simple: go into it, try to find somebody who is really good, learn from somebody. The business of science is actually very medieval. We are very, you know, advanced in technologies but how we interact is very medieval. You go to somebody, study with somebody, then you're sent to another country, you basically, you know, go around - most of us go to America or somewhere else, then you come back and start your own business. It's a lot of networking.

So my recommendation is try to get into a very good laboratory and go in there and do what you really like to do so when the PhD's finished really go out there, go to another lab, go abroad, find new ideas, see how other people do science, get some other cultures and then try to get your foot into a good institute.

And, you know, I get 120 people applying for one position in my job - in my institute - so I have to send many people away. Many people who are very talented, and I'm certainly not more talented than many other people out there, but of course if you have a place with good money, with good infrastructure, talented people have a fighting chance to succeed.

So my recommendation to these people is, you know, try to get your leg into a good institute and with some luck and hard work you can also make it happen.

And this is why I pointed out the first time I applied for something, they send me this letter, you know, saying I'm completely uninteresting. So I think many of us are interesting. Sometimes the circumstances might not allow to hire everybody. So I would not I would not give up and linger on in something you really like to do.

And your second question was?

QUESTION: Unintended consequences?

JOSEF PENNINGER: Oh the unintended consequences, I - also being a member of the Young Global Leaders I organised last year an evening dinner was actually the head of Homeland Security - Michael Chertoff at this time - or the head of the CDC on potential consequences of modern genetics on, you know, on homeland security which is an interesting topic because, you know, we have genetic information for instance on the Spanish flu virus, you know in essence you can just order the pieces of sequence.

It turns out that actually this is monitored. You cannot just order the Spanish flu virus because actually somebody will know about this. So there's

clearly some things in place in the background to make sure things like this are not happening.

And yes it's - in the Brothers Karamazov of Dostoevsky there's a beautiful chapter that everything - every stick has two ends. There's an end where bad consequences could happen, there's a good end. We all drive with our cars and we all know there are car accidents, but being mobile and being able to go around probably by far outweighs the consequences we might all know.

We all know some potential consequences for accidents that happen at gene therapy, but the therapy people - and actually one of them died - but I think the technologies which are being developed by far outweigh the risks. So we should not just push them away and don't worry about this. We should be aware of it because if you know what you're facing you can put - you know address it head on. I think that's very important so we should talk about this. It's very important that everybody knows about this.

But I think the new technologies of this huge promise - you know our gene which controls bone loss - you know, if this works this literally helps hundreds of millions of people in the future and I think that's the reason why I think that technologies which have been developed also there is a potential to go somewhere far.

At the end of the day I think there's a real potential to make our world better.

QUESTION: Professor Penninger, Peter Phillips, one of the directors of the National Press Club. I know you didn't come here to speak to us about China, but your presence here and your role at the Chinese Academy of Sciences represents too much of a temptation and I have to ask you what are the impressions which you can give us of the state of science and of research in China today, 30 years on from the opening of China and is anybody funding the opening of scientific candy stores in China?

JOSEF PENNINGER: Yes, my wife is actually from China so I go there quite a lot. And China's investing now a lot of money in basic research and also in the research to translate basic research into new companies. In Tien Zhie(*) for instance, pouring in billions, literally billions, to develop biotech parks.

In every town I visited, completely new campuses for universities. My wife is from Tsingtao, the place where the good beer comes from. The reason is because it was a Germany colony, that's why. Chinese beer is German beer. And, you know, there's three new campuses for research.

So China has put a lot of money into infrastructure. They will need, in my opinion, another 10 or 20 years to develop the, you know the intellectual mindset you need to be a good scientist. This

intellectual mindset not to believe, to doubt, and of course they have to break the culture in this.

But they're doing it. They've sent a lot of diamonds to America. They're bringing back now. They're on a very, very good rate. There's also a reason why they're doing this. Now they have manufactured the toys for the world and the t-shirts for the world, but they know the more people manufacture the more people will get rich, get into middle class and we have to create jobs for these people because China in 10 or 20 years will have a decent standard of living and many cheap jobs will not be there anymore. So they have to actively invest in the new technologies.

And so there's a true strategy behind this, to basically develop the entire country and move them in the future.

So this is basically what I can see. After this actually I will go to Beijing to discuss some collaborations with one of the elite universities, the Peking Medical College, and so I know that they're investing a lot of money.,

They will need some time and of course for them it's also important because they cannot just subscribe in the future to pay all the bills from an American biotech company for expensive medicines. They need to develop their own companies, they need to have a possibility to

develop their own medicines inhouse in their own country because otherwise their whole healthcare system will break down.

And I also believe that it's very important for countries like Austria, Australia, that there's a place - an infrastructure - to develop out of their own ideas companies because, you know, if you're always on the periphery of a large international company they might close things down very fast depending on the economic developments. If there's home grown companies they tend to stay - that are developed.

So - and I think China is a very good example of a country which has, in my opinion, and I might be wrong, of a country which has a very clear strategy where they want to go in science. But they will need another 10, 20 years.

QUESTION: Simon Grose, ScienceMedia.com.au.

Obesity's a big issue in the rich countries. This week we've had a parliamentary committee report on what it recommends Australia should do about obesity.

You're a pretty fit looking fellow, but I've noticed from your agenda here in Australia that you're under - that it's under threat. You had a lunch in Tasmania on Thursday, you had a gala dinner in Brisbane on Friday, you had a gala dinner in

Adelaide on Monday, you had a gala dinner in Sydney yesterday, you've got lunch at the Press Club today, you've got a gala dinner in Melbourne tomorrow and you've got a gala dinner in Perth on Friday.

So I just wonder how do you, as a medical professional, approach this obesity - this Australian obesity challenge?

JOSEF PENNINGER: Actually, first for this medal you guys really make me work and, secondly, address it having a good beer after the gala dinners with some friends without the nice dress.

QUESTION: Thank you very much.

[Laughter]

KEN RANDALL: Thank you very much for the past hour. It's been very good of you. We'd like to give you a - one of our sort of standard memento packages, which includes a membership if you can find the time to come back in the next year. And thank you for this and congratulations on the medal.

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