WEBVTT

1
00:00:10.769 --> 00:00:11.070
Kimberly Boddy: Dark

2
00:00:14.910 --> 00:00:22.560
Kimberly Boddy: Dark matter from the laboratory to the cosmos. So if you're interested in these types of things. Um, application will be open.

3
00:00:23.550 --> 00:00:37.740
Kimberly Boddy: Will be opening soon so look for an announcement from Aspen next month. Um, okay. Uh, yes. And of course this is assuming that everything goes back to normal by the end of next summer. We'll see about that.

4
00:00:38.820 --> 00:00:51.240
Kimberly Boddy: Um, so for right now, I'm going to talk about the the cosmology side of that of that program and specifically looking for dark matter particle physics.

5
00:00:52.260 --> 00:01:06.150
Kimberly Boddy: Micro physics nature dark matter, but using large scale observations like like this EMP. Um, so to to get us started really quickly. Here is the

6
00:01:07.470 --> 00:01:22.650
Kimberly Boddy: You know the schematic of the timeline of our universe, everything starts very hot and completely ionized. We have big bang nucleus. And this is a few seconds to two minutes after the Big Bang. And it's not until

7
00:01:24.480 --> 00:01:25.890
Kimberly Boddy: The hydrogen and

8
00:01:27.210 --> 00:01:35.850
Kimberly Boddy: The hydrogen is able to form that protons and electrons get together that microwave background is able to be admitted and observe today.

9
00:01:37.080 --> 00:01:45.630
Kimberly Boddy: Past the microwave background. The universe is mostly neutral we enter this area called the Dark Ages were not a lot is

10
00:01:46.770 --> 00:01:48.360

Kimberly Boddy: directly observable for us.

11
00:01:49.440 --> 00:01:53.430
Kimberly Boddy: But once the first stars turn on and started mission emitting a lot of high

12
00:01:54.540 --> 00:01:59.640
Kimberly Boddy: Energy radiation. Um, do we expect to see some

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00:02:01.050 --> 00:02:11.280
Kimberly Boddy: Some significant signal, though, that we hope to see in the near future. So this is the era of cosmic Dawn that initiates the process of reorganizing your universe.

14
00:02:11.700 --> 00:02:25.500
Kimberly Boddy: And then of course we can look at the structure of galaxies today. And so this is all to emphasize the importance of dark matter and the role that it plays in informing structures in our universe and

15
00:02:26.040 --> 00:02:36.870
Kimberly Boddy: Some of the most robust information that we have about dark matter comes from the cosmic microwave background radiation. So let me begin there.

16
00:02:38.220 --> 00:02:53.880
Kimberly Boddy: The link satellite has observed the CSV and I saw trapeze. This is the radiation or temperature fluctuations against some very smooth 2.7 Kelvin.

17
00:02:55.140 --> 00:03:04.530
Kimberly Boddy: That the CB to bit your bath is today. And so all this structure here you can see our tiny fluctuations about that 2.7 Kelvin.

18
00:03:05.820 --> 00:03:14.820
Kimberly Boddy: And all of this structure is giving us information about what was happening in the early universe at the time of recombination. And you also have

19
00:03:16.110 --> 00:03:26.760
Kimberly Boddy: Information under polarization of these photons. So the, the power spectrum that we have is a good way to quantify this map and

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00:03:27.240 --> 00:03:40.680

Kimberly Boddy: Here is the temperature perspective, the polarization power spectrum and this underlying curve is the Standard Cosmological Model called lambda CDN.

21
00:03:41.430 --> 00:04:02.760
Kimberly Boddy: And in lambda CDN, you assume that dark matter is essentially a cold and collision with so there's no other interactions. It's only purpose is to cluster as matter is expected to cluster. Um, it has to be distinct from the normal baryons in the universe by baryons I mean protons helium.

22
00:04:03.900 --> 00:04:15.930
Kimberly Boddy: nuclei and electrons and it has to be about six times more abundant than ordinary matters. So it is a the component of our universe that is driving

23
00:04:17.460 --> 00:04:27.090
Kimberly Boddy: The formation of gravitational potential wells for matter to cluster and fall into, and eventually form galaxies. And so the

24
00:04:28.110 --> 00:04:50.520
Kimberly Boddy: The thing to note here. If you're not very familiar with a CMT power spectra. Um, we usually cast these power spectrum in terms of multiple just keep in mind that a larger multiple needs a smaller Angular scale on the sky. So the higher the multiple we go, the better resolution, the

25
00:04:51.630 --> 00:05:02.790
Kimberly Boddy: The specific telescope pass. Okay. So this idea that dark matter is as effectively collision was. And then it has this very specific abundance

26
00:05:03.330 --> 00:05:24.090
Kimberly Boddy: Has led particle physicists to theorize a very actually gather well motivated dark matter candidate in terms of what its actual particle nature is and this is called the wind for the weekly interactive massive particle. And so the idea here behind the

27
00:05:25.440 --> 00:05:35.040
Kimberly Boddy: Particle physics experiments is how can we see dark matter interacting with standard model particles, you can produce them maybe

28
00:05:35.550 --> 00:05:54.150
Kimberly Boddy: In colliders maybe dark matter and I elites and you indirectly detect the annihilation products that you can actually see or

what I'll focus on a little bit more. Is this direct detection possibility if you have dark matter that can scatter on a standard model particle like a

29
00:05:55.470 --> 00:06:06.300
Kimberly Boddy: An atomic nuclei. And then you can see that in your detector. So the idea is this. Here's a depiction of our Milky Way and

30
00:06:07.320 --> 00:06:16.080
Kimberly Boddy: We are rotating in our Milky Way. At the same time, the Milky Way's enveloped me in a much larger dark matter halos right so dark matters responsible for

31
00:06:17.670 --> 00:06:25.560
Kimberly Boddy: For gravitational potential wells of galaxies, and so we live in a much larger dug their heels. So there's a lot of dark matter particles.

32
00:06:26.310 --> 00:06:39.210
Kimberly Boddy: That are surrounding us and in our frame it looks like there's something say this wind. Wind that's coming towards us and we can imagine building large detectors.

33
00:06:40.320 --> 00:06:48.660
Kimberly Boddy: The have gained incredible amount of sensitivity you place them very far underground to shield backgrounds and we're looking for.

34
00:06:48.930 --> 00:07:00.660
Kimberly Boddy: And what we assume as a very rare process for dark matter comes in and hits a target nucleus and that nucleus recoils and the readout of that recoil is is the

35
00:07:01.860 --> 00:07:06.090
Kimberly Boddy: Observation them direct detection experimented with certain looking for

36
00:07:07.560 --> 00:07:13.050
Kimberly Boddy: So the expected rate at which this is supposed to happen depends on a variety of

37
00:07:14.220 --> 00:07:33.810
Kimberly Boddy: Aspects, it depends on astrophysics. What is the property of dark matter of within our Halo. Um, it depends on the particle physics. What are you assuming about this interaction that dark better

supposed to have with normal matter and it depends on experimental parameters such as which

38
00:07:34.890 --> 00:07:41.580
Kimberly Boddy: What sort of target nucleus, do you have, what is your readout threshold for detecting this recoil. Okay.

39
00:07:42.720 --> 00:07:50.160
Kimberly Boddy: Um, so there are various ways of of parameter writing the types of interactions that dark matter can have with

40
00:07:51.480 --> 00:07:58.620
Kimberly Boddy: With ordinary matter, but instead of listing every possible theory, it's nice to work in terms of

41
00:07:59.850 --> 00:08:12.600
Kimberly Boddy: Distilled quantities, where you're just looking at the most basic physics that you need that can map to a more complete theories say so this in the context of

42
00:08:13.710 --> 00:08:24.900
Kimberly Boddy: direct detection very, um, has goes by the name of non relativistic EFT effective field theory and these authors have worked to

43
00:08:26.490 --> 00:08:41.100
Kimberly Boddy: Create this effective field theory using a very small number of observable. So the things that matter in a dark matter scattering process with nuclear arms are the spins of the particles which are just set by any particular theory, you're thinking about

44
00:08:42.330 --> 00:08:48.930
Kimberly Boddy: But it depends on the momentum transfer of the scattering process as well as the relative velocity of the particles.

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00:08:49.770 --> 00:08:58.950
Kimberly Boddy: So this is where we get some energy or velocity dependence in our, in our expected cross section or expected rate of scattering

46
00:08:59.460 --> 00:09:11.340
Kimberly Boddy: And the nice thing about this whole endeavor is that you can cram there's various different models as just a power counting exercise of these these different velocity

47

00:09:12.630 --> 00:09:14.190
Kimberly Boddy: Dependencies right

48
00:09:15.630 --> 00:09:25.290
Kimberly Boddy: So the, the most basic interaction that you can think of, which is what the direct detection experiments usually uses is called spin independence scattering

49
00:09:25.710 --> 00:09:38.310
Kimberly Boddy: Um, it's no spin dependence know velocity dependence and this is what we usually use to cast direct detection limits and so here you can see some of the state of the art experiments.

50
00:09:39.030 --> 00:09:46.080
Kimberly Boddy: The cross section dark matter to them cross section in Sydney meter squared here and the dark matter messenger movie.

51
00:09:47.520 --> 00:09:52.380
Kimberly Boddy: And if you're not used to thinking about particle physics units of one GB is about the proton mass

52
00:09:53.700 --> 00:10:03.210
Kimberly Boddy: So all of these experiments have incredible sensitivity. They're getting down to cross sections. This is 10 to the minus 4600 meter squared. This is very low.

53
00:10:03.960 --> 00:10:19.890
Kimberly Boddy: Um, but you can see already a little bit of an interesting feature of all of these experiments is that there's some sort of mass threshold that they suffer from this is because we're dealing with dark better that is contained in bounds within

54
00:10:21.030 --> 00:10:33.810
Kimberly Boddy: Our Milky Way Halo. And so it's only going to have so much kinetic energy. And because our detectors are only so sensitive our results are so sensitive there's there's effectively a mass cut off.

55
00:10:34.980 --> 00:10:45.990
Kimberly Boddy: Um, and also something that people usually don't talk about because we usually think of dark matter that's very weakly interacting is that if you crank up this cross section and

56
00:10:46.530 --> 00:11:06.540
Kimberly Boddy: You, you can imagine having dark matter that interacts very strongly with the standard model. Um, and if that occurs then you

have interactions of the dark matter through the atmosphere in the crust of the earth. And so, you lose sensitivity. These experiments lose sensitivity. If

57
00:11:07.920 --> 00:11:12.630
Kimberly Boddy: You is the dark matter can't even. It's not even expected to make it to the

58
00:11:13.980 --> 00:11:16.020
Kimberly Boddy: I apologize to the

59
00:11:18.300 --> 00:11:30.810
Kimberly Boddy: To the detector in the first place. Um, so we can search for this exact same type of physics that direct detection is searching for using cosmological observable.

60
00:11:31.710 --> 00:11:40.920
Kimberly Boddy: And so in our web search, what we can do instead of, you know, looking for direct detection or indirect detection in these standard ways

61
00:11:41.490 --> 00:11:57.960
Kimberly Boddy: We can look for in the case of scattering momentum transfer or if you'd like to think about annihilation. This is energy injection into the intergalactic medium at late times which which affects what the CMT should look like it's it propagates to us.

62
00:11:59.820 --> 00:12:08.460
Kimberly Boddy: So I will focus on this, this idea of moment and transfer and let me just give a very touristic picture of the

63
00:12:09.720 --> 00:12:12.030
Kimberly Boddy: Of what's going on in the early universe.

64
00:12:14.250 --> 00:12:23.130
Kimberly Boddy: So we can understand what happens when we turn on their interactions. So we have say dark matter that's clustered here and here.

65
00:12:23.910 --> 00:12:33.630
Kimberly Boddy: We have our very onset are in purple, that are wanting to in fall into these potential wells that are made. Um, but before recombination. We have this

66
00:12:34.350 --> 00:12:47.790

Kimberly Boddy: Radiation that also exists that the baryons are tightly coupled to. And so this radiation pressure wants to push the baryons out of the wells. And so you can imagine having this

67
00:12:48.840 --> 00:13:01.380
Kimberly Boddy: System of dark matter potential wells on various scales and the process of falling in and out of potential wells is just the the 48 space description of what's happening in the in the universe.

68
00:13:02.520 --> 00:13:04.620
Kimberly Boddy: So once we're combination happens

69
00:13:05.790 --> 00:13:13.110
Kimberly Boddy: This picture kind of freezes at a certain time and whatever the the baryons the photons, we're doing

70
00:13:14.400 --> 00:13:16.050
Kimberly Boddy: Gets imprinted on the CMT

71
00:13:18.150 --> 00:13:28.380
Kimberly Boddy: So we can ask. Now how does this picture change when you introduce non gravitational DARK, NON gravitational interactions of between dark matter and baryons

72
00:13:28.800 --> 00:13:35.190
Kimberly Boddy: And the idea here is that when you start coupling these two different fluids in the early universe.

73
00:13:35.580 --> 00:13:46.410
Kimberly Boddy: And you create a drag force between the baryons in the dark matter. And so this process of day that continuously happens the dark matter is actually going to drag

74
00:13:46.770 --> 00:14:00.180
Kimberly Boddy: Or sorry, the variants are actually going to drag the dark matter kind of out of their potential wells. And so what you end up getting is this is this small scale suppression that occurs because you're destroying

75
00:14:01.980 --> 00:14:12.330
Kimberly Boddy: Potential wells that are essentially weekly bound. So, the smaller the dark matter clustering smaller in the dark matter. Well, the more suppression. Yeah.

76

00:14:13.590 --> 00:14:14.340
Kimberly Boddy: So,

77
00:14:14.430 --> 00:14:17.340
Kimberly Boddy: Um, how now, can we relate this to the

78
00:14:17.460 --> 00:14:28.680
Kimberly Boddy: Particle physics that we're interested in. Um, well, all of the the models that I showed you, or the EFT formalism essentially that I showed you all the dependence.

79
00:14:30.660 --> 00:14:45.210
Kimberly Boddy: That you can distill various models, all the velocity dependence of those models you can essentially wrap up into the velocity dependence to some power.

80
00:14:46.410 --> 00:14:47.580
Kimberly Boddy: Of the of the

81
00:14:49.050 --> 00:14:57.330
Kimberly Boddy: Total cross section between dark matter and baryons. And so depending on what this power is it relates to different specific models.

82
00:14:57.900 --> 00:15:12.120
Kimberly Boddy: And you can have this power be positive and negative a negative power indicates that maybe you're interacting with the Standard Model particles through through very light.

83
00:15:13.440 --> 00:15:29.790
Kimberly Boddy: Mediators so you can even imagine that the dark matter has a very, very small electric charge. And it interacts with the normal matter through just ordinary photons. And so the velocities that are relevant here.

84
00:15:31.770 --> 00:15:41.880
Kimberly Boddy: Are the thermal dispersion, which depends on the, the mass of our bare hands or sorry, the temperature and massive are very honest in the temperature of our dark metal

85
00:15:42.900 --> 00:15:53.490
Kimberly Boddy: And there's also a relative bulk velocity. So, overall motion between the berry on fluid in the dark matter fluid that's not tied up into the emotion.

86
00:15:55.410 --> 00:15:56.850
Kimberly Boddy: Associated with the temperatures

87
00:15:57.990 --> 00:15:59.100
Kimberly Boddy: And so what we can do.

88
00:16:00.120 --> 00:16:10.020
Kimberly Boddy: Is look at the rate of momentum transfer I'm modding out the expansion rate of the universe as a function of redshift. And so if

89
00:16:10.830 --> 00:16:21.060
Kimberly Boddy: You are above this line that Stronach one, it means that you have a lot of momentum transfer. That's a great and and

90
00:16:21.810 --> 00:16:31.230
Kimberly Boddy: You're, you're scattered is essentially efficient if you are below this line, it means that Hubble expansion is winning and the particles are deleting too fast.

91
00:16:31.950 --> 00:16:38.460
Kimberly Boddy: To be able to have a efficient transfer of momentum between our death metal and you're burying fluids.

92
00:16:39.240 --> 00:16:49.020
Kimberly Boddy: So we can take various different models and we can see what the momentum transfer rate looks like for these models and picking a variety

93
00:16:49.920 --> 00:16:57.570
Kimberly Boddy: Of different powers at the end. You can see the effects here. So if you pick a very large value of in

94
00:16:58.290 --> 00:17:15.780
Kimberly Boddy: This means that there's a lot of efficient scattering at very early times and not so much at late times. But as you continue cranking down this value of in you see that eventually the, the slope of this line of flips from

95
00:17:17.010 --> 00:17:35.580
Kimberly Boddy: From the CB to the poor case. Okay. And all of these lines, I'm kind of showing you the results, but not in a very conventional way all these lines are set at their 95% competence love it. I'm confident confidence level upper limit down from fitting to data.

96
00:17:37.080 --> 00:17:43.050
Kimberly Boddy: Okay, so in a much more particle conventional sense. Here's the result of our

97
00:17:44.340 --> 00:17:58.710
Kimberly Boddy: CB analyses. So here I'm showing you the what I consider the easy case where you have velocities that scale as with some negative non negative power and

98
00:18:00.030 --> 00:18:18.510
Kimberly Boddy: The nice thing here is that all these models are sort of in the category of putting a lot of your interactions that early times and less. So at least times. So this ends up just being easier to deal with. And everything above a given line for a given model is excluded by point data.

99
00:18:19.830 --> 00:18:38.580
Kimberly Boddy: Over here I'm showing you a very specific case of n equals minus for just the sort of compared the, the mass dependence of the constraint. This is very, very flat until you start getting near the proton mass and this just looks much different from the cases over here.

100
00:18:39.690 --> 00:18:43.860
Kimberly Boddy: For for technical reasons that I'm happy to talk about later.

101
00:18:45.330 --> 00:18:55.410
Kimberly Boddy: But for right now, I want to kind of sort of close the book on on the link analyses for this end and move on to to

102
00:18:56.460 --> 00:19:00.930
Kimberly Boddy: Looking at what this has to say for for the galaxies that exist today.

103
00:19:02.310 --> 00:19:19.500
Kimberly Boddy: Okay, so what we can do is look at our matter power spectrum that we get from these different models. And so these I listed in terms of their operators, but the models in red, have no velocity dependence models and blue have some

104
00:19:20.670 --> 00:19:27.210
Kimberly Boddy: velocity squared. Dependence so the matter perspective as a function of scale and inverse make a person

105

00:19:28.320 --> 00:19:31.800
Kimberly Boddy: Looks like this so we can imagine having

106
00:19:32.910 --> 00:19:41.100
Kimberly Boddy: A sorry this. This is the case for me to see them so we can imagine now turning on these interactions that are supposed to affect small scales.

107
00:19:43.530 --> 00:19:51.690
Kimberly Boddy: More dominant way than the march skills. So you can see when you start turning on interactions, there's this peel off from the lambda CD and prediction.

108
00:19:52.950 --> 00:19:53.640
Kimberly Boddy: And

109
00:19:54.900 --> 00:20:01.080
Kimberly Boddy: If you are familiar with sort of the data that has been taken for the matter power spectrum.

110
00:20:02.250 --> 00:20:20.580
Kimberly Boddy: You can see that these models will be clearly rolled out. So if you're looking at a wave number of about one and wave number, about one these data follow pretty closely to what lambda CDN predicts. So now we can ask the question. Oh, OK. Let's go back to our

111
00:20:22.200 --> 00:20:25.500
Kimberly Boddy: Our picture of small scale suppression and

112
00:20:27.090 --> 00:20:40.290
Kimberly Boddy: And the fact that this in the early universe destroys weekly balance structures that we tested with the sea of me, but we can also now say, What does this do to the galaxies that are supposed to form from those structures.

113
00:20:40.740 --> 00:20:47.250
Kimberly Boddy: And so this is a simulation just showing the lack of structure that you get from a simulation.

114
00:20:48.420 --> 00:20:49.980
Kimberly Boddy: If you, if you destroy

115
00:20:51.450 --> 00:21:15.060

Kimberly Boddy: Small scale structure at very early times right so you can go out and test this with using Milky Way satellites. So these are Dorf galaxies that are orbiting our Milky Way within our Milky Way Halo. And so there are a handful of satellites that have been discovered by

116
00:21:16.710 --> 00:21:22.350
Kimberly Boddy: SPSS slim Digital Sky Survey. They're also sort of our standard classic

117
00:21:24.360 --> 00:21:40.290
Kimberly Boddy: Dorf galaxies there are more than admin discovered by the dark energy survey and we can use these the very existence of these galaxies to say, well, we can't have suppressed structure too much. Okay. And since I'm running a little short on time. Let me just give the

118
00:21:41.550 --> 00:21:46.080
Kimberly Boddy: The picture what's happening on so this is this is nice. It's, it's showing different

119
00:21:47.700 --> 00:21:56.640
Kimberly Boddy: Different constraints as well. So here's the CMT analysis that I was showing you before. And here's Milky Way satellites analysis.

120
00:21:57.480 --> 00:22:14.850
Kimberly Boddy: Um, and to give you a little bit of context into what particle physics does. Here's the direct detection blob. So normally, this goes down, way, way, way down here and limits dark matter cross sections at, you know, something like 10 to the minus 46

121
00:22:16.080 --> 00:22:23.640
Kimberly Boddy: And tier this. This is an estimate for the dark matter stealing the sensitivity ceiling that I was talking about before.

122
00:22:24.840 --> 00:22:28.620
Kimberly Boddy: Um, so this is using SPSS and the classical

123
00:22:29.790 --> 00:22:44.610
Kimberly Boddy: Satellites that we that we observed. This is an updated constraint with the d s collaboration to these DS and pan-starrs. And so using the population of satellites

124
00:22:45.900 --> 00:22:58.230
Kimberly Boddy: Were able to to have an improvement of this of this limit. So let me also say that this is a very generic feature or

125
00:22:59.250 --> 00:23:06.960
Kimberly Boddy: A very generic analysis for any model this sort of has a a cut off to the marriage matter of perspective.

126
00:23:07.470 --> 00:23:20.970
Kimberly Boddy: So if you have a warm dark matter model or a fuzzy dark matter model. Anything that gives the power suppression. You can imagine using that to constrain using this Milky Way satellites to constrain a model.

127
00:23:22.080 --> 00:23:33.420
Kimberly Boddy: And so in the last new minutes. Let me just say that we also have very have a variety of different models as well. I was showing you a very specific case.

128
00:23:34.470 --> 00:23:44.190
Kimberly Boddy: But the velocity dependent ones have very interesting features and that they have large acoustic dark acoustic oscillations and

129
00:23:45.630 --> 00:23:49.140
Kimberly Boddy: So those are a little bit more difficult to deal with.

130
00:23:50.550 --> 00:24:01.290
Kimberly Boddy: And I can tell you that procedure if you're interested. But I also want to leave time for questions. Let me just show you our, our preliminary results for these different models.

131
00:24:01.860 --> 00:24:15.360
Kimberly Boddy: So I RG already showed you this case for know velocity dependence and and here's showing the improvement between our, our statistical

132
00:24:16.860 --> 00:24:19.860
Kimberly Boddy: Limit and an inverse in the limit

133
00:24:21.750 --> 00:24:26.340
Kimberly Boddy: So yes, let me. I haven't heard in his bell

134
00:24:27.630 --> 00:24:29.640
Kimberly Boddy: But I'm pretty sure it should astounded at some

135
00:24:29.640 --> 00:24:35.100

Kimberly Boddy: Point. So I see her expression. So let me just stop there and

136
00:24:35.280 --> 00:24:37.500
Kimberly Boddy: See that there are a lot of interesting

137
00:24:38.850 --> 00:24:53.730
Kimberly Boddy: There are a lot of interesting new experiments coming online that that will will have improved precision and make this a very interesting field to be in to be happy to ask more questions. I'm sorry that I ran over

138
00:24:54.900 --> 00:24:55.410
Kimberly Boddy: almost certain

139
00:25:05.400 --> 00:25:07.410
Ana Bonaca: I'm muting issues over here because I

140
00:25:11.010 --> 00:25:12.120
Thank you for the wonderful

141
00:25:14.100 --> 00:25:24.540
Ana Bonaca: There are a few questions in the on the Slack channel so looks like many of them involved about the the kinds of

142
00:25:25.740 --> 00:25:43.650
Ana Bonaca: Velocity dependence, like the different models have for for scattering. And so, who we have in years as what sets the low mass scaling of the cross section limit with the with the CMT for and larger than zero, it seems to be very different for different n

143
00:25:45.180 --> 00:25:47.520
Kimberly Boddy: Oh, sorry. What sets the low mass

144
00:25:48.120 --> 00:25:54.930
Ana Bonaca: Scaling off the cross section limit with a CSV, for n equals larger than zero.

145
00:25:55.470 --> 00:25:56.040
Kimberly Boddy: So I think

146
00:25:56.310 --> 00:25:58.620
Ana Bonaca: Oh yeah, the last part of it.

147
00:25:59.760 --> 00:26:05.220
Kimberly Boddy: Right, right. Um, so this is actually an interesting combination between

148
00:26:06.420 --> 00:26:07.620
Kimberly Boddy: Between the

149
00:26:09.540 --> 00:26:11.910
Kimberly Boddy: The rate of heat transfer.

150
00:26:13.710 --> 00:26:18.270
Kimberly Boddy: And the rate of momentum transfer setting setting this scaling.

151
00:26:19.440 --> 00:26:35.280
Kimberly Boddy: So if I just think about the rate of momentum transfer I showed you that plot where I had different models that were all sort of the momentum rates of momentum transfer, we're all kind of intersecting was that the one that I had a lot of different. I guess I bring it up but

152
00:26:35.430 --> 00:26:35.880
Ana Bonaca: Now, yes.

153
00:26:36.870 --> 00:26:49.080
Kimberly Boddy: And they were all of these lines for the different powers of in verse, sort of intersecting it at a single location. And that's because when data is is sensitive to certain

154
00:26:50.370 --> 00:26:58.110
Kimberly Boddy: A certain L value of about 1400 and that corresponds to a mode. The is entered the horizon at a particular redshift.

155
00:26:58.860 --> 00:27:10.380
Kimberly Boddy: And so that's why the clustering of those lines sort of all all occurred in one location. Um, so, so at that scale at that time in history.

156
00:27:10.890 --> 00:27:21.300
Kimberly Boddy: Um, that's, that's when think data sets are the constraints that the momentum transfer rate can't be more than like a percent or something of the Hubble expansion.

157

00:27:23.400 --> 00:27:30.960
Kimberly Boddy: And so the the mass dependence comes when you think about a particular model. So there's a mass dependence when you

158
00:27:32.130 --> 00:27:43.080
Kimberly Boddy: When you look at the moment and transfer rate and it's just a matter of how you cast this constraint. Do you cast it as a fixed momentum transfer rate at a given value.

159
00:27:43.920 --> 00:27:52.470
Kimberly Boddy: A given redshift, or do you kind of break things apart and say, now I have two parameters. I have a massive cross section and

160
00:27:54.210 --> 00:27:57.630
Kimberly Boddy: And that's essentially what sets the mask opinions of the of the cross section.

161
00:27:59.370 --> 00:28:13.740
Ana Bonaca: Interesting and maybe to sort of end up on a in a very soon, without question from AVI, how close are we to the limits on lips rolling them out all together as a viable mother model for dark matter.

162
00:28:15.030 --> 00:28:28.200
Kimberly Boddy: How close are we willing them out at all. It's a viable model. Yeah. Um, I, in terms of in terms of other constraints coming in and saying something or in terms of

163
00:28:30.420 --> 00:28:33.000
Kimberly Boddy: Their viability on a theoretical

164
00:28:33.150 --> 00:28:41.640
loeb: Basis. It used to be the case that the cross section was related to week interactions. So in that context, is it without already

165
00:28:42.600 --> 00:28:47.460
Kimberly Boddy: Oh, I see. So um you so this doesn't have to be.

166
00:28:48.720 --> 00:28:52.920
Kimberly Boddy: A fundamental particle, you could imagine having a composite model.

167
00:28:54.270 --> 00:28:56.610
Kimberly Boddy: That's going to that's going to give you a much larger

168
00:28:57.630 --> 00:29:02.160
Kimberly Boddy: Interaction cross section because it's related to its geometric size so

169
00:29:02.430 --> 00:29:05.190
loeb: The original version of Williams is without that's what you're saying.

170
00:29:07.380 --> 00:29:12.510
Kimberly Boddy: I think there are some people who would argue that directly taking experiments haven't even produce

171
00:29:15.330 --> 00:29:22.740
Kimberly Boddy: All the regions of one space that we would that we would expect to see an actual wimp. Um,

172
00:29:23.760 --> 00:29:31.980
Kimberly Boddy: This is this is more interesting to say that that we thought of the wind because of cosmology, because of the relic abundance and what we assumed

173
00:29:32.880 --> 00:29:43.410
Kimberly Boddy: About that and we said a great week interaction can't have an effect on large scale structure, so therefore it's cross section but be very, very small week scale. Great.

174
00:29:44.550 --> 00:29:56.670
Kimberly Boddy: But if we actually look at the data and ask, okay, let's not think about thermal freeze out. Let's get rid of that. But how much can the CMT tolerate as of right now.

175
00:29:57.720 --> 00:30:09.330
Kimberly Boddy: And it's it's at levels that is much greater than one. Right. Um, so, so to say that cosmology is telling us that we need to win this is this is not correct.

176
00:30:11.640 --> 00:30:18.720
Ana Bonaca: Oh, sounds like there is also a paradigm shift happening on in the ideas of what dark matter particle could be

177
00:30:20.040 --> 00:30:34.140
Kimberly Boddy: Yeah, yeah. It's, um, there are a lot of I think there are a lot of assumptions important assumptions that are made that make

the picture very simple and the Wimp idea was, was very compelling. It was nice in a lot of different ways. Um,

178
00:30:36.630 --> 00:30:37.050
Kimberly Boddy: But yeah

179
00:30:37.500 --> 00:30:38.610
Kimberly Boddy: We haven't seen yet.

180
00:30:40.230 --> 00:30:45.000
Morgan Elowe MacLeod: Well, thank you so much. Kim for a really wonderful and informative talk. I learned a lot.

181
00:30:46.350 --> 00:30:50.880
Morgan Elowe MacLeod: So our skin talk today. We have the pleasure of welcoming Dr. Murray or saga.

182
00:30:53.700 --> 00:30:57.510
Morgan Elowe MacLeod: saga is an expert in

183
00:30:59.610 --> 00:31:05.430
Morgan Elowe MacLeod: Some related work of thinking about how dark matter distributions around galaxies.

184
00:31:07.470 --> 00:31:09.330
Morgan Elowe MacLeod: inform our observations of them.

185
00:31:11.130 --> 00:31:14.010
Morgan Elowe MacLeod: She did her PhD jointly between

186
00:31:15.240 --> 00:31:22.200
Morgan Elowe MacLeod: The University of Cape Town and university in Somerset, and

187
00:31:23.340 --> 00:31:30.600
Morgan Elowe MacLeod: Her research or present research is at the IU office of development.

188
00:31:31.740 --> 00:31:43.740
Morgan Elowe MacLeod: And which is in Cape Town, South Africa, and she's been thinking about how astronomers and the Astronomy community are contributing to

189
00:31:45.270 --> 00:31:53.580
Morgan Elowe MacLeod: working against I was going to say, contributing to the coven 19 pandemic, but we're trying not to. We're trying to work against the coven 19 pandemic and

190
00:31:55.830 --> 00:32:03.540
Morgan Elowe MacLeod: And I think it's a real privilege to have this talk today, because obviously this is a huge part of the world, we're all living

191
00:32:03.990 --> 00:32:18.510
Morgan Elowe MacLeod: And also because I think that I use my hours a day when I get to think about astronomy to escape from the reality of this pandemic and I'm really grateful that there are people

192
00:32:19.860 --> 00:32:32.220
Morgan Elowe MacLeod: Who are doing the opposite, like Dr. Chris saga and and you know in tackling this problem that faces us all head on. So we're really grateful for your seminar today and and welcome.

193
00:32:34.260 --> 00:32:36.180
Marie Korsaga: Thank you very much for having me.

194
00:32:36.600 --> 00:32:50.850
Marie Korsaga: Here. So before I start, I would like to remind that today is a holiday in South Africa. So we are celebrating heritage day which come every

195
00:32:51.570 --> 00:33:12.570
Marie Korsaga: 24th of September as a reminder of national cultural diversity and also as a chance to express national unity. So yeah, so as already said, my name is Marco saga. And I did my PhD.

196
00:33:13.770 --> 00:33:15.930
Marie Korsaga: in astrophysics gently between

197
00:33:16.170 --> 00:33:25.440
Marie Korsaga: University of Cape Town in South Africa and X Men say University in France. So marriage interest is only distribution of

198
00:33:26.640 --> 00:33:31.530
Marie Korsaga: That matter in galaxies using multi wavelength of division.

199
00:33:32.880 --> 00:33:45.900
Marie Korsaga: But beside my research. I'm also like Morgan said, I'm also interested on a development side of a tsunami. So I'm currently working as a fellow at

200
00:33:46.440 --> 00:33:58.740
Marie Korsaga: The Office of US economy for development already. So today, I'm not going to talk about my scientific results, but rather some of the work that I am doing at the odd.

201
00:33:59.340 --> 00:34:11.790
Marie Korsaga: So I would like to mention that we already is a giant institution of the International Astronomical Union and the South African National Heritage Foundation.

202
00:34:12.210 --> 00:34:27.990
Marie Korsaga: And we've been missions of funding and coordinating project that use us for me as a tool to address issues related to sustainable development and so besides its own activities. The Office has since 2013

203
00:34:28.620 --> 00:34:51.060
Marie Korsaga: Finds it more than hundred and 60 projects around the world through the annual call for proposals and in the fight against the pandemic. The oag as so far funds in more than 40 project that use us can only to to help address some of the impact caused by Covina 19

204
00:34:52.140 --> 00:34:55.380
Marie Korsaga: So coming back to my talk.

205
00:34:56.430 --> 00:35:07.230
Marie Korsaga: We already know it. That's the medical science community is in the front line to fight a against will coronavirus that's has now killed affected more than

206
00:35:08.790 --> 00:35:24.180
Marie Korsaga: 32 million people all over the world. So, however, it is important to mention that different activities were also conducted by scientists who are not directly involved in medical science in order to to help defeat

207
00:35:24.600 --> 00:35:39.300
Marie Korsaga: coronavirus. So in this talk, I'm going to provide a synthesis of activities and role play by the Astronomy community in the

fight against the cove in 19 pandemic and the presentation will be divided in three parts.

208
00:35:40.380 --> 00:35:53.160
Marie Korsaga: The first set in this first section I will be talking about the hardware projects conducted by astronomers and Vista gone section will be focused on

209
00:35:53.580 --> 00:36:06.510
Marie Korsaga: Modeling and the last one on education. So let's that we will hardware project so data has shown that approximately 6% of people infected with

210
00:36:07.650 --> 00:36:24.330
Marie Korsaga: Become severely sick and therefore need help to breed. And this has created a worldwide demand for ventilators, and a number of astronomers have taking up the challenge of producing new technology and low cost calculators to help

211
00:36:24.750 --> 00:36:31.980
Marie Korsaga: The medical community address a shortage of ventilators needed. So for example in South Africa.

212
00:36:32.790 --> 00:36:48.570
Marie Korsaga: With Department of Trade, Industry and competition mandated Sarah which 10 for sort of frequent Radio Astronomy Observatory to manage the national ventilator project for MVP. And so the NDP design is

213
00:36:50.160 --> 00:37:02.880
Marie Korsaga: Is based on the experience that they serve our team as going in the development and construction of the meerkat radio telescope which is a precursor to escape the largest radio telescope in Word.

214
00:37:03.330 --> 00:37:24.840
Marie Korsaga: So the aim is to help patients get oxygen by pumping a into the length with non invasive local ventilators, and this will help to treat the majority of hospitalized three can cases in South Africa and also across Sub Saharan Africa, also in France will laboratory of

215
00:37:26.040 --> 00:37:45.630
Marie Korsaga: For space science and astrophysical instrumentation Lisa and we'll party Observatory have manufacture valves. These are connecting pieces to transform the catalog diving mask into a respirator substitute for hospital. As you can see, and right inside image.

216
00:37:46.950 --> 00:38:00.810
Marie Korsaga: So in Italy Dr Cristiano Cal Jesse, who is an expert on a shirt for that matter particle work in collaboration with physicists and join us around the world to develop

217
00:38:01.380 --> 00:38:14.400
Marie Korsaga: A program and program is simple ventilator called the mechanical ventilator Milano, and that could be easily be manufactured around. We've just oxygen and electricity.

218
00:38:14.820 --> 00:38:25.170
Marie Korsaga: So for the success of the project. They use the equities in creating very complex system with gases for particle physics. And so what

219
00:38:25.980 --> 00:38:41.760
Marie Korsaga: Important with this ventilators we dismantle it or is its simplicity of its mechanical design which are low for rapid production and obviously low cost, also in Canada.

220
00:38:43.980 --> 00:38:51.420
Marie Korsaga: The actual mcdonagh who is a professor emeritus in Physics and Astronomy at Queen's University.

221
00:38:51.840 --> 00:39:02.310
Marie Korsaga: Work in collaboration with other physicists around the world to design and manufacture ventilators that provide a control supply of oxygen. And hey,

222
00:39:03.060 --> 00:39:20.610
Marie Korsaga: To Carbonite in 3000 patients and also with design of the month later was derived from the collective expertise in with design of gas handling and electronic control system us in the research for that matter, and so

223
00:39:22.890 --> 00:39:23.820
Marie Korsaga: Also

224
00:39:25.440 --> 00:39:26.370
Marie Korsaga: I think this is

225
00:39:27.390 --> 00:39:28.950
Marie Korsaga: Not the last one. Okay.

226
00:39:30.720 --> 00:39:44.430
Marie Korsaga: In the USA, Vanessa us. It's based on and technology to develop vital, which then four months later intervention technology accessible locally. And so the vital design is

227
00:39:45.660 --> 00:39:58.980
Marie Korsaga: The vital ventilator could assist patient who require dreaming assistance and also its design is simpler and faster to breathe bamboo conventional ventilator.

228
00:39:59.610 --> 00:40:10.020
Marie Korsaga: And the last example is this one. So in Thailand national astronomical Research Institute of Thailand.

229
00:40:10.680 --> 00:40:21.990
Marie Korsaga: And marriage is designing and developing a ventilators to help phase which is a shortage of ventilators in the country. And so the design of

230
00:40:22.380 --> 00:40:35.310
Marie Korsaga: This ventilator is made using the high pressure have flow control system. So, all these a this quick overview about the design of ventilators showed that astronomers

231
00:40:35.820 --> 00:40:56.550
Marie Korsaga: Are deeply involved to assist with healthcare workers with medical devices. So other hardware projects have also been conducted by astronomers to assist the healthcare persona and boost in the population. So we have, for example,

232
00:40:57.660 --> 00:41:04.890
Marie Korsaga: Vanessa who work in collaboration with other companies on a decontamination system will embrace that.

233
00:41:05.400 --> 00:41:17.610
Marie Korsaga: And so the system was developed five years ago and was initially used to distribute droplets of sterilizing free for rapid the contamination of ambulances and

234
00:41:17.970 --> 00:41:31.380
Marie Korsaga: Other vehicles. That's a Windows version of the system can be used to disinfect surfaces as well as kill pathogens, such as the corona bottles that are floating in the air and

235

00:41:34.320 --> 00:41:45.570
Marie Korsaga: In Tanzania, as well. I'm a student from Mary University of Science and Technology have developed is solar power foot activity.

236
00:41:46.170 --> 00:41:59.130
Marie Korsaga: handwashing system that you can see in the right hand side image in order to help reduce this clip of the barriers in the country. And so this is one of the cookie 19 project that

237
00:42:00.270 --> 00:42:09.330
Marie Korsaga: Already has funded through it's a solid, you know, pull for cookie 19 related proposal that I mentioned at the beginning.

238
00:42:10.050 --> 00:42:25.200
Marie Korsaga: So, also in Australia underscore physicists and an engineer created a proximity detector to a device that's give out a warning when two people are closer to each other than who

239
00:42:26.220 --> 00:42:28.230
Marie Korsaga: Recommends it safety limits.

240
00:42:30.330 --> 00:42:35.280
Marie Korsaga: So let's not explore the second checks from which about

241
00:42:37.200 --> 00:42:50.670
Marie Korsaga: Modeling, so it is important to know that many astronomers are using the computing resources to simulate the coroner barriers in order to endless to help understand the structure of the virus.

242
00:42:51.000 --> 00:43:02.460
Marie Korsaga: So for example, in the US researcher at the University of Florida in the Department of Physics and Astronomy creative individuals synthetic

243
00:43:02.970 --> 00:43:16.740
Marie Korsaga: coronavirus particularly bad a genome in order to study the structure of the new coronavirus. So the idea of creating the virus. But in general, is to make incompatible for of infection.

244
00:43:17.100 --> 00:43:32.250
Marie Korsaga: Our replication in order to figure out what makes the virus fall apart. What makes it tick and what makes it die and also we have a shell W brand planetarium at

245

00:43:34.020 --> 00:43:49.620
Marie Korsaga: At Ball State University, which is contributing in reply to the fight against coronavirus pandemic by volunteering. It's super computer to run to sit at home and so this is a competing project.

246
00:43:50.280 --> 00:44:10.410
Marie Korsaga: For predicting reporting structure of virus behind co-financing in order to help scientists understand the structure of venue coronavirus and also in India researcher, as we enter University Center.

247
00:44:12.120 --> 00:44:12.510
Marie Korsaga: For

248
00:44:13.830 --> 00:44:24.720
Marie Korsaga: Astronomy and Astrophysics develop a cell phone up to help detect and ensure an athlete and proper treatment to Carmen.

249
00:44:26.640 --> 00:44:27.300
Patients

250
00:44:34.890 --> 00:44:43.770
Marie Korsaga: We also have the computing resources of ice cream Neutrino Observatory, with which are being used.

251
00:44:44.850 --> 00:44:51.000
Marie Korsaga: To simulate protein folding of are supposed to end this simulation with health

252
00:44:52.380 --> 00:45:02.640
Marie Korsaga: Researcher understand how the virus coaching falls into three dimensional shape and how it's to juice and we have

253
00:45:04.140 --> 00:45:08.400
Marie Korsaga: Vanessa amis Research Center in California.

254
00:45:09.420 --> 00:45:20.400
Marie Korsaga: Which is using its supercomputer to crunch extremely complex and have volume of data to help advance with speed of scientific discovery in the file to

255
00:45:20.940 --> 00:45:45.450
Marie Korsaga: To stop the corona virus and the competing can process huge number of calculations related to bio informatics epidemiologists

modica molecular modeling, etc. And we have the UK space agency and collaboration with the international partnership.

256
00:45:46.890 --> 00:45:50.730
Marie Korsaga: European Space Agency agency.

257
00:45:52.080 --> 00:46:02.340
Marie Korsaga: Which are working together to help our medical stuff around the world to provide the best possible care for all patients using satellites and space.

258
00:46:02.940 --> 00:46:15.990
Marie Korsaga: technologies such as a satellite communication have observation satellites, etc. And so to finish as many as consumers around the world are

259
00:46:17.070 --> 00:46:43.380
Marie Korsaga: Working with epidemiology is to model simulation of coronavirus and so we have, for example, interesting studies published by Bruce bisects and blood me Lyra and and a daddy and salad. So you can have a look to these interesting

260
00:46:45.240 --> 00:46:48.360
Marie Korsaga: Like a glitch so

261
00:46:49.530 --> 00:46:50.850
Marie Korsaga: In the last section.

262
00:46:53.640 --> 00:47:00.960
Marie Korsaga: We all know that Corbett 19 pandemic has affected the global education so

263
00:47:03.240 --> 00:47:24.390
Marie Korsaga: Too. So to help our children and their parents and a number of us palomas have shifted their attention to provide free online resources resources and by offering daily economic activities to children. And so I'm going to give a few examples of

264
00:47:30.570 --> 00:47:31.680
Marie Korsaga: So, um,

265
00:47:31.740 --> 00:47:32.550
Marie Korsaga: But we have

266
00:47:33.540 --> 00:47:54.900
Marie Korsaga: A training program for for high school, run by us. When I was in Canada and I this platform offer free online as follow me activities for children. So it's very interesting, our platform. And so it's been interesting to to have a look. And so we have the

267
00:47:56.130 --> 00:47:58.740
Marie Korsaga: Image below as Konami center in our way.

268
00:48:00.330 --> 00:48:10.980
Marie Korsaga: Which has learned in mellow lunch in the low at home, which is a very interesting project that offer free online resources to remotely learn about

269
00:48:11.280 --> 00:48:28.650
Marie Korsaga: Astronomy topics such as our black holes galaxies and planets, etc. And also as well known as phone numbers from University of Toronto have crazy Cosmos on your couch, which is the series of

270
00:48:30.900 --> 00:48:51.420
Marie Korsaga: Weekly talks on YouTube. We've topic, ranging from old cosmic mysteries and to be lattice, a tsunami research and also we have the South African Radio Astronomy Observatory, which has created a e learning platform.

271
00:48:53.820 --> 00:48:57.540
Marie Korsaga: Which has created a learning platform.

272
00:48:59.910 --> 00:49:00.510
Marie Korsaga: To

273
00:49:03.720 --> 00:49:17.220
Marie Korsaga: To provide a online teaching and learning content to students and young I tsunami researcher at University of South Africa and also across the continent, so

274
00:49:17.970 --> 00:49:36.210
Marie Korsaga: The aim is to stimulate stimulate interest amongst students and young professionals to pursue a degree in radio astronomy and now the platform will also us online workshops and schools seminar.

275
00:49:37.920 --> 00:49:40.620
Marie Korsaga: Public talks etc and

276
00:49:42.600 --> 00:49:47.730
Marie Korsaga: We also have a group of scientists in India.

277
00:49:49.080 --> 00:49:55.200
Marie Korsaga: Which included with include including astronomers. Sorry.

278
00:49:56.700 --> 00:50:08.580
Marie Korsaga: published guidelines to answer scientifically. Some of the question related to slow and prevent the spread of food in 19 so

279
00:50:08.970 --> 00:50:24.810
Marie Korsaga: The particularity of this guideline is that there are available in many Indian language and at taking into account, we look at living condition that sometimes make physical distance difficult for the populations and

280
00:50:26.010 --> 00:50:37.860
Marie Korsaga: We have the NASA space up could be 19 challenge in our collaboration with other partners, which are organizing a global market on

281
00:50:39.180 --> 00:51:04.140
Marie Korsaga: Which regroup scientists around the world to solve challenges related to coordinate and using space based data. And to finish goes, we're running out of time. And so, as one woman's at University of men have started using the planetarium to contribute to the fight against

282
00:51:05.550 --> 00:51:25.350
Marie Korsaga: By displaying the puts in under barrel structure. Under the Dome also the planetarium has also find a way to be leveraged into a national system. That's the to add a possible vaccines. So we stop here. So that's

283
00:51:26.370 --> 00:51:31.680
Marie Korsaga: These are the activities that I wanted to highlight very quickly. So to conclude,

284
00:51:32.550 --> 00:51:43.110
Marie Korsaga: All these activities showed that it is important that we search for a solution should not be exclusively left to help her a specialist

285
00:51:43.470 --> 00:51:50.280

Marie Korsaga: So with different scientific contribution show the huge impact that a tsunami can have on our society.

286
00:51:50.730 --> 00:52:07.620
Marie Korsaga: And that's all science is necessary and useful in daily life. Yes, we are exploring the Universe, but we can also use how knowledge and skills to apply to different areas. So the tools developed through this crisis.

287
00:52:08.460 --> 00:52:21.900
Marie Korsaga: Will be useful to face the crisis English teacher. And so for more information about the activities and about a shadow work in related to

288
00:52:23.040 --> 00:52:30.360
Marie Korsaga: So please feel, have a look at the link this link. Yeah, so thank you.

289
00:52:41.910 --> 00:52:50.670
Ana Bonaca: It's really nice to see how many of the efforts. There are around the globe. So it really feels like that the whole planet is united and despite

290
00:52:52.020 --> 00:52:52.560
Ana Bonaca: Maybe just

291
00:52:53.580 --> 00:52:54.270
Ana Bonaca: Like a quick

292
00:52:55.320 --> 00:53:04.380
Ana Bonaca: technical question. You mentioned there is a hackathon happening is this ongoing or is it like set for specific dates that NASA is recognizing it

293
00:53:06.030 --> 00:53:06.870
Marie Korsaga: Or maybe funny.

294
00:53:07.890 --> 00:53:08.100
Marie Korsaga: Oh,

295
00:53:08.190 --> 00:53:16.080
Ana Bonaca: The Hackathon the analysis organizing is it set specific dates, or is it just ongoing

296
00:53:18.570 --> 00:53:22.290
Marie Korsaga: Thing. It's still ongoing, because there is

297
00:53:25.020 --> 00:53:46.440
Marie Korsaga: In many different dates related depending on the topics. So because it's a hackathon with different topics, though, so I it's still ongoing. So I can also you can also find the link of these activities on him.

298
00:53:48.570 --> 00:53:49.080
Marie Korsaga: Yeah.

299
00:53:49.560 --> 00:53:52.050
Ana Bonaca: Yeah, maybe later you can post it.

300
00:53:52.200 --> 00:53:53.100
Marie Korsaga: Yeah, yeah, we can

301
00:53:53.670 --> 00:54:16.800
Ana Bonaca: Ask you about it. Yeah, that would be very useful to get us engaged so Morgan Heather had a question of, kind of, how do we go forward as we enter this long term phase of the pandemic, where the efforts most needed. Is it the hardware side or the modeling or what you talked about last

302
00:54:17.820 --> 00:54:23.820
Ana Bonaca: About learning or providing materials. So where would you, where would you recommend us to

303
00:54:25.050 --> 00:54:27.810
Ana Bonaca: To join in which part of the practice by plan.

304
00:54:28.980 --> 00:54:33.270
Marie Korsaga: I think I'm on a plan is

305
00:54:36.210 --> 00:54:50.310
Marie Korsaga: I think interesting like I think as a sauna month. I think we're modeling site will be easier for us to do because we don't need like to to have find it to be granted to do these things, but

306
00:54:51.000 --> 00:55:04.530

Marie Korsaga: When I was talking about ventilators be designing things you need to be granted, but you can. We've been modeling side simulation, you can just apply your expertise that you using to do research.

307
00:55:06.390 --> 00:55:12.270
Ana Bonaca: And is, is your office, sort of the governing body that is coordinating all of these efforts.

308
00:55:13.980 --> 00:55:14.190
Sorry.

309
00:55:15.840 --> 00:55:29.850
Ana Bonaca: It's just wondering how is your office, keeping track of all of these efforts. Is that the best like if we say do have a study like how do we publish. How do we make, who do we make aware of it, like is it your office.

310
00:55:31.440 --> 00:55:36.840
Marie Korsaga: Yeah, it's, yeah, it's a part of what we doing, like I said,

311
00:55:38.010 --> 00:55:45.840
Marie Korsaga: I am a follow at already have the Office of astronomy for development. And so how I targeted like

312
00:55:47.520 --> 00:55:53.070
Marie Korsaga: We have different topics using a tsunami to help

313
00:55:54.300 --> 00:56:20.730
Marie Korsaga: Has the tools to to help develop this society. So it's everything related to development and things. So doing this. It's a way to show that I spoke to me is not just doing research backs are also can also apply this knowledge that we we have on different areas so

314
00:56:21.990 --> 00:56:31.530
Ana Bonaca: It's like I learned so much. I had no idea for so many of those efforts. And it's really amazing to see that these different fields coming together.

315
00:56:32.430 --> 00:56:43.440
Ana Bonaca: Sort of another as a kind of future looking question from Mr Rosen is do you think such collaboration will continue on other things after this pandemic ends.

316

00:56:45.330 --> 00:56:52.650
Marie Korsaga: Yes, I think it will continue because this has open a new

317
00:56:54.060 --> 00:57:11.340
Marie Korsaga: A new what's a new way to to do research for academia. So in the future, I think scientists, we collaborate. You know, when I talk about I'm talking about scientists like a huge like physicists and

318
00:57:12.030 --> 00:57:22.980
Marie Korsaga: Astronomers all these researchers can collaborate and then to work together because we can apply how it kills on specific

319
00:57:26.490 --> 00:57:33.030
Marie Korsaga: Things. So I think it will be continual because when you see in Africa, so

320
00:57:34.170 --> 00:57:56.400
Marie Korsaga: You can see a huge collaboration between different countries like to also i i can say for example, when you take the Ghana, the University of Ghana, we working. Also, together with other West African countries to also try to develop a vaccine.

321
00:57:57.540 --> 00:58:00.150
Marie Korsaga: So all these collaboration. I think it's

322
00:58:01.770 --> 00:58:22.560
Marie Korsaga: Forcing the link between researchers. So I think it's really continue after even after that and also we can see a strong link between the researchers in government now. So like in the example that I gave for the MVP.

323
00:58:23.610 --> 00:58:28.710
Marie Korsaga: Much later design in South Africa. It was a program. It's a project.

324
00:58:30.840 --> 00:58:51.480
Marie Korsaga: Mandated by the government, a project created by the government to give to astronomers to design a local ventilators, so this is something that's okay government's tax pressing on the capacities of research as one of us, so they can give them these kind of

325
00:58:52.830 --> 00:58:54.990
Marie Korsaga: Big projects. So I think it's

326

00:58:56.130 --> 00:58:56.340
Marie Korsaga: Yeah.

327
00:58:57.540 --> 00:59:01.830
Marie Korsaga: We have a link between researchers and governments going on.

328
00:59:04.230 --> 00:59:14.790
Ana Bonaca: Okay, I think, Okay, this is a really interesting question. So it's running a little bit late, but I want to hear your opinion on it. I think it's worth sharing with everyone. So Simon was asked is,

329
00:59:15.930 --> 00:59:20.190
Ana Bonaca: How receptive, do you think people have been to the efforts of astronomers

330
00:59:21.540 --> 00:59:21.930
Ana Bonaca: Like

331
00:59:23.100 --> 00:59:30.120
Ana Bonaca: Have there been any criticisms that the models we use as astronomers are not necessarily applicable to epidemiology.

332
00:59:31.950 --> 00:59:33.300
Marie Korsaga: Sorry, I didn't

333
00:59:34.290 --> 00:59:43.290
Ana Bonaca: Do you think people in general like from other fields like epidemiology is they think, have they been receptive of the work done by astronomers in modeling or

334
00:59:44.550 --> 00:59:49.020
Ana Bonaca: Was there more of a feeling that astronomers don't really know much about epidemiology.

335
00:59:50.820 --> 00:59:55.110
Marie Korsaga: Let's I find this a

336
00:59:56.130 --> 01:00:10.080
Marie Korsaga: Okay, my opinion it's I can say yes, some of the work, but there are important. Some of the work also that people are taking into seriously because I

337

01:00:11.340 --> 01:00:15.030
Marie Korsaga: I attended a seminar last week about a

338
01:00:16.170 --> 01:00:18.870
Marie Korsaga: A physicist is working on a

339
01:00:20.490 --> 01:00:22.500
Marie Korsaga: Let's call a search for that matter.

340
01:00:22.980 --> 01:00:23.700
Marie Korsaga: That matter.

341
01:00:23.760 --> 01:00:34.440
Marie Korsaga: In South Africa bikes is working is doing modeling is modeling and simulation for the government. So, and then the government a policy.

342
01:00:35.040 --> 01:00:49.980
Marie Korsaga: makers to take the decision about lock down if they going to to how the majors that they going to take and so they taking into account the work that she's doing so I think

343
01:00:50.880 --> 01:00:58.920
Marie Korsaga: Yeah, there are some work that that people are taking into serious when they want to take a decision, same thing. Yeah.

344
01:00:59.640 --> 01:01:01.770
Ana Bonaca: That's extremely promising. So I guess.

345
01:01:02.250 --> 01:01:02.970
Marie Korsaga: Yeah.

346
01:01:03.390 --> 01:01:14.130
Ana Bonaca: Thank you so much for sharing this work for us. And there are a few more questions and dislike for both of our speakers, so please. Yeah, hang out and I would like to keep interacting with you.

347
01:01:17.220 --> 01:01:18.450
Marie Korsaga: So really pleasure.

348
01:01:19.410 --> 01:01:24.930
Ana Bonaca: Thank you. Thank you for joining us here today, especially likely you're also dealing with the time difference

349
01:01:26.100 --> 01:01:30.570
Marie Korsaga: Okay I puts a link to form.

350
01:01:32.250 --> 01:01:35.730
Marie Korsaga: Too young to have more information about why they

351
01:01:36.210 --> 01:01:39.630
Marie Korsaga: Say, Oh, that's great. And so young and

352
01:01:41.970 --> 01:01:42.630
I just

353
01:01:44.250 --> 01:01:45.210
Putting this

354
01:01:47.940 --> 01:01:49.650
Ana Bonaca: Thank you. Yeah, thank you so much.

355
01:01:50.250 --> 01:01:53.010
Marie Korsaga: So you can have all information. Yeah.

356
01:01:54.390 --> 01:01:57.810
Marie Korsaga: The last thing. Okay, thank you so much.

357
01:01:58.800 --> 01:02:02.040
Ana Bonaca: Thank you. Thank you. Thank you, everyone, for coming.

358
01:02:03.090 --> 01:02:04.500
Ana Bonaca: And yeah.

359
01:02:04.560 --> 01:02:05.760
Morgan Elowe MacLeod: Thank you. See you next week.

360
01:02:06.390 --> 01:02:09.420
Ana Bonaca: Yes, next week, same time, same place.

361
01:02:12.480 --> 01:02:13.530
Ana Bonaca: Bye everyone.

362

01:02:14.160 --> 01:02:15.360
Kimberly Boddy: Bye bye.

363
01:02:16.080 --> 01:02:17.340
Morgan Elowe MacLeod: Bye, thank you so much.