Collaboration in Music

Interviewers: Paul Verschure (Convergent Science Network)
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Welcome to the Ernst Strüngmann Forum podcasts—a series of discussions designed to explore how people collaborate under real-life settings. Joining us in the series are high-profile experts from diverse areas in society, whose experiences will lend insight to what collaboration is, what it requires, and why it might break down. This series is produced in collaboration with the Convergent Science Network.

P. Verschure	This is Paul Verschure with the Convergent Science Network and Ernst Strüngmann Forum podcast on collaboration, together with my colleague Julia Lupp, and today our guest is Jonatas Manzolli, mathematician and composer from Brazil. Jonatas, welcome to the podcast.
J. Manzolli	It's great to be with you.
P. Verschure	Before we discuss collaboration, could you give us a short description of your career path that brought you to where you are today?
J. Manzolli	The story starts when I decided to take classes at the university. I was studying mathematics, but also decided to take courses in music. And suddenly things began to crash in my mind because, on one side, I had people telling me that I needed to understand things, while on the other side, people were saying me to focus on emotion, interpretation, and how interpretation can be a world model – the very same thing that mathematicians are also trying to understand. From there, I became a little bit a slave to this dichotomy: I didn't know whether my goal was to interpret or to understand.
	In terms of humankind, this is the biggest problem: whether you should understand things, or interpret things.
	While I was studying mathematics and music, I decided to get a master's degree in math. Then I wanted to understand how the musical instrument works in an orchestra. This took immense work and by the end, I hadn't composed any kind of musical composition. I was a little bit frustrated because I understood the orchestra and I made a very sophisticated mathematical model, but I didn't play around with it. I understood it, but I didn't produce art. So, I decided to do my PhD in music composition to put the emphasis on creation. As I pursued my PhD, I was always having this discussion of whether you produce music through math (understanding) or produce art.
	I gradually came to an understanding that my purpose in life is to be a kind of interface or bridge between possibilities of understanding and interpretation. For me, art is not for understanding and thinking. Art in music is for interpreting, for producing things that do not make us understand the world but make us live. Science, in contrast, exists to enable understanding. But I believe that both can profit from each other. For example, if you ask how the universe starts, you understand what it means, because life depends not only on how the universe starts, but on many other things.
	After that I started teaching at the University of Campinas, and there I push my students with these kinds of questions. As the head of the NICS - Interdisciplinary Center for Sound Communication for many years, I engaged with students of music, dance, and engineering. One day I met Paul at UCA, and we had a conversation about how robots can drive a system based on maths. The idea was: How does the robot talk to the system? We have engaged in many conversations and now, with the COVID pandemic, I have started to think that for this kind of research, the best thing is not only to produce artifacts that interact with people but to produce artifacts that are good for people. There is a difference.
P. Verschure	You started in the musical domain as an accomplished pianist, and then became a conductor. You moved to interactive music systems and are a composer. So, you have had a very broad set of experiences. In parallel, you are also a mathematician and teach a number of courses

	in that domain. You have always been balancing these two experiences. In that context, we ask how you would define collaboration. What is it and what is it good for?
J. Manzolli	I think I have two words to define collaborations: dialogue and good heart. Well, maybe three expressions – try to understand the other – but "good heart," in my opinion encompasses this. I believe that it's about listening to people. Collaboration is more than trying to make people do things. Collaboration is about getting people talk, to listen to others, far more than, say, trying to make people develop something.
J. Lupp	You describe composing or compositions as being the interpretation of a something. So, using the example of the *Le Sacre du Printemps*, this would be Stravinsky's musical interpretation of creation or evolution.
J. Manzolli	Exactly.
J. Lupp	As a composer, you try to create a dialogue with the listener by interpreting a concept, giving it over to listeners to consider, and perhaps expand their understanding of the concept. Is this how you see yourself as a composer?
J. Manzolli	I think my goal as a composer is to give them the opportunity to make their own interpretation. I don't think my personal interpretation is the main task; it's just my opinion. The main task of a composer is, to open a door for other interpretations. Of course, if Stravinsky had taken another model of creation or had thought in his world view, his music would be a little bit different. Of course, it would be. On the other hand, the way people take Stravinsky's music and share, let's say, emotionally and meld his ideas into their own – this is a matter of art. At least for me, it's the matter of composition.
P. Verschure	So I want to understand something here. I'm not creative and now we're on the track of the composer, who works to enable a form of collaboration. So what is this? Among all the agents that you're trying to proactively control, how do you structure that, what's happening?
J. Manzolli	I think it's a very complex form of collaboration. Let's take a piece of music, say Stravinsky again. Imagine that you have to collaborate, on a technical level, with the individual members of the orchestra as well as with the conductor. Some composers might say, "if the orchestra and the conductor understand my score, my work is done." It's not what I think, though. That's only part of it because collaboration also involved sharing meaning with people. This comes from me, comes from my muse, come from my score, and goes to people.
P. Verschure	Let's first look at the technical part. You use a notation system to, if you want, to program future actions of a bunch of agents in the orchestra and the conductor. So technically, how do you structure that? What are the key ingredients of that algorithm, if you may, to make that composition work?
J. Manzolli	You, of course, know that I work with algorithmic composition. But I'm not going to answer you in this way. What I want to convey instead is that there are rules and ways of organization. (We often refer to music as organized sound.) But the point is the organization can be done on many levels.
	One level involves the way you write music. There is a form of a symbolic notation, which many people understand, and using this notation, people can produce one interpretation of the music.
	The second level involves the way the sound is linked to the symbolic score. Sound itself is not always what is written in the score. Why not? Because the instruments have different shapes, different timbres. It is very complex. And the people who play one instrument can differ from someone else on the same instrument. So the second level involves sound.
	The third level is what I would describe as the emotional level. It is a level that creates a relationship between the listener and with myself; it is a social relationship.

My research over the years consists of trying to understand the symbolic notation and for that, I work with parameters. I represent this symbolic notation, mathematical parameters, and work with computers to produce a score.

I made this experience with Ada: a machine produces sounds and people start to react, we have these two second levels, because the sound itself is not what you write but is what people listen to. So you have to do research in perception.

P. Verschure   I understand. But before we go there Jonatas, in structuring your score, you want to make certain that all the future orchestra members, and the choir, etc. collaborate together to realize what you intend they realize.

J. Manzolli   That's one level.

P. Verschure   At that level, do you structure your score around a goal? Do you give them a goal; do you declare a goal? Or is it more microscopic in the way you link with them?

J. Manzolli   Oh okay, I got your question. You are speaking of orchestration or, as I tell my students, architecture. So, this is how I think of orchestration: You think about the building where people are going to live, or the building where people are going to listen to music. You have many layers within the orchestra, the instruments, as well as the layer of the notes. How do you work with that? I think that you need to have a holistic idea, a general idea of the concept you want to project, because if you don't have a general idea, all you are left with are just details, and the composition will not survive. This general idea can come to you in many ways. I'm very visual, so sometimes an idea comes to me in a visual form. Here I think we need more research because I believe that all people have an aesthetic, but perhaps not the same aesthetic. When I listen to a sound, it comes to me via images, but I don't think this is unique to me. It's for everybody. I believe that it is a misconception to think that when we speak about the organization of sounds that this refers only to the level of the writing.

P. Verschure   Are you saying that in developing a piece that is driven by an image you have, you attempt to convey that image in the minds of everyone who has to realize that piece?

J. Manzolli   Not that particular image, but one that might drive other people's image. The point is that I am not the composer in the sense of a composer from the Romantic Era? I don't like the idea of the Romantic composer as a superhero, that he is a genius and what's inside his brain or his mind goes to everybody, and he has to be immortal, because this is going to be forever. I don't believe in that.

J. Lupp   Going back to your original discussion of dialogue, social relationship, is it correct to say that as a composer you're trying to create a dialogue and this is the collaboration; you're offering ideas to spark a dialogue, an exchange.

J. Manzolli   Yes. For the people who attend and speak about the piece after the concert, for the musicians as we interact during a rehearsal, as well as for my students. There is potential for feedback or dialogue with me, with each other. For me as a composer, it's not about imposing an idea, but it's rather setting a pendulum in motion. This pendulum, you know, can swing back to me, go out to you, and then back again. There can be multiple feedback loops. This is a better way of describing how ideas are driven, similar to a self-organized system.

P. Verschure   But that's a tricky one, right, because what does that exactly mean? Also, as a composer, you write your score. So, for instance, in a piece, you might want the strings to interact with the winds in a particular way. You want them to collaborate. So how do you implement that interaction?

J. Manzolli   I write it in the score and ask people to play what I wrote. But what I try to say at the level of the symbolic score, is that it is not enough to do this.

P. Verschure   What I'm trying to force you to speak about is this: What's really the architecture? What's the building? What are the structural elements of the building?

J. Manzolli	Rules, actually. How the ideas are driven in a piece of music. As I told you previously, on one level or layer, we utilize symbolic notation. This layer has been for 400 years in the hands of the composers. All musicians learn how to use it. So at that layer I customize my ideas in the details. I give notes or a line to the flutes for them to play. I provide the clarinet with symbolic notation notes and describe how the line should be articulated (staccato, legato, etc.) as well as played in terms of dynamics (e.g., pianissimo). I give some guides in the universal time to the conductor.
	This is one level, which I call symbolic communication. Symbolic to me is based on the notation.
	When the rehearsal begins and the individual musicians in the orchestra start to play, many other things come out that relate to things beyond the score. For example, the position where the musicians are sitting, their relation to the sound and each other – a realm of complex relationships within the orchestra. In that sense, I call this the layer of the sound (and people). The orchestra has to build a sound for the composer's music. One point where there is a lot of misunderstanding concerns the function of the conductor. The conductor is there to help the orchestra build this sound. It's very special.
J. Lupp	Let us return to Paul's wish for an architecture and see if I understand your correctly. You're saying that the score of your composition is the framework for the collaboration among the people involved – collaboration among the individuals of the orchestra (including the conductor) as well as including the people who are listening to score. The score itself sets up an interaction first among the musicians, and then further out, in how it's interpreted by the listeners.
J. Manzolli	I couldn't describe better the idea of framework. Thank you very much. Importantly, though, the framework must permit the musicians freedom to interpret, even in a big orchestra.
P. Verschure	But Jonatas, doesn't your description suggest that all the agents in the system downstream are automata?
J. Manzolli	No, not at all.
P. Verschure	How do you orchestrate their collaboration? What makes it collaborative what they do?
J. Manzolli	That's the point. I think sometimes there are people that believe that the conductor is kind of a king, or a dictatorship, and people do everything the conductor says. I believe that if this happens, the music will be void of (individual) expression. The orchestra for me, is a good example of collaboration because it's has a framework that requires tolerance between the collaborators; that is, the musicians, the conductor, as well as the composer, who may not be physically present but has produced the score. The composer provided guides to the orchestra, which returns their interpretation. The orchestra respects the score, just as one individual respects another. This is how people work together in the orchestra: each person has a unique way of performing their instrument. Even in a large, very uniform orchestra where there is a specific concept of sound (as in the large, famous orchestras in Europe, for example), collaboration takes place. My point is that given this need to collaborate, if the musicians are a kind of automata, the resulting music would be devoid of meaning. Meaning emerges out of variations and nuances that each person (replete with their own interpretation) lends to the total sound and gives to the framework that the composer proposed. Understood that way, this is a very good example of synergy.
P. Verschure	What then makes that collaborative?
J. Manzolli	I think there are many ways, both good and bad. When musicians sit next to each other and begin to play, they collectively have a goal of making this piece of music the best that they can. They're engaged for that. And if they don't collaborate effectively (i.e., play what they have to play but they have to play with their own interpretation), the whole system will break down and the performance will be abysmal. Let's return to the *Rite of Spring* by Stravinsky,

which has been played many times. If you listen to one interpretation versus another, you will easily recognize the musical framework but find that there are many, many variations—in the way the conductor gave cues for the musicians, as well as in how the individual musicians have interacted with each other. Also, if I'm sitting in the audience hearing the piece again, I may be struck by the way it is played, finding that this new interpretation has provided new meaning to me. The music conveys meaning through shared dialogue between the composer, the musicians, and with the audience.

J. Lupp	The dialogue as well as the social interaction and/or reciprocity among these players.
J. Manzolli	The social interaction, the technical one that only people with the technical knowledge engage in, but there are many others. I'm thinking of another example outside of the orchestra. Let's take the example of Steve Reich when he was there in Africa. In trying to study how people do music there, he established some relations in his approach for minimal music. He experienced people playing music together, without a conductor or composer, but the music sounds were very pleasant, very complex and immense. Interesting. So, what's the difference? Well, here social relationships between the people were very high and religion was a prime focus of their interactions. They produced produce music because they listened to each other and had more individual freedom to add their part. Compared to an orchestra, where individuality plays less of a role, the music produced at such rituals showed the importance of individuality.
	Both models are interesting. In one it is the score, the framework, that gives individuals the opportunities to people to perform. In the other one, social relationships and rituals bring people together and to create music.
P. Verschure	In these two situations, does something like trust play a role?
J. Manzolli	Yes it does, and "trust" is a good way to describe this underlying phenomena. What I mean by trust is not that I believe in you. It means that I give you the opportunity to give something to me that pleases me. This is trust to me. Trust involves not just serving but the pleasure of staying together, of amplifying it. Trust must be exist between a conductor and the orchestra, or as in the latter example, between individuals and the community.
P. Verschure	How do you orchestrate that as a conductor, as a composer, or as an instrumentalist?
J. Manzolli	Well, some situations require a composer, others do not. Let's just take again Steve Reich as an example. After being in Africa, he returned to New York and wrote, for example, clapping music. He took a bit of the structure of what he heard, focused on the structure of the pulse, and conceived this as a music composition. In that sense, he made an abstraction and brought it in another framework (social relationship and trust) to complete his idea. When the clapping music is performed, there is one layer that I recognize as the symbolic notation, and one that reflects the way people play the score. Importantly, the composer is the person that brings this abstraction to the score but the score is not enough.
P. Verschure	That's what I am trying to understand. I could imagine that as you put a score together, you designate the ingredients and people. In that sense, you attempt to build up a trust relation between the performers because they need to interact reciprocally. Would you use elements of that kind to construct trust?
J. Manzolli	Yes, I think so. I think this way to talk is going in a very good direction, the direction that I believe is clear. For example, for many years I have worked with the UNICAMP [University of Campinas] Symphony Orchestra. They have premiered many works of mine, e.g., the opera, *Descobertas*. In that opera, the idea was to celebrate the 15th anniversary of UNICAMP. As I began to think how to approach this, I pondered whether I should describe who founded UNICAMP or perhaps another famous scientist associated with it. After much though, I realized that the best way to describe its creation was to describe how people work when they create. Thus, in the opera, *Descobertas*, there is no narrative, no main character, only the process of creation and how I represent – and this metaphor becomes the basis for

dialogue. I decided that I needed to have a score, but I wanted the collaboration from others: dancers, percussionists, and orchestra, and a team of technicians who build a multimodal system that's going to amplify and describe the movement for the audience. Working with such a big project requires combining different levels of understanding between different disciplines or areas of expertise. For example, for the dancers, the time for making the choreography was much longer than for the musicians. To produce the entire choreography took them almost six months. For the orchestral score, the rehearsal period was around 15 days. For the percussionists, they needed ca. two months, due to special types of sounds needed. And my question was: For the same score, why did it take drastically different timeframes to derive the interpretation? Well, for the dancers, they had to learn with their bodies and make the expression in their bodies. There is no external instrument to manipulate; my score does not work for them as it works for the musicians, because of the symbolic notation. The dancers needed to build up the choreography step-by-step. For the percussionists, they needed combine these two levels: the level of the body (because percussion instruments involve the body movement) and notation. Also, I put the instruments in the opera, in many different places on the stage. When I was developing this whole project, I needed to trust Cinthia [Cinthia Alireti], who was the conductor, as well as Daniel, Fernando, and the technicians. We were all involved. The most important factor was to understand the different timescales that people have to work and to collaborate between languages. For example, the musicians could adapt the protocol to their existing protocol, but the dancers needed to build up a protocol, and the percussionists were somewhere in between. The score of this opera contains notes, there was much left to discuss.

P. Verschure   Did you include in the composition elements to instill trust and the collaboration, for instance, by building dialogues inside the piece?

J. Manzolli   That's a good question. When I composed it, I inserted some "spice," by this I mean space in the score that allows for bifurcation. Normally when the orchestra is performing a piece, the musicians sit on stage and the audience sits in the hall and listens. This is classic Italian theater. For *Descobertas,* I give cues as to the position of the conductor and dancers to aid interpretation. But *when* something happens and *why* it happens is not prescribed – this depends very much on the choreographer. This is a little bit different from a musical score, which prescribes the time (e.g., bar number) when something is going to happen. But eEven then, there is still a small chance of modulating for the dance. When you add the space in the body, the tolerance of this cue has to be larger.

J. Manzolli   I don't know if I'm answering your question. The point is: As a composer, I am not only working not with musicians but with dancers and the technical engineering crew as well. Trust not only depends on the score and the framework in place, it depends on the level of response that each element in the system feedbacks into the team: how things band together, the way they take the project. Engineering in the opera takes the project in one direction, the dancer another, and the musician yet another. So, to successfully collaborate, each group must have to respect for the expertise and skill of the others.

P. Verschure   I understand, I think. Can you give a different example involving of a composition or conducting of a piece where thingst didn't work, where it really failed, where this creative collaboration did really not come off the ground? What's failure in that case?

J. Manzolli   Well, once I wrote a piece of music for percussion and string quartet, and I made the mistake of thinking that a particular sound that I wanted to prescribe in the score for the strings would match the sounds of the percussion. My mental goal was to make the string orchestra become a kind of percussion orchestra and the percussion instruments to become strings. I tried to invert the function and what happened? Well, there I was, standing in front of the ensemble with the conductor; I explained my idea to them and not only did they not get it, but they vehemently did not like it. They put their foot down and said "no." And no matter of discussion could get them change. You see, I liked my ideas and believed in my project but when I came in front of the orchestra and described my proposal to them, they said that my

ideas could not be implemented – that it was impossible because I was trying to radically change the function of the instrumentation in the traditional way: "You want to make us do something that is impossible. We don't believe in you and we don't trust your ideas."

J. Lupp   This insight is very interesting because often an audience sees only a hierarchical structure to a performance (i.e., conductor up front, musicians sitting down). Whether it's a classical music concert or an avant-garde dance company, people often do not understand the actual interplay or dialogue that goes on between conductor, composer, individual musicians, etc. When things break down, problems result. When the dialogue is good and there is a collective understanding of the framework that underpins a project or performance, then individuals collaborate to meet the goal of the music.

J. Manzolli   That's correct. Perhaps it happens more frequently in new music, where I'm a composer, where I'm making new proposals. Perhaps in performing a piece by Mozart, the framework is more stable, expectations are more tempered, and people have a clearer reference point. So, when a conductor suggests a subito piano in bar 55, a performer may be more willing to accept this because they are used to this music. In new music, this is not given. When you work with an orchestra, they have to understand and believe in your framework. Sometimes this involves getting musicians to think differently about the way they believe music should be. The score can convey some things but it cannot convey everything. In new music, not everything is prescribed before. You must work together.

P. Verschure   And that which is not described, is moved forward through trust.

J. Manzolli   Yes.

P. Verschure   Your example of the string-percussion inversion didn't work out because you wnet too far beyond people's expectations. Does this mean if things fall too far outside of this proximal zone of expectation (within a piece and within the way an orchestra might perform a piece) that a piece will collapse?

J. Manzolli   Yes. That is the primary challenge in writing contemporary music. Let me give you an example. There was a Brazilian composer who went to a very important festival in Brazil and he came with a score that was in essence a ball—a crystal ball with notes inside. His idea was to have people to interpret that ball to derive the score. The orchestra was not so keen about this approach so before they begin performing the music, they agree to play only a B-flat, despite being free to play what they see in the ball. So they came to the concert and despite being given the freedom to play what they see, they play the same note. That's completely contrary to what the composer wanted or intended. Why did they make such an agreement? Because they didn't want to collaborate with the composer. Because they didn't value the composer's ideas as good. Because they didn't trust the kind of freedom that the composer gave to them.

This serves as an example that I give to my students when we discuss how to score. How a composer scores is important in terms of giving cues. For example, some students tell me that they want to make a graphic score. The first question that I ask is: What do you intend, which sound do you want the performer to produce? A composer has a mental model of how it should sound, but the score must communicate this to the orchestra and musicians. Next one must analyze whether the piece is a solo, an orchestral piece, or chamber music piece. Each is very different. For example, with a solo piece, an incredible soloist might interpret your intentions in a unique way, and the dialogue (or collaboration) between you and the soloist is optimal. With chamber music, the dialogue between you and the musicians expands to incorporate four, five, six, or eight people. This social relationship that results can take more time to develop before the score is understood. Orchestras involve even more players. So when a student comes to me with intent to write an orchestral or chamber music piece, we first discuss the tolerance of their writing: how good are the symbols and methods that they have to convey their ideas. If it's chamber music, you can use extended techniques, explore many possibilities of the instrument, and even change the sound of the instruments.

For example, if my piece for percussion and string instruments had been for a string quartet, I would not have had a problem, because with a small group of four musicians, I go have gotten close to them and explained my intent; our dialogue would have been easier. But I proposed this piece for an entire orchestra. The way you write and communicate a score depends on the type of ensemble; the same musical idea must be represented in a completely different way if it is to be performed by an orchestra, a chamber group, an ensemble, or a soloist. So, how you drive the response of the interpretation? For soloists in new music, dialogue is key: the composer need to talk to them, really talk to them. There are times when I'm writing new techniques and I call the soloist to get their feedback, and we have dialogue. They may say, no, it doesn't work or yes, let's give it a try. With chamber music, a composer may still talk to the group, but often such good dialogue is not achieved.

P. Verschure   Moving beyond this type of new music, it should be note that you have been one of the pioneers of interactive music systems. Did this experience force you to formalize your ideas about musical collaboration into an algorithm that is executed by a computer, in an interaction with other computers or other humans? How is that translation step done from a perspective of collaboration?

J. Manzolli   When I started to work with algorithm composition many years ago, before my PhD, my goal was to make a kind of automat that could represent completely my musical ideas with an algorithm, with mathematical laws. I began to work on that at the start of my PhD, with the goal of using nonlinear systems in this whole complex. During this period, one question caused me to change from working on algorithmic composition to *interactive* algorithmic composition. What's the difference? When I receive a response from the machine, with all of the parameters that were imposed on the computer, sometimes I would be happy with the results, but not completely happy. Why was this? Well, I began to understand that the music which the computer had performed was an instantiation of many other mental musical ideas contained in my proposal. Let's be clear. When you work with a piece of art, you have a, general concept in advance of you wish to create. In other words, the composition from my perspective is the whole: the computer generates a kind of music automatically and performs one small part of this whole concept that I had parameterized. This means that the math served to represent the idea in terms of parameters, but the math doesn't give you the whole interpretation. To make the algorithm, you must reduce the complexity of your idea. Numbers are not enough, and the computer alone cannot represent everything. So I was quite frustrated and feared that I would have to go back to writing music by hand. Thankfully my supervisor at the time, Jim Ferguson, was a composer who had worked with John Cage for many years. He saw the problem as follows: I didn't want to have an automat finished piece of music, I wanted space for interpretation, with the computer involved as part of the game, but the computer was not a person who would perform exactly what I prescribed. This perspective made a great difference in my entire life. When I realized that, I began to understand that sometimes you can use the math in an algorithm to give boundaries of tolerance—where some behaviors are allowed and other behaviors are not allowed—but you are not describing the full behavior and you create space for interaction. After that, I started to work with many kinds of interactions. During my PhD, for example, I developed a glove, because as I conductor, the movement of my hands cause variations inside that space of sounds. So the maths give me that space, and I move my hands inside this space. Of course, I don't have numbers; I just have sounds. After representing this in an algorithm, the task is not to use numbers but to make the sound as close as possible to your interpretation. So that means you come back to the level of instrumentation or performance.

P. Verschure   So how does one distinguish interaction with an artificial, music-generating system and collaboration with that system?

J. Manzolli   Let's go to ROBO-SO (a robot-based interactive system), where I had this concept which I called *curva que faz som* (a curve that makes sound). I was looking for ways of drawing in this space of tolerance, to possibly instantiate music and creatively explore that space. When I

saw capoeira (small robots walking in the arena) and we are discussing about whether the robots were attracted to the lights and so on, one idea that popped into my mind was that this path of exploration in the arena might be equivalent to the path that a composer might develop working in an interactive system. By this I mean that the small robot is not there to really perform the music in that sense of performing notes, it is there to collaborate with a behavior, a dynamic behavior, that derives from principles available in the system.

P. Verschure   It's the variability right?

J. Manzolli   Exactly.

P. Verschure   So, if the next step in such a music system has to be collaborative, what features would you need to add to ROBO-SO to make it collaborative and not interactive?

J. Manzolli   The problem with ROBO-SO was that it does not listen to the music it plays, and we have we have been working a lot on it. What do I mean by listen? In music, we talk about a lot of *escuta* (listening). There are many layers of listening: to words, to music. I think it's very special when you listen to music, because music is a very plastic material that penetrates our brain in many different layers. So you can define listening to music only on an acoustic level, on a social level, and go in, let's say, in a psychological lab. Going back to ROBO-SO, I think that a feedback system is needed for ROBO-SO to listen to the sounds that are performed in the environment; this it will improve the system. We tried to do that in Ai-Da: Ai-Da performed music and many people interacted with Ai-Da, but Ai-Da did not listen to herself. Ai-Da tried to interpret the behavior of people inside the room. Thus, for me, that is why Ai-Da or ROBO-SO must listen to the music they are performing because they need to have pleasure. If they derive pleasure to listen to what they are performing, they could change the possibilities that the machine is exploring in this space.

P. Verschure   But then that would be your optimization objective, you're saying?

J. Manzolli   That is what I'm working on. I'm working primarily with dancers at the moment, not because they listen to music better than musicians but because modern dance adjusts more – to the sound, with their body. I think this a good paradigm to understand the relationship between mind and body; it is a good representation of embodiment, or embodied cognition.

P. Verschure   Within the domain of music, you have a very deep understanding of how to structure collaboration, how to produce beauty etc. But let's generalize to the domain of human collaboration in general. Let's say you want to manage a big organization. What lessons could you extract from that domain of music to structure collaboration in a big business?

J. Manzolli   I would say that rules should not be perceived as commands. Rules should be perceived as possibilities of interpretation. So you are not there to receive commands, you are there to make an interpretation. Secondly, if you are in charge of the whole community, you are not there to write the rules, you are there to collaborate in the structure of the rules and in the proscription of the rules. I would try to make people believe that all types of work constitute a kind of creative process, no matter what you do. You, as a worked, create something. If someone in the in the chain of actions doesn't feel good or creative in their work, then something is wrong. I'm not running any company of course, so I don't know how this could be implemented. I am just giving you my perspective. I understand "interpretation" or "giving meaning" to be a creative act, so if you don't give space to create creativity in the chain of the actors, the work may not be optimal.

P. Verschure   Looking at societal confinement because of COVID 19, what have we learned about human collaboration?

J. Manzolli   Well, I think the first thing is that collaboration is the base of survival. Take the issue of the vaccination: A person might believe that the vaccine is not good for many reasons (e.g., a mistrust of science, religious reasons). If a person does not believe that vaccination benefits the collective, that by getting vaccinated helps everyone, then not much has been learned.

A consequence of this type of thinking is that people have started to focus too much on their own egotistical perspectives. They may isolate, but they forget about the whole, the collective. And we can observe what problems this has caused.

The second thing that I have learned myself is what I call the *aesthetics of compression*. Here is what I mean: When you are isolated within a small space, your experience a repetition of patterns. Even though many other things are happening continuously, you yourself are isolated within a sort of cave. There, you are reliant on your values. And if you don't have values, or you are unwilling to follow these values, you end up creating new ones.

Personally, at the beginning of a pandemic, to counteract the stress, I decided to write letters, musical letters (i.e., a small score lasting 5-6 minutes). I wrote many musical letters to friends of mine and this enabled a conversation with people; people started to come back, and a larger experience of collaboration took form.

For example, I wrote a small poem describing that behavior of being reconnected and sent it to 15 dancers, and they responded with movement. There's no music; just movement and poetry that is ready. What I did is when I received their movement and their voice is that I used algorithmic composition to produce a kind of expression that mixed up their movement with their voice. And now I call this result "music." There's not even one note there, so why do I call this this music? Because it serves me as a composer to express a kind of will in the sound domain. It's organized, it makes a kind of melody, it makes a kind of harmony, but music is not necessary using speech material. Did I answer your question?

P. Verschure   You did. But here's another question: Do you believe that for humanity, as such, will be able to respond to the massive challenges ahead (e.g., ecological collapse, deforestation). Will humanity be able to achieve sustainable long-term collaboration?

J. Manzolli   This is a very difficult question, but I tend to believe that when people need things, they go for it. For example, if I'm starving, I search out food. I believe that this new generation, these students of mine, my son, are going to make a difference because we have to survive. The situation in which we are living is serious and has caused major alarm bells to go off. In whatever future society emerges, I think that it is crucial to ensure that culture and art reman, because not all problems can be solved simply by science. I'm not only referring to environmental problems, which have many layers: layers of the forests, of a story that's there, of relationships. People tend to be very, let's say, intolerant today. I think that collaboration, arts, and culture might lead us to survive and build a equitable society—not one with spikes (spikes, knives, and forks, and oh, give me, I'm going to eat it) that we see today. That's the problem. The future needs to provide space for art, science, and culture if we want to succeed.

P. Verschure   Jonatas, last question: If you could change one thing in humans, what would you change to make them better collaborators?

J. Manzolli   I would enhance their capacity to believe in other people and change their ability to become tolerant of others.

P. Verschure   Jonatas Manzolli, thank you very much for this conversation.