Host: Bryan Stanley
Guest: Zohreh Davoudi

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00:00:00,000 --> 00:00:04,350
…Welcome to this episode of My Journey as a Physicist.

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00:00:04,350 --> 00:00:07,350
On this episode we are joined by Dr Zohreh Davoudi,

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00:00:07,350 --> 00:00:10,560
an assistant professor at the university of Maryland.

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00:00:10,560 --> 00:00:16,620
Welcome professor Zohreh Davoudi. Could you briefly introduce yourself. What is your

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00:00:16,620 --> 00:00:19,980
position and what is sort of work that you do?

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00:00:19,980 --> 00:00:26,550
Hi, thanks for having me here. I'm an assistant professor of physics at the University of Maryland.

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00:00:26,550 --> 00:00:30,960
I'm doing theoretical research in physics.

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00:00:30,960 --> 00:00:35,700
And in particular in the area of nuclear and particle physics.

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00:00:35,700 --> 00:00:39,630
And besides doing research I also teach

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00:00:39,630 --> 00:00:44,430
and advise the students and early career scientists

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00:00:44,430 --> 00:00:51,345
as part of my job. And I participate in various different activities related to

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00:00:51,345 --> 00:00:55,140
the community and workshops and programs.

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00:00:55,140 --> 00:01:01,750
So kind of this constitutes uh my my everyday life as as a researcher and scientist.

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00:01:01,750 --> 00:01:06,190
Could you talk a little bit what your research actually looks at?

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00:01:06,190 --> 00:01:09,550
Yes, so my research is sitting at the

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00:01:09,550 --> 00:01:13,540
intersection of kind of two or three fields.

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00:01:13,540 --> 00:01:20,470
Originally, where I come from is kind of interest in the physics of strong interactions,

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00:01:20,470 --> 00:01:23,710
how the elementary particles of the

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00:01:23,710 --> 00:01:27,540
Standard Model such as quarks and gluons

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00:01:27,540 --> 00:01:31,630
build the matter in the form that we know of

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00:01:31,630 --> 00:01:38,220
and kind of how the complexities in the visible matter in the universe arise from these

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00:01:38,220 --> 00:01:41,580
fundamental interactions and elementary particles.

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00:01:41,580 --> 00:01:44,730
For example, even understanding how the

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00:01:44,730 --> 00:01:48,660
core of an atomic nucleus, the proton and neutron

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00:01:48,660 --> 00:01:53,280
come out of these interactions of the standard model and in particular

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00:01:53,280 --> 00:01:58,140
quarks and gluons and how they, they interact,

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00:01:58,140 --> 00:02:02,250
is a very non-trivial question. And with the tools

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00:02:02,250 --> 00:02:07,380
that my community of researchers and myself had been developing,

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00:02:07,380 --> 00:02:11,370
we are starting to answer questions of

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00:02:11,370 --> 00:02:14,565
what are the fundamental properties of these objects

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00:02:14,565 --> 00:02:18,930
are, and starting from the quark and gluon degree

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00:02:18,930 --> 00:02:22,770
of freedom of the strong interactions. Uh so that's really sort of

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00:02:22,770 --> 00:02:26,970
the cornerstone of my my theoretical research.

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00:02:26,970 --> 00:02:32,730
And in order to address this problem, I use various different tools and techniques

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00:02:32,730 --> 00:02:36,630
and and theoretical backgrounds that I can talk about as as we go

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00:02:36,630 --> 00:02:40,530
on…You mentioned the community that you work in…

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00:02:40,530 --> 00:02:46,365
how big is your research group? And do you work primarily alone? Do you have a team of graduate or

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00:02:46,365 --> 00:02:50,100
other faculty you work with as a part of a larger collaboration?

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00:02:50,100 --> 00:02:53,370
Um, that's a very good question. So it used to be

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00:02:53,370 --> 00:02:57,180
that if you say someone is a theoretical physicist, that means that

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00:02:57,180 --> 00:03:01,920
that person would sit down alone in a room and work from

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00:03:01,920 --> 00:03:06,690

morning to late evening on problems on his or her own,

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00:03:06,690 --> 00:03:12,000
and that's sort of a notion of theoretical physicists. Nowadays this notion is changing because

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00:03:12,000 --> 00:03:18,480
the size of problems that we would like to address in our research is really large

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00:03:18,480 --> 00:03:24,750
and the complexity is really high. That means that just that notion of solving a problem by

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00:03:24,750 --> 00:03:31,590
your own does not apply anymore. And in fact there are large theoretical collaborations,

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00:03:31,590 --> 00:03:36,060
just like with the experimental collaborations; maybe not as large,

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00:03:36,060 --> 00:03:40,830
but it's still a large collaborations are sometimes required

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00:03:40,830 --> 00:03:44,190
to perform meaningful theoretical research,

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00:03:44,190 --> 00:03:47,880
particularly in the field of nuclear and high-energy physics.

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00:03:47,880 --> 00:03:50,970
So my numerical work,

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00:03:50,970 --> 00:03:55,140
which would require solving the theory of a strong force

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00:03:55,140 --> 00:03:58,830

using supercomputers, particularly needs

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00:03:58,830 --> 00:04:02,970
large collaborations with people with various sets of skills

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00:04:02,970 --> 00:04:09,570
from numerical and algorithmic computational to very formal and theoretical,

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00:04:09,570 --> 00:04:13,050
to really join forces and solve these problems.

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00:04:13,050 --> 00:04:19,440
So for example, I'm part of a collaboration called NPLQCD which stands for

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00:04:19,440 --> 00:04:26,325
“nuclear physics from lattice QCD”, sounds like a technical term, but really it means that getting

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00:04:26,325 --> 00:04:30,570
nuclear physics out of the quarks and gluons of nature

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00:04:30,570 --> 00:04:33,930
And using a high-performance computing and super

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00:04:33,930 --> 00:04:38,340
computer sort of technologies and computational methods.

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00:04:38,340 --> 00:04:45,060
So this collaboration is a group of, depending on the projects, maybe 10 to 15 people.

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00:04:45,060 --> 00:04:50,760
And it ranges from serious senior scientists to junior scientists to the postdocs and the

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00:04:50,760 --> 00:04:54,810

students So it's a very fun collaboration to be part of.

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00:04:54,810 --> 00:04:58,230
But also I do research on kind

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00:04:58,230 --> 00:05:01,830
of newer methods to address problems that

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00:05:01,830 --> 00:05:07,890
I'm interested in, and this methods are based on quantum computing and quantum simulation.

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00:05:07,890 --> 00:05:11,910
Um so again this is a field that is really growing,

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00:05:11,910 --> 00:05:18,480
and because of its nature it means that it really needs collaborations and different of people

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00:05:18,480 --> 00:05:23,220
of different factor on an expertise to come together and talk to each other.

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00:05:23,220 --> 00:05:30,120
So part of my group, I think, University of Maryland is really sort of a group of maybe up to 10.

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00:05:30,120 --> 00:05:36,930
Uh really interested and talented students and post-docs and early career scientists

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00:05:36,930 --> 00:05:40,440
as well as some senior colleagues and collaborators

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00:05:40,440 --> 00:05:46,770
that are interested in understanding how quantum computing and quantum simulation can be

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00:05:46,770 --> 00:05:52,800

useful for research in nuclear particle physics. So kind of these two different communities

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00:05:52,800 --> 00:05:58,740
are trying to understand how they can help each other out and advance the science.

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00:05:58,740 --> 00:06:03,780
You kind of mentioned what people think: what a theorist does versus what they actually do.

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00:06:03,780 --> 00:06:09,690
Another preconception I have in my mind is, or if there is I'm working pen to paper on doing

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00:06:09,690 --> 00:06:14,160
these equations on a piece of paper, and but you're talking about doing computers and

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00:06:14,160 --> 00:06:20,280
simulation Like how much of your actual work is pen and paper versus I am programming.

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00:06:20,280 --> 00:06:25,230
Yeah. It really depends on the type of theory and research you're doing.

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00:06:25,230 --> 00:06:29,910
So I'm not claiming that every theory problem out there nowadays

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00:06:29,910 --> 00:06:33,600
needs a bit of computer. Of course there are still topics

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00:06:33,600 --> 00:06:37,530
that people just sit down and work it out on a pen and paper.

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But what I'm seeing is that more and more are moving towards an era where

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00:06:43,320 --> 00:06:46,950

we understand that we have more tools to compute and

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00:06:46,950 --> 00:06:51,720
calculate that we had before. 50 years ago we didn't have a computer.

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00:06:51,720 --> 00:06:57,270
A hundred years ago we had different different tools and skills and perspectives.

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00:06:57,270 --> 00:07:02,850
So as theoretical physics physicists, we are moving with the technology, we are

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00:07:02,850 --> 00:07:06,930
expanding our horizon of what is possible,

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00:07:06,930 --> 00:07:12,090
what other complicated problems we can go after there, now that we have new tools.

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00:07:12,090 --> 00:07:17,640
And this is really kind of an evolving feature for for theory work.

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00:07:17,640 --> 00:07:22,935
And that what that means is that we now realize that not only we need mathematical and formal

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00:07:22,935 --> 00:07:28,470
skills, but we also need to know how to talk to a computing machine

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00:07:28,470 --> 00:07:32,115
and be able to translate our formal problem to

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00:07:32,115 --> 00:07:36,180
a numerical problem. It’s not an easier step, as it turned out.

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00:07:36,180 --> 00:07:41,760

And it really requires that you understand your theory very well, you need to be a theorist to

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00:07:41,760 --> 00:07:46,650
really bridge this path of going from pen and paper to computer.

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00:07:46,650 --> 00:07:51,060
And then again you need to be a really good physicist or theorist

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00:07:51,060 --> 00:07:56,190
to be able to translate your theories now to a quantum computing machine,

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00:07:56,190 --> 00:08:01,930
right? So it's just a matter of more technologies are becoming available to us.

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00:08:01,930 --> 00:08:08,830
So as theorists, we understand that “Oh, we have more capabilities to go after even more difficult problems”

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00:08:08,830 --> 00:08:12,640
and this is kind of evolving and it's fun and interesting. And I think

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00:08:12,640 --> 00:08:16,480
if you talk to someone in 10, 20, 30 years,

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00:08:16,480 --> 00:08:20,560
their notion of theoretical physics would definitely be different.

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00:08:20,560 --> 00:08:26,200
I have those questions. This is mainly because I don't necessarily have the background of how quantum computers work,

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00:08:26,200 --> 00:08:32,740
so doing simulations or working with quantum computers, what does that gain you? Do you have to

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00:08:32,740 --> 00:08:38,169
solve problems in a different way if you do it on like a quantum computer or is essentially just

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00:08:38,169 --> 00:08:43,179
you have more powers that you can solve more complex problems?

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00:08:43,179 --> 00:08:49,765
Yeah, absolutely. Very good question because sometimes the understanding or the misconception

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00:08:49,765 --> 00:08:56,080
out there is that we are going to have this quantum computers to completely replace

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00:08:56,080 --> 00:09:01,270
kind of already working classical computers and machines.

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00:09:01,270 --> 00:09:07,905
That's not true, right? We have made a huge progress, and by we I mean, a large

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00:09:07,905 --> 00:09:14,070
community of computer scientists and applied mathematicians and fundamental

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00:09:14,070 --> 00:09:19,320
scientist and algorithmic experts and hardware experts,

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00:09:19,320 --> 00:09:26,085
and to build this very large powerful supercomputers they can perform calculations

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00:09:26,085 --> 00:09:30,150
of very huge complexity and size.

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00:09:30,150 --> 00:09:33,270

So we have to keep in mind that

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00:09:33,270 --> 00:09:38,850
certain problems that we do now in science and in particular in physics

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00:09:38,850 --> 00:09:43,440
we have a very well controlled over the computational complexity

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00:09:43,440 --> 00:09:47,190
by doing high-performance computing. And in fact we can reach

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00:09:47,190 --> 00:09:50,190
very precise answers for

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00:09:50,190 --> 00:09:53,670
the problems we're after. For example, in nuclear and particle

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00:09:53,670 --> 00:09:57,390
physics using this method of lattice QCD that I'm using.

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00:09:57,390 --> 00:10:01,900
But on the other hand you have to identify the sort of problems

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00:10:01,900 --> 00:10:08,020
that are not within the reach of the current classical supercomputers.

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00:10:08,020 --> 00:10:12,220
For example, we have to understand how our problem is scaled

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00:10:12,220 --> 00:10:17,380
with the size, with the number of degrees of freedom, with the complexity that we add to it,

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00:10:17,380 --> 00:10:23,650

that if we're interested in certain problems, certain quantities, certain precision on that quantity,

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00:10:23,650 --> 00:10:29,905
we are not going to get that, even if you start to kind of grow our compensation complexity then

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00:10:29,905 --> 00:10:33,880
extrapolate to the future just as it has been in the past.

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00:10:33,880 --> 00:10:37,810
We're not going to get there. We're not going to get there in 50 years or a hundred years.

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00:10:37,810 --> 00:10:44,650
Basically because there's an exponential growth in the complexity of the problems and the size of the problems.

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00:10:44,650 --> 00:10:49,900
And that's when you start to say “alright maybe this particular problem is not really suitable

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00:10:49,900 --> 00:10:54,310
for the computational framework in classical

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00:10:54,310 --> 00:10:57,340
a high performance computing that I’ve been using,

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00:10:57,340 --> 00:11:02,620
so I have to start thinking about a different type of computing.

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00:11:02,620 --> 00:11:06,370
And once every scientist, every engineer,

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00:11:06,370 --> 00:11:10,240
depending on what your problem is, identify those problems,

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00:11:10,240 --> 00:11:13,900
then you should start to learn the rules of quantum mechanics

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00:11:13,900 --> 00:11:20,410
and how the rules of quantum mechanics turn out to the speed of computations, if you are able to

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00:11:20,410 --> 00:11:23,875
Build a computer out of

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00:11:23,875 --> 00:11:27,610
quantum mechanical degrees of freedom

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00:11:27,610 --> 00:11:31,630
that behave quantum mechanically and show entanglements

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00:11:31,630 --> 00:11:37,120
and all these various strange properties that we see in quantum mechanics, they put them all

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00:11:37,120 --> 00:11:43,240
together and take advantage of these to be able to speed up the computations in a way that if

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00:11:43,240 --> 00:11:46,750
you start to double a multiple the size of your problem,

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00:11:46,750 --> 00:11:50,140
you don't have to double the multiple the size of your computer.

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00:11:50,140 --> 00:11:54,550
We only do that logarithmically, which is a very great improvement.

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00:11:54,550 --> 00:11:59,440
And not only that now you can use entanglements in quantum mechanics.

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00:11:59,440 --> 00:12:03,480
To also paralyze the operations on your

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00:12:03,480 --> 00:12:08,130
bits or cubits in a way that is not possible classically.

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00:12:08,130 --> 00:12:12,390
So again that's where that theoretical perspective comes in.

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00:12:12,390 --> 00:12:17,250
Because you have to be a physicist, even if you are an experimentalist, you have to really

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00:12:17,250 --> 00:12:23,040
understand this theory and working principles of these machines to be able to first build these

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00:12:23,040 --> 00:12:29,400
machines, if you're an experimentalist, or to be able to use them to solve your problem,

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00:12:29,400 --> 00:12:35,130
if you're a theoretical physicist. Yeah, that's amazing. There's a lot of moving parts there.

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00:12:35,130 --> 00:12:41,880
I guess I'm I'm curious about when did you first become interested in physics and then maybe

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00:12:41,880 --> 00:12:45,540
later on, how did you get interested in this field of physics?

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00:12:45,540 --> 00:12:51,300
Uh Hey yes. So it's not a hard question because I exactly remember how things evolved

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00:12:51,300 --> 00:12:58,230
for me, from wanting to be many different things and eventually settling on becoming a physicist.

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00:12:58,230 --> 00:13:01,680
And it actually happened at a very early age because

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00:13:01,680 --> 00:13:05,220
once I started to go to a school, elementary school,

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00:13:05,220 --> 00:13:09,090
I started to realize I enjoyed math.

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00:13:09,090 --> 00:13:15,240
And I enjoy working out hard problems. The problems that won't take me a second to solve.

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00:13:15,240 --> 00:13:20,820
Might take half a day to think about them and then go around and ask people and try to

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00:13:20,820 --> 00:13:25,290
to argue one way or another, and I really enjoyed that and I thought “okay.

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00:13:25,290 --> 00:13:28,620
So maybe math mathematician is a good

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00:13:28,620 --> 00:13:33,270
Uh trajectory for for my future.” And I was like very early age.

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00:13:33,270 --> 00:13:36,795
And it wasn't until my father actually went back to a

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00:13:36,795 --> 00:13:40,710
school to get the second degree in physics.

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00:13:40,710 --> 00:13:47,055
So he was a science teacher and he saw that he could probably use a little bit more

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00:13:47,055 --> 00:13:52,860
challenge in in life and like uh, learning in the more complex subject, and come back and then

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00:13:52,860 --> 00:13:56,535
maybe teach physics. So although he had children and he had a full-time

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00:13:56,535 --> 00:14:01,680
job and he said “No I want to go back to college.” And then he chose physics.

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00:14:01,680 --> 00:14:07,140
And then, so I got interested. I talked to my father quite a bit.

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00:14:07,140 --> 00:14:13,830
And I started to learn that all right physics is really kind of that subject that captures

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00:14:13,830 --> 00:14:18,390
both the mathematical beauty and also

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00:14:18,390 --> 00:14:25,350
tries to use this mathematical structure and beauty to for an application to understand nature

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00:14:25,350 --> 00:14:31,170
and answer big mysterious questions about where we come from? Where do we go?

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00:14:31,170 --> 00:14:35,640
What's the fate of our universe? What are the working principles of our universe?

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00:14:35,640 --> 00:14:41,070
So really captured my my interests. I was probably in middle school at that time.

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00:14:41,070 --> 00:14:45,630
And I sorted of started to think about “All right, physics is what I wanted to do.”

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00:14:45,630 --> 00:14:50,070
Um, my notion of becoming a physicist but obviously very obscure right?

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00:14:50,070 --> 00:14:55,260
I had no idea. All right, I thought maybe a physicist would end up in, in a space.

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00:14:55,260 --> 00:15:01,560
And does um a space physics and um explores Uh other planets.

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00:15:01,560 --> 00:15:07,450
I didn't quite know what the physicist is like actual advanced physics…physicists would do.

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00:15:07,450 --> 00:15:10,870
Um but it's still I want it to move on

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00:15:10,870 --> 00:15:15,460
and see what happens. So even when you went and got your

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00:15:15,460 --> 00:15:20,110
your degrees in physics, did you decide “Yes I want to go

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00:15:20,110 --> 00:15:25,420
through this this academic route” or did you ever think “oh I want to maybe experiment in

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00:15:25,420 --> 00:15:31,090
different areas whether that be industry or other areas that you might apply physics”.

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00:15:31,090 --> 00:15:36,040
Yeah Yeah absolutely. So. Um, I guess I kind of made that decision very early on. When I

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00:15:36,040 --> 00:15:42,520
was choosing college, because the way so I come from a different country um I just came to the US

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00:15:42,520 --> 00:15:48,070
for graduate school but I did most of my studies before then in Iran.

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00:15:48,070 --> 00:15:51,835
And so the kind of culture and environment buzz difference.

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00:15:51,835 --> 00:15:56,380
There, if you weren't with a student with really good mathematical skills,

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00:15:56,380 --> 00:16:02,380
you would pick an engineering degree. Because that's a high paying the high paying jobs are engineering

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00:16:02,380 --> 00:16:05,410
jobs uh in in the country. So you will become

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00:16:05,410 --> 00:16:09,280
an electrical engineer a computer engineer,

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00:16:09,280 --> 00:16:12,580
and that was kind of very very fashionable at the time.

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00:16:12,580 --> 00:16:18,220
I think it still is, right? And even so that time I was like “okay I have this passion for

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00:16:18,220 --> 00:16:22,540
physics and math. Would it be enough for me to become an engineer?

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00:16:22,540 --> 00:16:26,530
I'm sure there are very challenging technical problems that I can

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00:16:26,530 --> 00:16:30,730

I can tackle them in those fields. But is that really what I want to do?”

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00:16:30,730 --> 00:16:37,465
And I decide to no.I want to go and get deep in physics, no matter what the future is and at

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00:16:37,465 --> 00:16:43,960
the time my parents like my my teachers were like, “no, Just don't don't Don't ruin your

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00:16:43,960 --> 00:16:50,350
future. You can have a good high paying jobs uh if you pick engineering and what do you want to

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00:16:50,350 --> 00:16:53,950
be be as, as a physicist do you want to be a physics

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00:16:53,950 --> 00:16:59,350
sort of high school teacher is that all you want?” I was like, I don't know what's going to

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00:16:59,350 --> 00:17:05,250
happen in terms of like job and career, but all I know is that it wasn't enough like four

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00:17:05,250 --> 00:17:10,470
years of physics in high school wasn't enough, so I want to do another four years at least.

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00:17:10,470 --> 00:17:13,589
So I made the decisions and I don't regret it. I think

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00:17:13,589 --> 00:17:17,520
maybe the first person actually believed in me and saw

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00:17:17,520 --> 00:17:21,915
he was like, be happy as my father. I was like deep down he knew that

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00:17:21,915 --> 00:17:26,609
I'm going to go as far as I can get because I'm very curious

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00:17:26,609 --> 00:17:32,505
about this object. So it it sort of every step of the way when I had to make a decision it was

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00:17:32,505 --> 00:17:35,880
like, “okay let me pick between physics and something that

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00:17:35,880 --> 00:17:39,390
is not hundred percent physics” I would always speak physics.

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00:17:39,390 --> 00:17:45,720
I don't think it's that problem is straight forward for everyone. It really depends on where you come from,

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00:17:45,720 --> 00:17:50,640
what's the culture around you is like, who are the people that are influencing you.

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00:17:50,640 --> 00:17:57,555
So no one person is the same in that kind of decision, but I would say I

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00:17:57,555 --> 00:18:00,960
don't regret it. I'm happy that I'm here today.

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00:18:00,960 --> 00:18:06,460
If I would go back, I think I would definitely make the same decisions.

225
00:18:06,460 --> 00:18:12,475
Were there like any obstacles or hurdles that you feel comfortable sharing that you had to

226
00:18:12,475 --> 00:18:16,240
overcome during your your career as a physicist?

227
00:18:16,240 --> 00:18:21,430
Yes, I think definitely coming to the US and like making that move, big move,

228
00:18:21,430 --> 00:18:25,480
was, was challenging. Right? So I was a person I

229
00:18:25,480 --> 00:18:29,530
was coming like, uh starting from a small town

230
00:18:29,530 --> 00:18:32,815
with a very sort of limited set of resources

231
00:18:32,815 --> 00:18:36,580
and connections really to the

232
00:18:36,580 --> 00:18:40,060
to the entire world. And then I went to college.

233
00:18:40,060 --> 00:18:44,260
It was a good university in the capital city is so like opens my eyes and like

234
00:18:44,260 --> 00:18:48,700
…I realized, all right it's possible to actually go

235
00:18:48,700 --> 00:18:55,240
outside the country and study of physics at the frontier, which was really what I wanted.

236
00:18:55,240 --> 00:18:58,840
I felt like a bit isolated. We had very good

237
00:18:58,840 --> 00:19:03,265
educational system. We had very good, um, instructors at the

238
00:19:03,265 --> 00:19:07,810
university, very passionate people, very caring.

239
00:19:07,810 --> 00:19:11,440
Um but it's still it wasn't enough. It felt like we were just like

240
00:19:11,440 --> 00:19:15,370
out there and to some degree watching

241
00:19:15,370 --> 00:19:20,980
and developments that are happening out there, that that are exciting.

242
00:19:20,980 --> 00:19:26,980
And until I went to college, I didn't realize that I could have the opportunity to actually do it.

243
00:19:26,980 --> 00:19:31,510
To be part of those developments, to be part of that progress.

244
00:19:31,510 --> 00:19:38,080
And…so I decided to make this big move. And again coming from back there on where I never

245
00:19:38,080 --> 00:19:41,680
had any travel outside the country until

246
00:19:41,680 --> 00:19:46,390
I was about to go out and come to the US on my own.

247
00:19:46,390 --> 00:19:51,505
And I study physics at graduate school. I mean I was a very active person, I was very

248
00:19:51,505 --> 00:19:58,330
outspoken, I was very kind of outgoing back in my country And when I came here because of

249
00:19:58,330 --> 00:20:03,190
language barrier and also the things I felt like I'm a different person now.

250
00:20:03,190 --> 00:20:07,780
I cannot quite communicate what I think, how I feel,

251
00:20:07,780 --> 00:20:13,630
what things should be. I have always a strong opinion about how things should look like and

252
00:20:13,630 --> 00:20:17,080
how to improve things and how to move forward.

253
00:20:17,080 --> 00:20:20,350
And I felt like in a first maybe couple of years in the

254
00:20:20,350 --> 00:20:24,490
US, as a graduate student, I didn't have that voice.

255
00:20:24,490 --> 00:20:27,940
I had a voice in my head. But like canceling

256
00:20:27,940 --> 00:20:31,900
A voice to an external voice that others can hear

257
00:20:31,900 --> 00:20:37,435
was difficult. And because part of it was culture, it doesn't just like enough to know

258
00:20:37,435 --> 00:20:41,920
English well, And you should have also understood

259
00:20:41,920 --> 00:20:48,040
the culture and how people act and feel and express themselves.

260
00:20:48,040 --> 00:20:51,520
So I think that was really the big challenge I was like, “how if I

261
00:20:51,520 --> 00:20:55,480
never recover myself how if that…as Zohreh.”

262
00:20:55,480 --> 00:21:01,990
That's why it's in my past I just left it behind at home and I would never be the same person again.

263
00:21:01,990 --> 00:21:06,070
Because I did this this migration to the US.

264
00:21:06,070 --> 00:21:10,150
And fortunately that changed. I think part of the reason it changed was

265
00:21:10,150 --> 00:21:13,840
having good mentors, good people around you

266
00:21:13,840 --> 00:21:18,160
that give would give you the confidence and will believe in you.

267
00:21:18,160 --> 00:21:23,170
And despite the fact that you might not talk too much or communicate too much,

268
00:21:23,170 --> 00:21:27,220
they would understand that you have potentials and you're different

269
00:21:27,220 --> 00:21:32,080
and if you're given the opportunity you can shine. I hope that I could do that.

270
00:21:32,080 --> 00:21:35,710

I can't claim that if not, I was able to,

271
00:21:35,710 --> 00:21:39,610
to be um, who they wanted me to be.

272
00:21:39,610 --> 00:21:42,610
But I think it it was an interesting evolution.

273
00:21:42,610 --> 00:21:46,840
Every day I felt like I'm kind of coming out of

274
00:21:46,840 --> 00:21:51,520
that that sort of confined shell and be able to come make it better.

275
00:21:51,520 --> 00:21:57,730
And eventually it just took a few years. Like now halfway through through grad school I felt like

276
00:21:57,730 --> 00:22:01,870
okay, I was starting to become myself and have a voice

277
00:22:01,870 --> 00:22:07,360
and be able to accomplish things that I want. So just being patient

278
00:22:07,360 --> 00:22:14,350
and having good mentors and a good environment around you I think would allow you to, to

279
00:22:14,350 --> 00:22:18,280
face the challenges and hopefully come out a strong.

280
00:22:18,280 --> 00:22:22,210
Yeah Yeah. Yeah. That's great. Thank you for sharing.

281
00:22:22,210 --> 00:22:28,480

Do you feel that after living here that you opened up back to like the person that you said that

282
00:22:28,480 --> 00:22:32,440
you felt you were back in Iran or did you, would you say

283
00:22:32,440 --> 00:22:36,700
you can't evolve into an even like bigger, different person.

284
00:22:36,700 --> 00:22:40,360
Oh yeah absolutely. That's a very good question So

285
00:22:40,360 --> 00:22:44,050
definitely I feel like the person I am today

286
00:22:44,050 --> 00:22:48,760
would have been a different person If I had stayed in my country.

287
00:22:48,760 --> 00:22:53,620
Um I'm not saying in a good way or a bad way; it's just a different person.

288
00:22:53,620 --> 00:22:57,760
And um in terms of abilities

289
00:22:57,760 --> 00:23:04,420
to communicate, to accomplish, what they have in mind, to have the confidence in what I

290
00:23:04,420 --> 00:23:08,140
want to do to be a strong and be

291
00:23:08,140 --> 00:23:12,040
sort of wanting and desiring what you want.

292
00:23:12,040 --> 00:23:18,700

I think I'm probably more, I think I probably gained more just because part of it is really the

293
00:23:18,700 --> 00:23:24,460
challenge of being in this country for many years pretty much on your own

294
00:23:24,460 --> 00:23:29,110
and not being able to see your family. I had

295
00:23:29,110 --> 00:23:33,340
very interesting VISA issues because if I wanted to go

296
00:23:33,340 --> 00:23:38,140
back I had to reapply for VISA. It was like a single entry VISA to the US.

297
00:23:38,140 --> 00:23:41,740
As an Iranian citizen it was like, it's always a

298
00:23:41,740 --> 00:23:46,360
lengthy process to go through the VISA applications and trends.

299
00:23:46,360 --> 00:23:51,640
They wanted to do that during my grad school, so I chose to not go back.

300
00:23:51,640 --> 00:23:56,230
Um because of all of these sort of challenging Um situations.

301
00:23:56,230 --> 00:24:02,170
And it took seven years to be able to reunite with my family. I was very close with my family.

302
00:24:02,170 --> 00:24:08,350
Right? And I think as a result of all these sort of challenges

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00:24:08,350 --> 00:24:12,670

and situations um we just become a different person. You just add

304
00:24:12,670 --> 00:24:17,740
develop appreciations for things that you took for granted before.

305
00:24:17,740 --> 00:24:21,040
Like family and having the support system.

306
00:24:21,040 --> 00:24:26,980
And and having people that look like you and think like you but also on the other hand is

307
00:24:26,980 --> 00:24:33,250
starting to develop appreciation for how having a different environment and

308
00:24:33,250 --> 00:24:36,490
diverse environments around you can

309
00:24:36,490 --> 00:24:42,850
make you to grow faster. So that was one of the things that really I think impacted

310
00:24:42,850 --> 00:24:49,720
me as a person in terms of personality and life perspectives to be in a

311
00:24:49,720 --> 00:24:53,275
country where everyone didn't look like me,

312
00:24:53,275 --> 00:24:57,130
everyone didn't speak like me or think like me.

313
00:24:57,130 --> 00:25:00,940
And it actually changed me in a very

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00:25:00,940 --> 00:25:07,900

interesting and I think extraordinary ways and that's I'm proud of, and I think

315
00:25:07,900 --> 00:25:13,450
that's really, at the end of the day I would say it was worth it

316
00:25:13,450 --> 00:25:17,260
to come to this country and face these challenges.

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00:25:17,260 --> 00:25:21,235
Thank you for for sharing this really great to hear. We talked a lot about

318
00:25:21,235 --> 00:25:25,480
your experiences as a physicist and, and working in the lab.

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00:25:25,480 --> 00:25:30,820
I'm curious what, you know your life outside of physics where is there any interest or hobbies

320
00:25:30,820 --> 00:25:34,930
that you have when you when you need a break from from work?

321
00:25:34,930 --> 00:25:41,260
Okay. So I got to say as an assistant professor, I don't have much free time.

322
00:25:41,260 --> 00:25:46,360
I am not saying that to kind of make yet you guys afraid of pursuing this

323
00:25:46,360 --> 00:25:52,420
kind of academy to job, but it’s really a bigger responsibility. Becoming a professor at the

324
00:25:52,420 --> 00:25:56,650
university was probably the biggest transition in terms of

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00:25:56,650 --> 00:26:00,580

going through this academy staircase.

326
00:26:00,580 --> 00:26:04,210
It wasn't really the sort of the, the biggest job for me.

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00:26:04,210 --> 00:26:10,840
Not that I wasn't quite independent before, I was like in terms of my research capabilities

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00:26:10,840 --> 00:26:17,500
and thinking I, I think I was independent, but in terms of like coming to

329
00:26:17,500 --> 00:26:23,980
this job, and having to handle multiple aspects of an

330
00:26:23,980 --> 00:26:28,660
academy position at the same time that I didn't have to deal with before.

331
00:26:28,660 --> 00:26:35,350
It was an interesting transition and I had to do teaching and advising and be in

332
00:26:35,350 --> 00:26:42,280
charge of things and make my own decisions for, for the group and funding and communicating

333
00:26:42,280 --> 00:26:47,170
with my colleagues and make keep taking part in the decision-making process

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00:26:47,170 --> 00:26:51,010
in the department in the community. And be

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00:26:51,010 --> 00:26:56,020
…a valuable member and helpful member to the bigger

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00:26:56,020 --> 00:27:00,445

scientific community. All of these kind of sort of happen

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00:27:00,445 --> 00:27:05,020
as you got this title that now you're an assistant professor.

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00:27:05,020 --> 00:27:10,780
And so it leaves little time and kind of, I miss still going through this process of

339
00:27:10,780 --> 00:27:15,010
understanding sort of maximizing and making things

340
00:27:15,010 --> 00:27:19,870
more efficient in terms of the time that in end of the day I can have for me.

341
00:27:19,870 --> 00:27:26,380
After spend with family and friends, but sort of really, as soon as I have any time left

342
00:27:26,380 --> 00:27:29,980
that that is not my job. I would want to talk to

343
00:27:29,980 --> 00:27:33,700
my family and friends and catch up with them.

344
00:27:33,700 --> 00:27:37,360
I think maybe at some point things get a little easier and

345
00:27:37,360 --> 00:27:41,110
I would have time for other fun activities.

346
00:27:41,110 --> 00:27:47,815
But I think at this point, if whenever I have some free time it's like, okay I'm missing out

347
00:27:47,815 --> 00:27:52,390

on for example talking to my parents or maybe helping out my

348
00:27:52,390 --> 00:27:57,070
siblings, my younger siblings, that need advice on different things.

349
00:27:57,070 --> 00:28:02,350
So I try to kind of make sure that that social aspect of my life is not compromised

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00:28:02,350 --> 00:28:08,980
because I worked too much. But I can't really claim that I've been perfect I'm sure if you asked my friends

351
00:28:08,980 --> 00:28:15,400
and they would not be happy. About how, how available I am but I'm just being my best and I

352
00:28:15,400 --> 00:28:20,695
think at the moment, that's the most important thing for me that's really at the top of my list

353
00:28:20,695 --> 00:28:25,060
to not be disconnected from people that I care about

354
00:28:25,060 --> 00:28:29,170
given how busy and occupied I am with this job.

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00:28:29,170 --> 00:28:34,630
Can you explain sort of what a typical day or a week may look like with all your different

356
00:28:34,630 --> 00:28:38,350
responsibilities in this position? Yes, it depends on what kind

357
00:28:38,350 --> 00:28:42,100
of deadlines I have…For various things.

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00:28:42,100 --> 00:28:48,250
No single week is the same as the next week because every day comes with its own sort

359
00:28:48,250 --> 00:28:53,020
of uh, plannings and different things that had to be taken care of.

360
00:28:53,020 --> 00:28:58,930
But really I loved the weeks that I really enjoy are the ones that I can sort of strip out all

361
00:28:58,930 --> 00:29:01,990
these other activities and take care of them as quickly

362
00:29:01,990 --> 00:29:08,440
possible and do research. There are weeks that it's less possible, there are weeks that

363
00:29:08,440 --> 00:29:13,960
I can do that. Um particularly during the summertime it's pretty nice because you get to

364
00:29:13,960 --> 00:29:20,170
actually spend more time with your group and also travel. If it's not during the pandemic you can

365
00:29:20,170 --> 00:29:25,900
travel to places and talk to you to your collaborators and to the community and understand what's

366
00:29:25,900 --> 00:29:32,410
what's new and what's going on. And I also do research and like sit down and actually write

367
00:29:32,410 --> 00:29:37,360
down all these ideas and thinkings that you've had during the semester And you didn't have

368
00:29:37,360 --> 00:29:41,770
enough time to develop them and put them in in a paper.

369
00:29:41,770 --> 00:29:46,570
It's kind of a good time to do that. So because we're in summer I saw that I talk about the

370
00:29:46,570 --> 00:29:53,560
summer time, but still in the summer there are other other…commitments and responsibilities.

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00:29:53,560 --> 00:29:59,530
If you asked me about my next week, I'm dealing three lectures in in one summer school.

372
00:29:59,530 --> 00:30:03,610
I'm on the PhD defense committee Uh to to excellent

373
00:30:03,610 --> 00:30:10,210
students here at the UMD. I look forward to that and I'm sort of going through reading their physics.

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00:30:10,210 --> 00:30:16,120
And I have multiple meetings with my group members because we're all pushing very interesting

375
00:30:16,120 --> 00:30:20,200
projects, and I am always excited to hear what

376
00:30:20,200 --> 00:30:25,090
happened. What, what the step that we thought would be useful? Did it work?

377
00:30:25,090 --> 00:30:28,960
Uh so that's really the fun part of it. And the most fun of

378
00:30:28,960 --> 00:30:33,070
that is when I get time to actually sit down and doing my stuff.

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00:30:33,070 --> 00:30:38,740

As opposed to, uh, give it to my group members, of course I enjoy then,

380
00:30:38,740 --> 00:30:45,130
Um when they do this and they they make progress, but as a physicist always deep down,

381
00:30:45,130 --> 00:30:51,730
it's like okay I need to also sit down and do this calculation or write this piece of code or,

382
00:30:51,730 --> 00:30:57,610
or work it out and like work out an example for myself and understand really what's going on.

383
00:30:57,610 --> 00:31:02,650
And that’s really the joy that you get by sitting down

384
00:31:02,650 --> 00:31:05,770
and doing this kind of problems yourself. So

385
00:31:05,770 --> 00:31:12,670
what I'm trying to not become…is someone that…just sits back and

386
00:31:12,670 --> 00:31:17,020
manages a research group. I hope that doesn't happen.

387
00:31:17,020 --> 00:31:22,900
And what I'm trying to make sure is that I still have time for myself.

388
00:31:22,900 --> 00:31:27,910
And what that means is that as a theoretical physicist I would still have time

389
00:31:27,910 --> 00:31:31,900
to sit and work things out Um on my own.

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00:31:31,900 --> 00:31:37,690

And so we'll we'll see…Busy. There's just a lot going on.

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00:31:37,690 --> 00:31:41,230
Yes. Yes indeed. Every week.

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00:31:41,230 --> 00:31:46,090
There is no exception. So kind of wrapping things up a little bit I guess,

393
00:31:46,090 --> 00:31:53,020
I'm I'm curious. Do you have any advice or tips of wisdoms for…maybe students who are

394
00:31:53,020 --> 00:31:58,780
thinking about being physicists or may want to be physicists you know going forward?

395
00:31:58,780 --> 00:32:05,530
Yeah absolutely. So I think that there are two two aspects to figuring out that that you want to

396
00:32:05,530 --> 00:32:09,280
be a physicist. First is to get educated. If you don't

397
00:32:09,280 --> 00:32:13,660
know what's going on at the forefront of physics research,

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00:32:13,660 --> 00:32:16,990
you should not expect yourself to know whether you

399
00:32:16,990 --> 00:32:20,890
want to be in this this field you want to pick this career.

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00:32:20,890 --> 00:32:27,490
So get educated, take as many courses as you can, go to as many talks as you can,

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00:32:27,490 --> 00:32:32,440

talk to as many people that are excited to talk about their work with you.

402
00:32:32,440 --> 00:32:37,780
That's very important. Just like sitting back and watching from afar.

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00:32:37,780 --> 00:32:41,980
That would not do. You have to actually be actively sort of

404
00:32:41,980 --> 00:32:47,140
absorbing the information to be able to know for sure

405
00:32:47,140 --> 00:32:51,700
whether you are made for this field,whether you feel happy

406
00:32:51,700 --> 00:32:57,850
to spend the rest of your career doing this kind of problems. So that's number one.

407
00:32:57,850 --> 00:33:02,020
And then number two is to kind of related

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00:33:02,020 --> 00:33:06,940
to number one get your hands dirty. Do research as soon as you can.

409
00:33:06,940 --> 00:33:12,220
This was not something that we uh during my education was that common.

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00:33:12,220 --> 00:33:15,430
But it's becoming more and more common, and I think it's useful.

411
00:33:15,430 --> 00:33:19,345
It's useful as long as you do not compromise getting that sort of

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00:33:19,345 --> 00:33:24,310

basic minimum requirements for in terms of like physics education

413
00:33:24,310 --> 00:33:28,990
and learning about all these advanced topics you should never compromise that because you want

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00:33:28,990 --> 00:33:35,620
to just do research without having that sort of theory and some foundational background,

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00:33:35,620 --> 00:33:41,170
you will not be a good physicist whether in experiment or theory. So that part don't compromise.

416
00:33:41,170 --> 00:33:46,780
But once you have that under control, get into research as soon as possible. Talk to faculty

417
00:33:46,780 --> 00:33:53,290
members. See, um and then to try to do both types of research. Don't, don't limit yourself to

418
00:33:53,290 --> 00:33:57,670
what you think that you're made for, because until you actually don't

419
00:33:57,670 --> 00:34:02,650
do other different things and gain experience, you wouldn't know, right?

420
00:34:02,650 --> 00:34:08,290
I never did experimental research. Maybe I would have been good for it, but I didn't try, and

421
00:34:08,290 --> 00:34:12,114
there wasn't enough opportunities or resources for me at the

422
00:34:12,114 --> 00:34:16,570
time that I was growing as a physicist before I come to the US

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00:34:16,570 --> 00:34:22,239
to try experimental research. But who knows? Maybe if I had the opportunity I would have

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00:34:22,239 --> 00:34:26,050
actually enjoyed it. And in fact when I came to the US

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00:34:26,050 --> 00:34:29,620
I started to realize so much exciting and

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00:34:29,620 --> 00:34:33,489
stuff are going on on the experimental front here.

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00:34:33,489 --> 00:34:39,460
I started to develop a lot of appreciation for for this field. And now I work with them very

428
00:34:39,460 --> 00:34:42,940
closely on this quantum simulation research.

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00:34:42,940 --> 00:34:46,780
And um so that's very important. That's just don't limit

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00:34:46,780 --> 00:34:53,770
yourself within certain boundaries because you don't have…the perspective, the vision

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00:34:53,770 --> 00:34:58,180
as someone who's just starting to know what's out there

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00:34:58,180 --> 00:35:02,740
and decide. You're not in a position to decide your entire career,

433
00:35:02,740 --> 00:35:10,030
your entire career as a physicist right now, unless you expand your your horizon and then look

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00:35:10,030 --> 00:35:15,880
at different places and diversify. So just do a little bit of research here and there to get a

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00:35:15,880 --> 00:35:22,795
taste of what it takes to do every kind of research from formal and theory to numerical

436
00:35:22,795 --> 00:35:25,930
to experimental to observational.

437
00:35:25,930 --> 00:35:30,070
Um it's hard to do all of these at the same time but maybe pick one

438
00:35:30,070 --> 00:35:34,660
and two that are more closer to your heart

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00:35:34,660 --> 00:35:41,050
and then see how it goes. And during undergrad or the later years of undergrad, I think that's

440
00:35:41,050 --> 00:35:44,800
the best time to start asking these questions.

441
00:35:44,800 --> 00:35:48,400
That's really great advice. Thank you for sharing.

442
00:35:48,400 --> 00:35:53,830
Thank you for coming on and doing this. So, it was a lot of fun talking with you And getting to learn about you.

443
00:35:53,830 --> 00:35:58,000
Of course, it was very fun for myself as well. I hope that these points

444
00:35:58,000 --> 00:36:02,468
would be helpful to every student out there.