AUDIO TRANSCRIPT:

Conversation with Juan Manuel García-Ruiz

Interview took place…

keywords: crystals, physics,

JUAN MANUEL: And this is something that has a huge impact on the art, all the art. I don't know [if] you are familiar with [unclear? 00:07].

ARJUNA: No, but just to go slow; this is super interesting so I want to go a bit slow. So, in your early research, you discovered a silicon crystal that merges with barrium and produces a structure that looks organic but is not organic – or behaves organic?

Yeah.

JUAN MANUEL: Exactly. This look organic and look in shape, you know, but also in texture. So, if you look in detail inside, you know, with a microscope with the optical microscope, on a , [they] are very similar to the– not only the shape, but the texture of the shells [that align use? 00:51] shapes like a– shells of the, you know, [unclear? 00:56] or whatever, you know, or a snail or– not a snail... *(pauses, thinking of word)*... a caracola? Yeah, the shell of the [audio distorted, 01:05], all this.

It is very similar, but this happened much later. So we're trying to understand which is the correlation between these two [ways to think? 01:19] very complex shells, you know, because one of the invention of life is to make these shells with a spiral, you know, with the texture, which is very– they are very strong, you know, mechanical. So it's something– actually it's a dream for engineers to make something similar to what life is able to do. So, these

[biomorph? 01:44] I made in the lab are similar in texture – not only in shapes, so this is, this is [unclear? 01:52]

ARJUNA: And it's met some resistance from the community because they thought it was a mistake

JUAN MANUEL: Not now. At the beginning in 2000, 2002 still people don't believe it. But now it's, you know, there are many laboratories already working on that in [unclear: 02:13] in Japan. So now, yep– no, everybody believes.

ARJUNA: And then that is a possible way that life begins? Is that the proposal?

JUAN MANUEL: Well, we are working on that also, because similar to this [statute? 02:32], there is a higher pH. There is another [statute? 02:36] in which we already demonstrate that when you have formamide– formamide is a very simple carbon molecule, one carbon molecule with– very simple– that occurs in the universe– is in the universe. So we show that in the [pressing of this statute? [02:54] that we made in the [lab at a higher Ph? 02:56] condensation of this simple molecule gives you amino acid nucleobases and all the brick of life. So the brick of life can be made with this. The problem now is, well, how to go farther, you know how to go to proteins and to [unclear: 03:15] action. Yeah, but this is something, sure, already demonstrated.

ARJUNA: The name of the carbon is carbon plus, what's the molecule that you condense into the ingredients for life is called?

JUAN MANUEL: formamide [repeats and types name to Arjuna]

ARJUNA: Ok, formamide

JUAN MANUEL: So, if you Google formamide you will see is a very simple molecule. So condensation of these molecules is already shown that you have the brick of life.

ARJUNA: And then the presence of water in this kind of primitive art is necessary for that.

JUAN MANUEL: Sure, sure, sure. This is very, very, very important. Yep.

ARJUNA: And if it's not a primitive art– wasn't like [how? 04:10], what was it? What was the climate? What was the atmosphere?

JUAN MANUEL: Ah, well, what we propose is that you have a [unclear: 04:20], because if– the pH was very alkaline, very high, because, you know, this colleague, they already demonstrate that there was water there. So, what we will propose is that if there were water so early; the [class, the first class? 04:42] was just a [class of? 04:45] olivine – is a mineral, right, periodic sense – so [automatic rocks? 04:48]. We know, and this is why this is very interesting, is that when you have water on top, and in contact with olivines, then you form hydrogen reducing environment and [varial calorie? 05:04] water. So, this is called serpentinization. And this is a reaction that now for instance, in Aqua de Ney, California; in Oman; in Malaga, these are– the alkaline water that we have is because of these reactions. And this is the– it's a factory of organic molecules. So, hydrogen immediately react with CO2 to form [unclear, 05:33] hydrocarbon. So, we believe that we have an ocean with a lot of molecule– actually, the whole planet will be a factory of organic molecules. So, that we will have an atmosphere with vapour, water vapor, and a lot of– a haze of organic compounds. This was– all we imagined this. [unclear crossover: 06:01]

ARJUNA: Sorry go ahead

JUAN MANUEL: Yeah, I asked one of my friends which is a painter to draw how we imagined the [unclear - audio faded, 06:12]

ARJUNA: Serpentinization is, I mean as far as I've read, this is the theory of the beginning of life right? This kind of [unclear: 06:20]

JUAN MANUEL: Well, serpentinization is a reaction that this is very, very–

ARJUNA: And then the bacteria... [unclear: 06:26]

JUAN MANUEL: Yeah, work very well. Not everybody agree that you have serpentinization then you have alkaline environment, high pH, you know, but, if you go to [Balara? 06:41] or to Oman or to other places with serpentinization there is no silica there. But what it is– what we propose is that at the beginning you have an alkaline environment, but the first [protocontines?: 06:57] the first [of them to form? 06:57], they are another kind of rocks, called [goronite? 07:01] and called [anultrasite? 07:03], and their reaction, we already demonstrate that the reaction of this water with [the goronite from the statute we are claiming? 07:13] I mean, the [viable unclear? 07:14]. So, there are already people who believe that now you have serpentinization also in the [black smoke air? 07:26], people that believe that hydrothermal [vents? 07:27] were the origin of life. We are not convinced on this, so we believe that this is much more general, this is the whole planet – is not because– certainly is now very appealing to think about the hydrothermal [vents? 07:47] to be– because we have this [black smoke air, you know, white smoke air? 07:52], but we believe that this is much later. So at the very beginning, actually, we don't need to go to the– because the whole plan was working like that.

ARJUNA: What's the evidence for this?

JUAN MANUEL: For what? For...

ARJUNA: For that it's– I mean, I like the idea that serpentinization was happening over the entire [planet? 08:12] because I think, to me what happened, everywhere – not just in, like, the black [unclear: 08:16] or...

JUAN MANUEL: Yeah. Well, the evidence is that if– the reasoning is that if we had 4.4 billion years ago, water must condense on the [ultramatic? 08:31] because it's the– the only rock available at the time. So then [unclear: 08:37] serpentinization and then we know that the first rock [unclear: 08:42], so everything works, actually, we made an experiment which we take a very [unclear: 08:48] water pass through a granite, and then this [statue forms? 08:50]. So it's something that, in our view should happen everywhere, everywhere. But as I told you we don't have rock from there [unclear/audio distorted: 09:02] But we believe that maybe Mars will be– because this is something that– so our view is that everybody's looking for all your life something absolutely singular, bizarre, you know, [rad? 09:17], what we believe is that to make the brick of life is very easy, is everywhere. So if the whole planet was a factory, and actually any other planet, like Mars, or moons like Titan or [Enceladus? 09:34], you know, [what's that way? 09:38] So the problem is– the question is: why is so difficult the step from the brick of life, I mean [unclear: 09:46] to something really able to cell reproduce.

ARJUNA: And, I mean [unclear: 09:53] but I like it. When it makes the step to organic life, you think it would be the same bacteria everywhere or different bacterias on different sides of the planet?

JUAN MANUEL: Oh, yeah, well, first of all, I think that it will be very difficult to create this self organized– especially to create [RNA? 10:16] or– but I think that will be nothing– the probability is very low. So we don't know yet

if this is a matter of lottery, so that you have– an in some way, if we are right, so that means that we have 400 million year, which is a huge amount of time, to [truly? 10:42] make reaction, reaction, reaction, and then [lottery? unclear: 10:46]. The other way is to have self organizing structure, self-organizing reactions that I like it very much. But as far as I know, so far, there is nothing yet discovered that could really facilitate this. So, my point is that if life appeared would be in the very singular conditions. So [we would? 11:16] not really have in the same different places different– because, you know, it is to have [different organisms? 11:26], it is very complicated. You need to have a membrane. In principle, mineral membrane will work; [lipds? 11.35] which is easy to do also will have a membrane, but then you need copper [calantilization? 11:40]. So it's a complicated [unclear: 11:42]...

ARJUNA: It's super interesting. It's also very nice to spend some time imagining... [laughs]

JUAN MANUEL: Oh, yeah, this is– I love– this is what– You know, this is what we [manage? 11:57] to think basically, you know, say a thing and so [pause] I think the important thing is that we have a [low internal logic? 12:06]. So I think– actually we propose now our big project to, yeah to prove [all the things? 12:11]. Yeah, I mean, it's a matter of what is science? You know, science is to try to– is you are doing something that you already know the results. [Laughs] So and I don't care about to be wrong.

ARJUNA: In terms of timeline, we don't know when the first bacteria appeared. You know we don't have a [record? 12:36]...

JUAN MANUEL: Well this is other problem that also [bite more of an interest? 12:43]. Because our colleagues, micropaleontologists, they were looking back back back, you know, and then they found here, you know, 3.8

billion years ago, this is the present, they found a [statue? 12:59] that look [that? 13:02] and they say, Okay, these are the first proof of life, the [problem is the variable? 13:06] look exactly the same. So we published a paper in [Science, couple of paper? 13:13], I'm saying that, well, we have to careful [we like to be careful? 13:19] because, you know, morphology– but it's because people thought, you know, for [for the Titon? 13:25] well, you're very young, maybe you don't remember, in I think 1996, or 2000s, you know, people from NASA, they claimed that they found life in a meteorite, in the [LEH- 084 over 01? 13:40] because one of them prove it, because they found some of the [statute? 13:45] that look like biological and they say there is no way that inorganically you can produce that shape and then we can say well, we can because we found– we made this a [stature? 13:57], same size, same shape everything the same. And in addition, in the same case, [that the rock at that time? 14:07] [laughs] So now, to me–

ARJUNA: What's then the distinction between a biomorph and a bacteria or other...

JUAN MANUEL: Very, very difficult to distinguish, very difficult. So to me, I think that life is very old, so I think the life probably is on this planet 4 billion years ago right. But we don't have proof. Actually, no, we don't have really proof of this because of this problem of the difficulty to determine– because what we– I think that we propose and now I think many people believe is that inorganic [world? 14:57] fueling organic reaction can mimic very well [light shapes? 15:00]. So maybe the first evidence of life now we could say is 3 billion years. So it's something about this here. But most probably is much older. So, there is also some [statistical stromatolite? 15:26] that are complicated shapes that made not by life but induced by life. So, this also our colleagues are working on this [pause] is still under

debate – it's something that's a big debate about that. But for sure, 3.5, 3.2 billion year is for sure we already life.

ARJUNA: And before we have this fossil record, we don't know how long that period is between the Big Bang or whatever and the first life, because...

JUAN MANUEL: Oh, no, no, the Big Bang is 15,000 million year. But then the solar system formed and the planet – well, it's very difficult to say when the planet appeared, you know, but what we mean is when, for the first time you have a mass, you know, collapsing, and then this is 4.650 million year, so is 4560 million years old, then the [moon? 16:43] formation is about 4.5. So, it's not clear yet, right. But most people believe that the moon form because a huge impact of a meteorite that [provides information on the moon? 16:54], or maybe a sequence of very close big impact. Okay, this happened 4.5. And then we believe the 4.4 [unclear early? 17:09], we already have the ocean [and? 17:11] the water. So that means that we have 4.4. And then till 3.5 – we have one billion years you know and the problem is too [vast?], is very difficult to grasp what it means, you know, when people say, Yeah, but it's only one million years. Think about it: one million, one billion it's a huge amount of [laughs]. You know, because when people say dinosaur, which is very old, is 60 million is not [unclear: 17:51], you know, it's so [laughs]. So this, I think that we have a lot of time, you know, there's a lot of time. Because when people thought that [the earliest was a unclear? 18:03], then you have almost no time, you know, because you need water. But now we know the 4.4 billion is already [worth? 18:09] a huge amount of time for the origin of life.

ARJUNA: Just thinking philosophically, we always call it the origin of life, when you think of this like one bacteria appearing, [bu when you have a

theory that it's happening over? 18:27] the whole planet, it's not really an origin, but it's like... [laughs]

JUAN MANUEL: Well, no! But, you know, everything in this in this is a sequence of reactions. So it's not [we have unclear? 18:45] you don't know it's not something that – it's not like the birth of a baby [laughs]

ARJUNA: But this is the way– the tendency is to think that there was one bacteria floating in the middle of the Pacific Ocean [laughs]. It helps the human give it a kind of human narrative or evolutionary narrative...

JUAN MANUEL: Yeah, because we are all very anthropocentric. So we believe that all life, it's basically– But no, I mean, the origin of life is sequence or reaction, in which you have many prior [neuron and many neuron? 19:22] you know, whenever– so is something that you are very close, but they back, very back, back back. So and then a certain moment they start to do that you will have a sequence could be maybe in other places What I mean is that they teach you the number of ticket for lottery that we have, is much bigger than we thought before.

ARJUNA: Yeah. But I like this as an image I like the simultaneity of it, and it produces a difference– it produces less linear, less of a linear [unclear: 19:49], more nonlinear, more planetary, more emergent in a kind of complex – it makes it more complex.

JUAN MANUEL: Yeah, exactly. And because, you know, in most cases, most of the processing in nature [are unclear? 20:13], which is basically nonlinear. But I mean, [an issue? 20:17] is something that logic should play a lot of thing because, you know, to me life is, how to say, I think it's a very bad project [laughs]. Imagine that we have in the universe, right, and then we have an evaluation committee, and

then people came, you know, I want to evaluate life on the planet. And then you look over [so? 20:47] I have recently, well two years ago, I have, you know [cathetories? 20:58]. Well, you know, they introduce you a [catheter? 20:57], you know, and so I was there in the hospital, there were friend of mine who were the doctor. So they use the [catheter? 21:07], and I can't, because you have a local anesthetic, only local, so you really can't see in the TV screen, you know, you see all of your fa-. And then I remember they say, 4000 million years for this! [laughs] And then my colleague doctor, "Why do you say...?" No, no, I will explain you later. No, this is the problem. The problem is that, 4000 billion year, and the most, let's say, evolved organism – [unclear, 21:39] completely ridiculous [laughs]. That's very, very [loving? 21:45], you know, something that died but yet [unclear 21:48]. Very bad, you know, so, to me, this is a pain, the journey of this project, very bad, you know, because it's a fall of some million year [pfft sound]; there are almost 2000 million year in which you are only [unclear 22:03], you know, and then later in complexity. So, for instance, you know, reproduction, which is very, well very important for that [William? 22:16] system, right. In our case, which is supposed to be the most evolved organism, reproduction, we made [is blood made? 22:27] in a way in which the same minimum of effort matters [unclear: 22:30]. So, in the most important thing, you know, we use now, [unclear, phone ringing 22:42] to be something very [clean or something? Unclear, then answers phone in Spanish: 22:46]. So, yeah, so, I think that, to me, should be something more. Yes. That is nonlinear. So, [I think that you unclear 23:13] did actually, no, I think there's something nonlinear, we need to [unclear? 23:15] what kind of reaction, it is very important now, to work with amino acids to make protein polypeptide, we need to know how does this happen. Because to me, I mean, obviously, it's very easy – geologically easy. So, what we

are doing actually, is that we made this [experiment? 23:40] in the conditions, which are supposed to be the condition of the early years so that means that you want to have brick of life, this is easy– so it was probably it was everywhere in the planet at that time. So this is the [unclear: 23:58] it says that you have a factory and then it's a matter of [logic? 24:03], and we have time, and a very high productivity of organic molecules.

ARJUNA: Sounds good. I want to talk a little bit about the text you sent and then I won't take up too much more of your time. But it's it's very, I've enjoyed talking to you. And it's nice to hear these things. The point of the text that I liked or was very interested in was this: the source for the crystal be a possible source of inspiration for the platonic solid? I know this was [crossover, clarifying question] platonic solids.

JUAN MANUEL: Oh, yeah. Yes.

ARJUNA: Can you tell me a little bit where this idea came from? I mean, I guess you said it in the article but it's nice to hear it from you.

JUAN MANUEL: Yeah. Well, this idea came from– I learned three or four years ago that the first thing that [ominit? 25:08] collected was crystal, were crystal [courses? 25:09]. And this has been demonstrated, so 800,000 million years ago, you know, already [how many to collect? 25:19] because this is before the [concept? 25:24]. So, I really want to explain why [unclear: 25:28] and then I have this explanation I wrote in the paper, which is well basically is because [crystal has? 25:28] completely different than in terms of symmetry, or any other thing in the nature, so, the people where they are, you know, the [unclear: 25:45] were there, because they already have the brain prepared to think about trying to understand. You want to try to understand something, the first thing that you do is to make

compartments, to separate things. And then everything in nature is fractal is the [unclear, is cube?: 26:06]. And then, you know, you see this little crystal, then, wow this is completely different. This is a flat faces, straight line, [first time? 26:19] you know, it's also the [bride? 26:20]. So, this [unclear: 26:23], and the other important thing to me is that everything in nature [of that time? 26:28], you know, now, you see that this [bowl? 26:35] is glowing, and then die. The children, you know, the animals, the trees, you know, everything, but you have this crystal. Then you say, who? Who made this? Because I didn't make it, you didn't – who made that? And then, to me, this is the first way in which the brain of these people, you know, start to think that should be something else to explain all this thing, because remember that these people collect and bring it with them. So all they will be they are continuously. So they have to think about, you know, who made this? And then is the first–

ARJUNA: –the first metaphysics.

JUAN MANUEL: [Exactly? 27:22] Yep.

ARJUNA: And also the crystal, it doesn't die, it just keeps growing. And I don't know if they were able – they wouldn't have observe a crystal growing but it doesn't die [laughs]. [unclear in crossover, 27:29]

JUAN MANUEL: Exactly. It's there forever. I mean, the [coarse? 27:34] crystal is [audio distortion: 27:36] me, this is a– and then I remember, you know, 2001 – the movie. The monolith in the movie is a crystal. Because Arthur Clarke and Stanley Kubrick, they both belong to a number of intellectual at that time in the 1970s, 1980s in which they believe of a visitation. So they believe that there are– for instance, the musician [Esther Housing? 28:22], I don't know if you are familiar, [Esto Housing?] is a musician that they believe that the music is not terrestrial, you know, it's something that– so these

people. So, they have this idea that there is a God over civilization, [unclear: 28:42] civilization very powerful – enough to modify the evolution of the– you know, this is what the movie's about right. So, they had to show this is civilization. So what they do? They select a crystal, they choose a crystal – actually [unclear: 29:04] in The Sentinel, which is the novel, which is based, is also in the script– you read the different script of 2001 the first one was a cube, no a diamond actually, second one was a cube and the third one the final one was the monolith [orthorhombic crystal? 29:21]. And then I said well– so far nobody came to visit us but maybe they were right [they're saying that? 29:31] the crystal actually it was the trigger, they catalyze the [causes? 29:40], you know, the way in which the [cause?], because in my opinion, this is something that– it is clear that when you have this crystal it's a way in which you can imagine other thing much complex like mountains, like a tree, like this, in terms of this kind of [unclear] we call [unclear Euclidian? 30:03] geometry.

ARJUNA: Yeah. Can you say that again sorry?

JUAN MANUEL: Yeah, that, you know, if this is the first time in which for instance later something very complex like mountains could be a pyramid and a tree could be [a triangle? 30:23] you know, so, it's a way in which people understand or start [to construct? 30:28], start to work in the idea that you can actually use this crystal symmetry, I mean, what we call later platonic solid or equilibrium symmetry to understand the complex world outside and this one we did until [20th Century? 30:50], we use this geometry, eucleudian geometry. So, now, we understand that we want to really manage the planet and nature, euclidian geometry is not enough. So, we need to develop another [mathematica? 31:04] and this is, to me, this is the most important thing is we need to– the geometry that we have and the

mathematica that we have is not enough to really understand the complexity of it all.

ARJUNA: The stuff with quantum mechanics is kind of out there– I mean, this is a whole different conversation. But I mean, I guess the crystal could go– the crystal went, as I understand it, in two parts: it went metaphysical and it went to the abstract, or to the [crossover, unclear: 31:34] geometric. I guess at a certain point they were the same, but then it was a place where they were separate...

JUAN MANUEL: Yeah, but you know, this is why I asked do you know this art historian, German art historian called Worringer, Arthur [incorrect first name] Worringer. He wrote [unclear: 31:59] a book, actually was his thesis, it's called Abstraction and Empathy.

ARJUNA: I didn't understand you, yeah.

JUAN MANUEL: Okay. So, to me it's very important text because you know, is actually is the [unclear, the historian? 31: 19] who in some ways support all the [unclear: 32:22] because what he said is that there is two different approach: one is they call crystal inorganic and the other one they call organic life you know, organic life-like shape, and then he say that the first civilization were mostly, fundamentally crystal inorganic. And then later on, then we discovered, you know, all this kind of culture based on trying to represent real [rock? 33:01] but the very beginning was basically conceptual [as the word? 33:05] and this is why, you know, this is why all the art studied in 20th Century art, you know, all the [purists? 33:14] for instance, you know, there was a kind of crystallin cooked – the first one was crystallin cooked so, [Leggo Roussiere? 33:21], all the people, all the architecture of the [–lite? 33:20], all the thing, this is basically based on this– on no base but, you know, supported by this area, the [bahouse? 33:32], [bahouse?] is a strong influence from Worringer.

ARJUNA: But this would be the geometric lineage of the crystal and not the metaphysical [laughs]

JUAN MANUEL: Well, exactly. Because– yeah, I think you're right because Worringer [Arthur Worringer? 33:54], go more to the metaphysical, but the people they painted, the artists, they stay on the on the just the, the job to [unclear: 34:01]– actually why this was so important is because another reason is because of the kindergarten. You know, the kindergarten was invented by a crystal [unclear: 34:15] in 19th century, and to me, it was critical, because they create this very successful schools in 19th century that was everywhere in – well, not everywhere but France, United Kingdom [unclear: 34:32], Germany, Austria, Italy, United States, Mexico, Japan, everywhere, you know, there was thousands of schools in which all this choosing, this table – [there is actually a? 34:48] table with quadricula. So they had to make, for sure, you know, something based on geometry on platonic symmetry, you know, on crystals, so actually they invented this to play with cubes and to play with the [unclear: 35:06] something [what the children draw? 35:07] this is 19th century. So who went to this school? All the artists [of the system? 35:12], so Kandinsky, Le Corbusier, you know, [Bright?]. All these people [unclear: 35:19] all these people. So, yeah, that was a really, really very important very high impact – to me too much. Actually I think that now we have to look for– so now we know, because of the [variables? 35:36], and because you know other reasons, that actually there is not such a [unclear: 35:42] between life, and so it's something which is much more diffused, so on, I think that is nonsense to have these two, kind of, art – because there was a pattern. Until now, you know, still people– the last district in Manhattan, you know, with the new buildings it is called the Crystal City. You know the [Siru? 36:16] song also this is purely crystalline.

Still many people, many [archivists? 36:21], but then you have other people like [Demajor? 36:24], or Toyo Ito in Japan, or Sara, you know, this [unclear: 36:31] architect, unfortunately she died. These people are already looking for new ways. But to me, the very difficult thing is to create art in which you mesh both things. This to me is very difficult.

ARJUNA: I mean, this is something we're very interested in, we spoke to some geobiologists who are working at that threshold between life and non life. So like, bacteria that we produce so slowly that it was inorganic [laughs]. Those kind of things...

JUAN MANUEL: Yeah, yeah yeah.

ARJUNA: I had two more questions, and then I'll let you get back to your day. The first question was about the optical qualities of the crystal and whether the [early hominits? 37:22] would like look through it, or look at the way the light moved through it. And this, I mean, also helps with the kind of consciousness or pattern recognition, you know. If you look through it, it's like a kaleidoscope. Suddenly, you see the world in geometric pattern

JUAN MANUEL: To me the optics was– this optic in order to really appreciate this optic, it's very difficult. I mean, it's something that at the beginning, [we're setting the price? 37:54] of the crystal [course? 37:57] transparency also, which is something that you can see through is the only thing that actually you can see through, in some cases also you can have a reflection, so you can see yourself – these are the [quality base? 38:12] we reference here for instance, or of [calcitice? 38:17] and [with you have this spirit? 38:19], I think that this is very, very [important? 38:22]. Because you need to have– well, you need to have to pick things and to to really start to appreciate this. I mean the optical property of crystals– because so far we only have

evidence of collection of [rocks? 38:44], not only one I mean calcite is complicated to a single piece of calcite [crossover unclear, sodium chloride? 38:52] you can see in the sea salt, I mean in the sea, the shoreline, you can see it but they're very tiny crystals [probably not really important? 39:06] actually what people start to– when they, you know, have [an edge? 39:13], you know this, that the primitive people, you know, use, so, they have symmetry, I mean mirror symmetry, and some of them have [unclear: 39:22] something that I was talking with some people are studying these things, and they say – and actually you see that, you don't need too much symmetry to make– to work it. So, it's something that people already start to do and then in Africa, you can find also some stone that has been [unclear: 39:53]. So very [unclear: 39:56] properties – I'm not sure that it would be...

ARJUNA: And I guess, two last questions. By the time, I mean, they were gathering the crystals and then I guess, as it develops, they were kind of mining them, at some point, like, basic mining, but they were looking for them, they were opening as a kind of a practice of mining, and not only a practice of mining, but not necessarily the hominis but as we sort of come forward, stone age and forward...

[Transcription software only uploaded 40 minutes. The timecodes from this point on refer to 40 minutes plus the time indicated]

JUAN MANUEL: You mean, primitive people [unclear: 02:54]

ARJUNA: Yeah but also as, like, I'm thinking between the primitive person and the platonic solids, the Plato of assigning the elements with these things?

JUAN MANUEL: No– the rock crystal, I think, they were not mining until much later, but rock crystal they appear in the [silicon pine? 03:14], for instance

there is a– I don't know if I sent you this – there is a place here in south of Spain, it's a [tomb? 03:25] in which people [this archaologists? 03:27] discover [unclear: 03:29] crystal that side. They are [unclear: 03:31]. And this [unclear: 03:36] crystal is impossible to find in– you have to go 600 kilometre or 800 kilometre. So 6000 years ago, already the people were, you know, travelling with this crystal [in order to make some? 03:52]. So I think that mining crystal– because later on what happened is that they start to work with– they like very much the green rocks. So they start to have with [asurite? 04:10] some greens– minerals, so the colour start to be important. But the problem is that we don't have too much– so, we know that quartz is for [unclear: 04:24], you know, quartz is the beginning. And then you have quartz everywhere, all the [tombs? 04:29] you have quartz, crystals, quartz, and still was very important – until now. Now there's many people who believe that, you know [laughs slightly], have some energy of the quartz crystal, and it's something that is maintained along the history.

ARJUNA: I guess the reason I'm asking this is, I like in the text where you say this kind of a platonic solid in the beginning of a kind of abstraction or abstract thinking, and what it would be like to imagine reality without this kind of compartmentalization and pattern recognition. This is something that both Denise, my collaborator, and I we think a lot about this kind of, you know, if we take out separation and you take out category, and you take out hierarchy, what kind of subjectivities, you know, what would the reality be like? And I guess we make the argument that a lot of that categorization is a kind of violence that's been used in colonialism, used for alienation [unclear, crossover: 05:40]

JUAN MANUEL: This is, I like– I was watching some of your work with a philosopher from Canada. Ok no? Yeah. Very much interesting. I will actually, could you tell me more about this? What your–

ARJUNA: Yeah, I mean, she's been studying the history of knowledge. Especially the European like [Kant? 06:02] and the kind of lineage of European knowledge. And she says that race and violence and this kind of long tradition of racial violence is–

JUAN MANUEL: I cannot [read? 06:17]– there was some problem.

ARJUNA: There's a long tradition of racial violence in the foundational epistemologies and ontologies, and she traces it back to Kant and traces it back further to Plato, we just went to Plato, we say that the platonic solids becomes the detonation mechanism for the nuclear bomb – it's the Archimedes solid, but it's in this lineage of symmetry and reflective surfaces, so we say that almost all of knowledge, and almost all of the ways we comprehend and understand the world has a racial violence inherence in it, or violence inherent in it, and the separation, the category, the hierarchy of these pillars, and so we tried to imagine what happens when we take away the platonic solid, and we take away the critique of judgement and we take away some of Marx's linear history, we take away these big moments

JUAN MANUEL: [unclear: 07:22] did you take away the euclidean geometry?

ARJUNA: ...taken away [unclear: 07:26] geometry.

JUAN MANUEL: Yeah because the euclidean geometry is– all the things that you say is euclidean, and there was actually the way in which Western civilization, yeah, dominate the world, you know, because of this. Yeah, this is interesting because, to me, I'm very much now interested in the relation between science and art. Yeah I think that

would be very much interesting to try to, you know, explore if we can use another– maybe art, maybe, I don't know, any other thing that could be an alternative way of knowledge.

ARJUNA: We say, we call it poetics. So a combination of poetry and ethics, and this would be– [repeats word for clarity]

JUAN MANUEL: like a politic and poetry?

ARJUNA: ...instead of euclidean geometry we have poetics [unclear: 08:33]

JUAN MANUEL: Okay, but– and what is the main tool for poetics?

ARJUNA: I'll send you a video, and we try to do it in the video. It's very difficult to explain because it's like [laughs]

JUAN MANUEL: Yeah, I will like to– No, I was watching and reading some you sent, I also Google it and I would like very much to know about this, because I'm now finishing a paper about the [kind of? 09:04] crystal in– because, you know, I don't know if I have sent you the paper– no, because it was not in English yet. Because when this happens, this kindergarten, you know, approach and then there's two ways of understand art. One way is geometry, Euclidean geometry, and the other one is the cube of life. You know, one thing is what people believe that like Le Corbusier, you know, the architecture of the skyscraper of New York and the geometry, the curricula for the cities, you know, and there was, obviously, two different ways to understand art. And they are represented– there is a writer called Italo Calvino. I don't know if you're familiar, Italo Calvino. He said, we have the artists– we're talking about the writers, the writers of the crystal and the writing of the fire, you know, and then this is two completely different ways to understand life, to understand art, to write. But I focus very much in the debate between Salvador Dali

and Garcia Lorca, which is a Spanish poet. And it's a beautiful, beautiful– because they fall in love [with each other? 10:30] they fall in love when they were very young. So it's a wonderful personal history and, at the same time, a debate about [the thing? 10:39] So very much interesting [unclear :10:39]. Because Garcia Lorca was a wonderful poet, you know, he was really very bright– brave, you know? Because he understood very well this [thing? 10:53]. So but they say, to Dali at that time– Dali was crystal, just pure geometry, was completely crazy with geometry, but Lorca say ['Well, Dali, hear this too very well? 11:07]. But he said, 'Don't bother, don't believe, this is not the way', I think that he want to understand life, he will go to New York. All this architecture, you know, is something that is [a goustier? 11:21], you know, it's something that provoke, you are unhappy with this. So you want to understand, black people in the [US don't understand? 11:27] then you need to– there is another kind of a geometry is something that kill you. So it's very interesting all these things [laughs]. So please just send me your...

ARJUNA: I'll send you the video, and what comes to mind is this platonic solid, and the crystal is connected to resource extraction. So abstraction [unclear, crossover: 11:51] resource extraction. Like mining, but also going to, like– so yeah, the project of abstract thinking and the project of resource extraction are very [unclear, crossover: 12:02]

JUAN MANUEL: Yeah, yeah. I understand. Yeah. [Unclear: 12:09] platonic was already very, let's say advanced, because it was 6th century before Christ then it's interesting that it was completely forgotten until 14th century until the Renaissance. And then it's become [again? 12:31] something that used by, let's say, what we call now science. Because the people who use always seem to imagine the world, the orbit of the universe– actually was [unclear: 12:44] proposed this, he was wrong, but was proposed that actually the whole universe was

based on the platonic solids. Yeah, and that's very interesting. So [I, problem is? 12:57] I increased a lot of it. [Arjuna laughs] So my colleagues say, 'But, you know, [you already get'? 13:01], no it's that I study and then I came to this conclusion is that there was too much. I think that the 20th century was a dictatorship of the crystal [signature? 13:10]. And this is, you know, this is why I remember my colleagues, you know, this is that, why all the [unclear? 13:21] saw it, confirms to me, you know, Stalinists and Hitler and all these people, they like it, the symmetry of [prism? 13:30], you know, this is something [obvious? 13:31] because, actually, psychologically it's also very useful, because in some way, people relax– why people relax with this? Because when people say, Well something already [ok? 13:44], [so what? So what? 13:45] is knowing that this can be controlled, is under control, don't worry is under control. Well, this is not too much! [laughs] But this is the idea that [this has been so? 13:58]. Symmetry, crystal symmetry, is a way to say I know how to control you, right? I know to dominate you. So this is, so we need to figure out [a thing or two? 14:14] [laughs]. Okay, so...

ARJUNA: That's great. It's great to hear this former crystologer–crystolog– [both laugh] Yeah it's very nice. Thank you so much for talking and I'll send you some films when we stay in touch, maybe we're going to come to Spain to look at the [spupeed? 14:31] to film that cos we couldn't get to [Nika? 14:33] and then we could come and say hello

JUAN MANUEL: Yeah Nika is not possible now because the people they are– But the good thing is that they [unclear, a lot? 14:41] of it, so I was visiting, so I was still there and very well maintain it, they were able to reduce the humidity which is very important. So yeah, but...

ARJUNA: Yeah I think we gave up and we'll try the [Pulpi? 15:00] and this one I think is accessible.

JUAN MANUEL: Yeah [Pulpi?] is something that is– I am going next Friday to– people from my lab and from the administration they asked me to go there so [unclear, crossover: 15:13]

ARJUNA: Is it far from Malaga or not so far?

JUAN MANUEL: It's very close to– well it's in Almeria, but from Malaga it's about two hours, [2 hour?] and a half. [Unclear, crossover: 15:23] Okay.

ARJUNA: [Christobel?, 15:24] thank you so much, and have a good day.

JUAN MANUEL: Thank you. Bye bye, ciao.

ARJUNA: Bye bye.

[END OF RECORDING]