

## **INTERVISTA DI DARIO DE TOFFOLI A DEMIS HASSABIS – 21 ottobre 2015**

Dario: Yes, fine, always playing and thinking about games and things like that...

Demis: Yeah. Dario, is that your home office or your work office?

Dario: Work office, yes, but we are just a small company, not as big as yours!

Demis Yeah

Dario: Ok, I will steal you just 15 minutes, something like that. Just a little chat.

Demis. Yes

Dario: Now you are very famous for many things, little things like changing the world, things like that. But first of all I would like to talk with you about games, because I met you as a player.

Demis: Yes

Dario: I think it was 1997 at the very first Mind Sports Olympiad, you were something around twenty, something like that. Pretty soon it was very clear to me that you are something more than the other players. There were a lot of good players, but you were different, really different. In fact you won five times the Pentamind. That is the overall World Games Championship of the Mind Sports Olympiad. And it has been an extraordinary experience playing with you. Something different. Would you tell us please which game you like the best and why you like these games?

Demis: Yeah. It's a good question. I mean, I love pretty much all games, but I have some favorites, for different reasons. So, you know, I think I could list some favorite games: chess was my first game...

Dario: you were a chess kid prodigy, something like that

Demis: Yeah, that's right, and I think chess is the foundation of all my other game skills, because it teaches you all the cool things of planning, strategy and so on... and discipline. And then, now I would probably say that my favorite game, in the middle of my career, when you first met me, I think games like Diplomacy, which is I think an amazingly designed game. Probably you can't play it with friends, because you lose those friends!

Dario. Yeah! You also break families with this kind of game!

Demis: Yeah! Exactly. So it's kind of limited because of that, but I think it is actually one of the more fascinating games, and one of the most beautifully designed games. The rules are so simple. And very unique I think, with the secret moves and the alliances and so on. Then of course more recently, poker. I think poker is a very interesting game, the variation from the psychology aspect.

Dario: Absolutely. People often underestimate poker

Demis: Yes, and I think it is only interesting actually playing live poker, because when you play online then you lose most of the psychology aspect, which I think is the most interesting aspect.

Dario: I am not sure to completely agree with you

Demis: Maybe there is still psychology, but it is a bit less because you can't read...

Dario: Yes, but there are different patterns of behavior

Demis: Sure

Dario: But the point is I don't like the program that tracks the player. It's something that I think is unfair.

Demis: Yeah, we should be doing that. Then, more modern invented games, I love Entropy, I won the World Champion many times in that. I think you know that is one of my favorite ones, because...

Dario: I imagine

Demis: Yeah, and every game is different, because on how you tour out. It has some luck in it, but I think it is about the same like in backgammon, where it's probabilities... And then finally I would say go. I would say that it is probably the king of all games in terms of the beauty and the aesthetic. Right?

Dario: yeah. Alex Randolph used to say that go was not invented, because it is so perfect that it already exists.

Demis: yeah. And it is so old, right? I mean, it has always existed.

Dario: Yeah, but maybe we will have a surprise about go...

Demis: yes, we will. I think in a few months there will be quite a big surprise. You know of course we are working on A.I. And go is one of these very hard things for computers to play. Because it's so aesthetic. Right? It's not about pure calculation, it's actually about patterns, and beauty and shapes. Usually those things computers are not good at. So, it's a very interesting game

Dario: we will go to this later. In a few minutes

Demis: yeah

Dario: Which are the achievements, we are talking about games, you are prouder of ? The Pentamind or something else?

Demis: I think the first couple of Pentamind is my proudest, because I played quite a lot of chess when I was young, but I always enjoyed many games rather than one. And the first Pentamind, when the MSO was very big, bi prize money, all the best players came, it was fantastic, right? And then hopefully we can get it to go back to that. But I think it was quite

an amazingly strong field and we had all the best game players there. The first two or three times was, you know...

Dario: Very good! Very good memories!

Demis: yeah. Exactly

Dario: Ok. But after a few years, and after a lot of achievements, you quit as a serious competitor in the MSO. Ok. You came sometimes, you showed up, you took part in a Tournament, you got, grabbed, some medals. But that's all. You quit the serious participation. Could you explain why?

Demis: Yeah. So, about ten years ago I guess that was, more than 10 years ago now, 2003 or 2004. First I had won the Pentamind five times. I wasn't much more I could do with the Pentamind. It was several things together. The other thing was things changing in my work: I finished my games company, my kids were born, I achieved a PHD, I was moving in my new phase of life, my neuroscience and then my A.I., so it didn't fit quite as much to be able to go away for weekends and play lots of games, you know, all nights. Maybe I was getting older as well. And also the other thing was, one of the things I really enjoyed was learning new games, but then, I probably got to learn about fifty, a hundred games, I don't know, you know, some large number. So that means now, I still like learning new games but there is less joy, because most games I can see are thieves of games I already know. So there is not whole new kinds of games, that you have never seen...

Dario: Yes, the exploration, the first part, the excitement.

Demis: Yeah. The first time you come across go, or the first time you play poker, you this very different...

Dario: I remember the first time we played Aware.

Demis: Yes, exactly. It was fascinating, right? You played with these champions from Africa. Remember?

Dario: Yeah.

Demis: It was fantastic. They were Masters

Dario: You directly joined the world championship. I was satisfied with the beginner Tournament.

Demis: Yeah! So, it was fun, and you know, shogi, and then learning all these... By the time I got I guess my late twenties I felt I had explored a lot of games. And I still love them, but...

Dario: the excitement

Demis: The other thing, maybe the final reason is that it was around that time that the MSO started going down in terms of sponsorship. So it was as big an event anymore. Right?

Dario: Yeah. Let's say: I think you are the strongest opponent I ever had and possibly you are one of the strongest players ever. I could think about Stu Ungar, I don't know exactly how the pronunciation of the name is... Are there other players, even in the past, that you would like to be compared to? Which one?

Demis: Yeah, I think

Dario: Stu Ungar is a completely different life, let's say.

Demis: Yeah, a very different life. You know there are some... I love anybody who is the maximum at their chosen thing, right? So, you know, like today, in modern day, poker players, I like Phil Ivey and Stu Ungar is also amazing and Johnny Chan and Phill Hellmuth... those guys. But I quite like the classic chess players and go players as well. So the famous go players from 200 years ago, Shu Saku, the Invincible, and then, you know, from the chess players, I do really like Kasparov and Bobby Fischer and Michael Tyle

Dario: these players only play one game, as far as I know

Demis: Yes, Exactly.

Dario: what do you think their achievement would have been playing all kind of games?

Demis: I actually don't think many of them would have been that good at many games. I have taught quite a few chess players other games, and, it's a different type of skill being general games player like me or you are. You know I think it's more about how fast can you transfer your knowledge between games.

Dario: Precisely. You describe precisely what I like.

Demis: Yeah. That's what I love doing. And I think you love it too, and that's what makes us all round players. Whereas I think a lot of those chess player for example, they like being... they like only chess, and they only see the specifics of chess. They are really not good at any of the other games. I think you see that, it's not true by everyone, but you see that in quite a lot of places. I think one of the most impressive competitors we played against was... there was a couple of very strong ones, back in the days when we were playing. I always thought Larry Kaufmann is very impressive, because he was Master at four games: go, shogi, chess and chinese chess. All chess. Still not fully around, right? But still quite impressive because he was a Master in it.

Dario: the most important, all information games

Demis: yes, that's true. So it's not fully general, right? But I think, you know, it's hard to know who in the past would have been good, because we don't really know until the MSO. That's why the MSO was so great, because really for the first time you could see who was good at all these different games, right?

Dario: Ok. Let's go to the MSO. I think nowadays there is room for an improvement. I think this event deserves to be better recognized in the world, and I always thought that your collaboration would be the key to this improvement. Do you think there is any possibility for

this to happen? Do you think that Ethan Ilfeld, who is a great person, would accept you to be involved? Could it really be another story?

Demis: Yeah. It's going to be difficult. By the way, I should ask you: are you going to transcribe this discussion? Or, how are you going to use this on the website? You are recording?

Dario: Yeah, I am recording.

Demis: Yeah, ok. I think we both share this passion. We want to be... Mso absolutely deserve to be big, and I think also it would be great for children to be encouraged to be games players. Because in some ways my view is, and this is what I teaching my children, it's actually more important to be a general game player because then what you are doing is training life skills, that you can use in other areas. Business, science... Whereas if you go very narrow to try to become Magnus Carlson at chess, I think you are learning skills that are only very specific to chess, after a certain level. Right? And so I would love this to happen. The problem is that Ethan, he has done a great job keeping it going when there was no other support for the MSO. I thik he woud have been gone if he hadn't been around. But now maybe the problem is that he likes to run things very closely and tight.

Dario: Maybe too much control

Demis: Yeah. But if you want something to be very big, you have to share control with others, right? And get other views.

Dario: I hope this will happen

Demis: and so do I: I chatted to him about it. But he so far is quite resistent to the idea of anyone else being involved. And this is shame, because I think this is great and if he was more open then his objects would be achieved easier as well. Because I think he wants it to grow too.

Dario: We don't really wan't to steal nothing from him

Demis. Yeah. And you know, I think we need a players association. I think we need to take out cues from all the successful organization that there have been before. We know how to do this, right?

Dario: yes

Demis: so, you know, I just hope that that can happen. Otherwise if not, maybe in the long run some new organization has to be set up with a new competition. Potentially... Because, we have to see how it goes next year or two, but it is not growing, it's still nowhere back to where it was in the beginning. You know, it should be many thousands of people, like in Essen, right?

Dario: I have just been in Essen. It was fantastic!

Demis: Yeah? How many people were there this year?

Dario: 162.000. It was amazing. Everybody crazy for playing.

Demis: Wow. What do you think about having something like this kind of olympic competition at Essen? Maybe it should be at Essen.

Dario: Essen is more for companies that show their games to gamers. It's not really... Yes there are competitions, but it's not based on competition. There was a very big Catan match with 1040 players, together in one room, so it was fantastic.

Demis: Really?

Dario: Yes.

Demis: Maybe I should go next year, because my kids love Catan. Settlers of Catan is actually also a genius game.

Dario: It changed the scene of games.

Demis: Yeah, because everyone was playing Monopoli and things like that before at home, right? And then they made this game. The genius of it was that it is so simple, and yet you can figure the boards, every game is different, and also this German idea I think, making sure all the players are involved, no matter whose turn it is... Right?

Dario: Yeah. The last question about games: the new players that are successful in the MSO. Which one you see as the better, the one for the future. Andres Kuusk, Ankush Khandelwal, James Heppel...

Demis: yes. They are all great players actually. I think they are actually really quality players that would have been really challenging even back in our day. Andres Kuusk especially I think is a very strong games player. I think Heppel is getting stronger, and I think would become very strong. His weakness is maybe more the classical games, like you know, the chess type games. Andres I think is a really good all around player. I think it's great that they kind of are carrying the torch forward, they are all worthy champions.

Dario: Ok. Now let's go quickly in what you are famous for. You solved DeepMind and you started your A.I. start up, and I think it was a record of the amount of money, and now you are leading research in Google for A.I., if I am not wrong.

Demis: Yeah

Dario: Can you shortly explain us, in a couple of minutes, what you do?

Demis: Yeah. I now run a division at Google, after the sale of the company, really my company DeepMind is very still separate, so we run it as like an autonomous unit within Google. And what we do, is we work on artificial intelligence (A.I. Like you were saying) , but a very specific type of A.I.

A.I. Is about making machines smart, and there is two ways of doing that: one is that you can program, you can think of the solution, and program that solution into the computer, and then the computer kind of dumbly executes the solution. But instead of that, what we

do is we give the computer the ability to learn for itself. So then it can learn by experience. So if it is playing a game, it will learn by playing the game, and then it gets progressively better, learns how to, you know, win the game, and learns the structure of the game. So it's kind of ultimate learning, rather than being given the solution. So it's a kind of new type of A.I. If you like. We and other people and groups around the world, academicians and other companies are making quite big breakthroughs now in this new type of learning algorithms.

Dario: And you will have big news in the future. You are kind of successful in what you are doing.

Demis: Yes. We are doing good. We have had some big news. We had a nature paper in February this year that showed our system playing old games like Space Invaders and these kind of games

Dario: I saw the video through Scientific American, it was amazing, how they played.

Demis: Yeah. And it learns for itself how to play just from the pixels on the screen. You don't tell anything else. You just tell it maximize score, here is the pixels, and it figures everything out for itself. So it's quite amazing when you see it. And yes, how you say, things are going well, and now we are replaying it to other domains and in a few months time I think we'll have some other big announcements.

Dario: ok. I am waiting for that. Yes, because it should be very very big not only in A.I. But also in the games world. Because you kind of combine the two things.

Demis: Exactly. My two combining. Right?

Dario: Yeah. Some years ago you were talking about combining neuroscience and computer science and I remember that very moment and I asked you joking "are you going to build the Nexus 6 Androids as in Blade Runner?" and you didn't realize I was joking and you answered seriously "Yes, something like that!". So how far are you in this quest?

Demis: Well, we are doing good, I mean, we have done work on robots, but I think it's going to be the most important technology ever, because if you solve intelligence A.I., then you can use it to help everything else. So I want to use it to solve science, help scientific problems and breakthroughs. So, we are doing good, you know, it's many decades away, the full thing...

Dario: Decades? Yes, but you are shaping a new world

Demis: Yeah. So it's going well. It's hard work. But it's a lot of fun, and it is a really privilege to have the chance to work on this kind of stuff, with all the brilliant people here.

Dario: you are brilliant

Demis. Thanks Dario. Same are you. So you know, it has been some of my best moments in my life being at the MSO battles, it was so fun when we were in the late 90's, 2000. There were some crazy things. Remember when we were playing two games at once?

Dario: Yeah. I remember. It was very fun! So, let's end with a couple of provocations. Friendly provocations, of course! There is one thing I don't understand of you have a lovely family that you seem to love very much, because saw you are loving your family... Your wife is italian, your children speak italian... And you with your mind can not speak italian! I can't understand that

Demis: It is very bad, I agree. Two things about that: one is, language is one of the few things at school I was terrible.

Dario: I don't believe you!

Demis: It's true! The other thing was that my wife, she never.. she is quite impatient, she doesn't like teaching, so she didn't want to... you know, she'd rather talk in english with me. So I never really had the incentive, or the need to talk italian. Now with my kids, you know they are bilingual obviously from birth, so I hear, there is so much italian my house... I understand a lot of italian, but haven't had much practice speaking it.

Dario: Ok. So maybe one of these years we'll speak a little italian.

Demis: maybe we should

Dario: I would be proud of it!

Demis: Yeah! Let's do that next year

Dario: the last provocation: so when you sold your company, I think a lot of money circulated around you. But you don't seem in any way affected by this money. You do not act as a Hollywood celebrity or something like that. So, money doesn't seem to be your goal, am I right?

Demis: Yeah. Of course. Money never was my goal

Dario: That makes you not only brilliant but really a great person

Demis: Thank you Dario, I much appreciate that

Dario: Just a few word about your relationship with all this money that circulated around you.

Demis: Yeah, Look, people asked me that before, I actually made some, quite a lot of money, not as much as this company with my games company, for my age. But that didn't change me either. I am glad. You have known me for many years. I am glad to hear I have either. And the reason is I am not interested in money, power and these things. I want to do achievements and live doing brilliant things and achieve you know, big things. And that's what motivates me. And the only good thing about money is that it means that you are more free to do things that you want to do, right? So that's the good thing. It supports he things you want to do. So I am giving lots of money to my old university, I supported a little bit the MSO, I'd like to do more, but soar out the structure if we are going to do that, so there are many charities, things I have done, for my family, my wife's family. It's great

for that. That's what's money for: helping people you love, people you believe in, and gives you personal freedom. I can really concentrate on what matters in life, like my science, family and other things without worrying. So I think that's what money should be for. Not for material things, right?

Dario: Yeah. And that makes me very very proud to be your friend

Demis: Thanks Dario! Lovely talking to you! You had really good questions and it is always interesting to talk to you.

Dario: So next year in London

Demis: Yeah. I see you soon Dario. Take care

Dario: ciao