

Numberphile Podcast Transcript

Episode: Nursery Rhymes and Numbers - with Alan Stewart

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A team of composers and musicians have joined forces to re-imagine classic nursery rhymes with new counts, timings and tempos. It's dubbed Tuplets for Toddlers, and has been led Numberphile's resident composer Alan Stewart.

[Check out the album on Amazon](#)

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An old interview with Alan [can be found here](#)

A couple of Brady's favourite videos scored by Alan include [this one from Mt Everest](#) and [this one from Chile](#) - but there are countless more!

Oh, [this fire log one was good to](#)

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Brady Haran [BH]: Do you recognize this tune?

[Clip from Tuplets for Toddlers, a Penguin Cafe Orchestra style version of Frère Jacques]

BH: Alright, how about this one?

[Another clip from Tuplets for Toddlers, a Penguin Cafe Orchestra style version of Three Blind Mice]

BH: [clip continues] They may be familiar but perhaps don't sound quite right. [clip fades] That's because they're part of an experimental album called *Tuplets for Toddlers*, which has taken familiar nursery rhymes but played 'round with the underlying numbers, the counts, the rhythms, the tempos.

[Clip from *Tuplets for Toddlers*, a West African style version of the *Itsy Bitsy Spider*]

BH: It's a fascinating collaboration between a number of talented composers, but we'll get more into that soon. But first let's go back a few steps and to today's very special guest, Alan Stewart. Now Alan's an important man in my life because he composes and performs much of the music you'll hear across all my videos and podcasts, not just *Numberphile*. To me he's some kind of genius, I actually call him the *Maestro*. [chuckles] A nickname I'm not entirely sure he likes, but he's way to polite to stop me. Like me, Alan lives in the UK but he's not a full-time musician, in fact, he's a school teacher and that's where our discussion begins.

[gentle toy piano music plays]

BH: Did you always wanna be a physics teacher, was that like... was that what you wanted to be when you grew up?

Alan Stewart [AS]: No, I don't think I knew what I wanted to be at all when I was at school. I kind of drifted into physics because I found it quite easy, I suppose? And I don't wanna sound big headed like that but I just found it came naturally to me. Maths on the other hand... did not come easily to me and I really struggled with A level maths when I was at college myself, but no, physics, I always found like, it just made a lot of sense to me, and so when it came time to choose what I wanted to study at university, physics just seemed like a very natural choice.

BH: Did you want to be a physics teacher or did you wanna like be making discoveries and working at the Large Hadron Collider and figuring out how black holes work?

AS: So during my degree, I think there was a lot of pressure for us to decide upon our career. I was still very very uncertain about what I wanted to do, until I got to third year and I took part in something called the Undergraduate Ambassador Scheme, where undergraduates were sent into local secondary schools to teach science and that unit of my degree I absolutely loved that. I love sharing science ideas with the students at the secondary school. I loved how it was very active thing to be doing. Yeah I decided I really want to be a teacher when I graduate.

BH: So if I was to ask your students now what kind of physics teacher you are, what would they say? Would they say, oh he's jokey or he's fun or he's strict or he's like... what kind of teacher is Mr. Stewart?

AS: I don't think I'm jokey, and I'm not even sure if I'm that fun, what I try to do is I quite... myself I quite like thinking things through a lot and perhaps including a little bit of philosophy as well. So when I teach, I'm very eager to draw ideas out of the students and have a lot of discussion work and I like that sort of theatrical way that you can perhaps build a bit of suspense, so rather than students, you know, here's what Rutherford discovered about the atom, I like to try and turn it into a bit of a story. That's what I hope my students would say.
[laughs]

BH: Alan, you said that math wasn't your strong point, but we always hear that mathematics like underpins physics so much so how do you reconcile those two things? Is mathematics not this like essential tool to be a good physicist?

AS: Your absolutely right, maths is crucial for physics. I... you know... it's always said that maths is the language of physics so... although I didn't find that

maths came easily to me at all and so I had to do a lot of work and that... I think came as a bit of a shock to me when I was sixteen years old, because up to that point in school, I think I'd found quite a lot of things not too difficult, except for foreign languages which I was really really really bad at. So I just had to do a lot of work. I remember sitting for hours and hours doing maths homework and then ten minutes doing physics homework.

BH: Let's talk music then, because music's not like your... your job... your occupation but it's a huge part of your life. How did you... how did music become part of your life?

AS: That's a good question. How did music become part of my life? So when I was a kid, my mum, I think tried very hard to encourage me to learn an instrument so when I was six years old I played recorder and when I was nine I played the violin, except I didn't really play either of those instruments because I didn't have any internal motivation to practice and I gave up pretty quickly. But then when I was thirteen I signed up for something called Duke of Edinburgh, the Duke of Edinburgh Award...

BH: Yeah?

AS: ...is like this scheme that... encourages young people to get involved in lots of different activities and the reason that I wanted to do Duke of Edinburgh was because of the expedition part where basically you get to go camping across the countryside and to me that sounded like a lot of fun. But the problem was you couldn't get the award if you just did the camping part, you also had to do a community element, which was like volunteering and helping out somewhere, you had to do a sport which luckily I had covered, I'm not a sporty person at all but I did... [sighs] I did happen play this quite obscure sport, so that wasn't a problem.

BH: Hang on, what obscure sport do you play?

AS: I don't play it anymore actually but... [chuckles] so the sport... I don't know if you'll have come across it, Brady. It's called goalball. It's a sport for blind people, and...

BH: Right?

AS: ...and the ball has a little bell inside, so that...

BH: Ahh.

AS: ...all of the players can hear where on the court the ball is.

BH: I have seen that played, yeah.

AS: Yeah, I played that when I was at school. I was okay for the sporting element of the award, the tricky part was the skill, where you had to provide evidence that you had...

BH: Yeah.

AS: ...acquired some skill, and my sister was already having piano lessons and I thought, oh okay, I might as well, you know have piano lessons. So I went along to this lady who's name was Mrs. Cooper and she seemed to teach everybody in my sort of local area of town. I think Mrs. Cooper was probably a little bit intimidated by me as a student, not because of my like personality, but... I think the normal way that children learnt is that alongside that they learn how to read sheet music and I wasn't...

BH: Hmm.

AS: I wasn't able to read sheet music because of my eyesight and so... Mrs.

Cooper had this student and yet had not idea how to... how to teach me, really. But she was very very patient and she was very very kind.

BH: Yeah?

AS: And I went to her for three years learning piano.

BH: Alan do you think... I mean we didn't mention you have got like a visual impairment which results in you learning music in this different way, and you don't use sheet music in anyway way. Do you think that has made you a different kind of musician to what you would've been if you could read sheet music.

AS: Yeah... absolutely. I think there are so many advantages to being able to read sheet music... the ability to be handed a piece of paper, sit down at your instrument and just play what's written. I would love to be able to do that, and I really admire musicians that can do that. The way I had to learn was purely by listening and then copying. So playing by ear, and of course the best musicians in the world can also do that. They can just hear a piece of music and just reproduce on their instrument but that was my only option.

BH: [chuckles] Right.

AS: So the process was to begin with it was very laborious. Um... I remember, you know, Mrs. Cooper would play me one bar of music, which might be just four notes on the piano and then I would have to repeat that back to her, and then she'd play me another bar of music, which would be maybe six notes and I'd play that back and then I remember actually after I'd had a piano listen at Mrs. Cooper's house I would pretty much run home because I had to get to the piano that was in my mum and dad's house and had to sit down and play what I had learned as soon as possible otherwise, you know, I'd forget it.

BH: But Alan do you feel in anyway does this untethering from sheet music, while it has it's disadvantages, do you think it's helped you on the composing side of things? Like it makes you a bit more creative or a bit freestyley?

AS: That's a great question. Um... yes I think in a way it has been an advantage because I'm very very dependent on listening, obviously, like any musician is, but for me when I play with other musicians for example they might be reading from sheet music and I've... I had to learn how to fit in with a band and I was really lucky growing up and when I went to university that there were lots of musicians around me and so I had lots of opportunities to play with other people and it meant that if I had a melodic idea in my brain, like a little tune, then I would just be able to perform that straight away on the piano just like how if you have a thought in your brain you're able to speak that thought out loud without needing to think about it too much.

BH: Mhm.

AS: So when it comes to composing, I feel like I do have, not an advantage because I'm certain that other composers do this as well, but if I have an idea for a tune then I can immediately kind of get that out of my brain and onto the keys of the piano without spending ages and ages trying to figure out the idea in my head.

BH: Super.

AS: I don't know if that makes sense.

BH: I... it kinda does. I mean I'm not... I haven't got a musical bone in my body, as you well know and you will probably found out for the rest of this podcast.

AS: [chuckles]

BH: When you have an idea then for a new tune or an idea and that, that obviously means you can't write it down. How do you capture it? Do you just have to make a recording that's an audio file that you can go back to a year later and go, oh yeah that was a good idea I had, you know, and just listen to it? That's your way of capturing it?

AS: Yeah so when I was learning piano I didn't have any means of recording anything. So anything that I did compose, and I did try to start composing when I was quite... I wouldn't've been as pretentious to call it composing but I had certain melodies that would just stay in my brain and so I never had to write them down.

BH: Hmm.

AS: I never had to record them. Of course now with, you know, software like Audacity, which you can get for free, yeah I'll just record if I have an idea. I've got a little dictaphone as well that I carry around so if I have an idea for a tune I'll just, you know, get the dictaphone out and sing into the dictaphone.

BH: So what are your outlets for music now? Um... obviously my video's about one, [laughs] which I'm very grateful for. How else do you sort of outlet your music?

AS: Yeah I feel very lucky. I have lots of ways that I get to play live music. I play percussion for two choirs, the West End Singers and the Southampton Gay Men's Chorus, are both fantastic community choirs and I play percussion to accompany them.

BH: Mhm?

AS: I also play at my church, not recently of course because of...

BH: Yeah.

AS: ...lockdown but before then every single week, I'd either play piano or guitar or percussion and I feel like I'm very lucky at the church because there are some incredible musicians there. A professor of jazz at the university... near the church and he makes me feel ashamed. You know, every time he sits down... every time he sits down at the piano, my mind is blown...

BH: [laughs]

AS: ...by his ability and for a very long time I pretended [laughs] that I couldn't play piano or that I didn't want to play piano in front of this guy because he was so so good, and I just stuck to playing percussion which is much easier. [laughs]

BH: Did he give you the thumbs up when he finally heard you play piano, he thinks your good enough?

AS: He... he... he is a lovely man.

BH: [chuckles]

AS: And he was very... very gracious when he described my piano playing.

BH: [laughs]

AS: He said that I had a very lyrical touch.

BH: Ooh, nice. Lyrical touch. That could be the name for your next album.
Alan Stewart, Lyrical Touch.

AS: [laughs] Lyrical Touch. [laughs]

BH: Let's speak about albums. Let's get to the business here because the reason we're recording this is you've been working on like sort of a special project, bit of a pet project of yours, something unusual, tell me what it's called and talk me through it.

AS: Yeah, thanks. So... there's an album called Tuplets for Toddlers, which I've helped to kind of coordinate.

BH: You've sort of been a sort of a curator and an organizer of it, have you?

AS: Yeah, so... I've got two small children and my oldest son is four and a half and he's just started at school and my youngest son is one and a half and they absolutely love listening to music. We have music on just all the time in the house.

BH: Do you play them music?

AS: I play them music.

BH: Yeah?

AS: Yeah... um... they play music, they've got loads and loads of toy instruments, we've got Spotify on, we've got music in the car, just so much music in the house.

BH: Yeah.

AS: And some of the music they want to listen to I find very tedious. Um... you know... nursery rhymes, there are hundreds and hundreds of nursery rhymes available to listen to on Spotify but after, you know, the fiftieth time of the

Wheels on the Bus, you get a bit... a bit bored. And so at the start of lockdown I was kind of going a bit crazy listening to the same songs on repeat and I thought, actually, I could record some nursery rhymes but I could make them a little bit different, just to make them a bit more interesting for me and I thought, and maybe other parents might appreciate this too, having familiar songs but performed in a slightly unfamiliar way. So I started recording my ideas and my main kind of guiding principle was I wanted the tune's to be recognizable, so just traditional nursery rhymes, but I wanted to do something playful with the rhythm.

[Clip of a Penguin Cafe Orchestra style version of Wheels on the Bus]

AS: [music fades down and continues] I wanted some usual timing going on that you don't often hear in kids music and in fact you don't often here in, [music fades out] you know, pop music on the radio.

BH: So you recorded some, you made some of these did you?

AS: I did about twelve recordings of my own where I was just experimenting with some new software that I'd got which made very very easy to adjust things like the rhythm of a performance.

[Clip of non-standard version of Twinkle Twinkle Little Star]

AS: [music fades down and continues] And in fact it felt like cheating because what I was able to do was just play the Wheels on the Bus, normally, and then in the software [music fades out] I could move the individual notes to produce a rhythm that I hadn't actually performed.

[Clip of non-standard version of Wheels on the Bus]

BH: This is kind of like for adults is it? Is it kind of like when you watch a kids

movie, like Shrek, that appeals to kids on a kids level but there's the occasional nod and the wink to the adults with like a slightly naughty joke that will go over the head of the kids? Are you doing the same thing with music? Is this like the kids'll like it 'cause it's Wheels on the Bus but the adults'll be like oh that's quirky, that's different and the kids wouldn't even appreciate it?

AS: I really like that analogy. That's an amazing analogy with Shrek. I think what I want to be able to say is that, yes, I'm doing it for the adults and maybe particularly adults who are themselves musical might appreciate some of these rhythmic ideas but there is another purpose as well, which is when you hear something new in music, sometimes that can have a really big impact on you, like it might be just the sound of a particular chord and I remember this from when I was a kid, just hearing some idea in a piece of music and it would really stick with me and I'd wonder like... what's going on in that song? Why does that sound so good or why does that sound so sad? So with this Triplets for Toddlers album, my hope is that somewhere, maybe even subconsciously, a kid is gonna listen to some of these rhythms and think, ooh, that rhythm doesn't sound like what I'm used to, I wonder what's happening in that song.

BH: Is toddler too young for that though? Is it... can a toddler have those thoughts? You know the sort of person who listen to Wheels on the Bus, are they also the sort of kid that's going to be able to think that deeply about music, or is more subliminal.

AS: I... that's a, yeah that's a great question as well. I think it probably... I think at that age it will be subliminal, and I don't think they would be conscious that there's something slightly strange about the music they're hearing, I think as you get older you might be able to articulate that thought better in your brain and then my hope would be that when adults listen to this music they would recognize that there's something a little bit unusual about it. Even if they don't know technically what's going on.

BH: So Alan, obviously at first this was just you playing around but you've kind of expanded this and turned this into kind of a real collaboration. Tell me how things expanded in this way.

AS: So I made these twelve tracks and they were just kind of sketches but it occurred to me that [laughs] well... like this sounds quite arrogant but it occurred to me that the idea of this album, I'd never come across this idea before, like an album for children that is going to introduce them to some exciting rhythmic ideas and I already had the name for the album, *Tuplets for Toddlers*, in my head and I thought...

BH: What is a tuplet?

AS: Ah, we'll get onto that, Brady, that...

BH: We'll come to that, okay.

AS: That's a good... yeah we'll come to that.

BH: [laughs]

AS: I had the title for this album, *Tuplets for Toddlers*, and I thought, maybe, just maybe, some proper composers, professional composers, might kind of get the idea and might be quite excited by it, and one thing that I thought might have the appeal here is, the tunes already exist, you know, the *Wheels on the Bus* melody, I think everybody knows that, and so the composer's job is going to be much narrower. Their task is to take this well known tune and then do something fun with the rhythm. So I contacted David Bruce, he's a composer who has done a huge amount of work, he's had his work performed at the BBC Prom, and I thought I was probably shooting quite high but...

BH: [laughs]

AS: I sent him an email, just explaining like, I'd like to make this album called *Tuplets for Toddlers*, it's gonna introduce children to exciting rhythmic ideas and I really got the sense from David Bruce that he understood straight away what this project would be and he was really enthusiastic, he asked lots of really good questions that I hadn't thought about and I feel like he really helped me to shape the project. Then I started contacting other composers. David Bruce has collaborated with some other musicians before, on composition projects, so I thought well the logical people to contact is, yeah, these other composers, and it kind of went from there.

BH: And how many of you banded together? How many of you pulled together for this album?

AS: I must've contacted maybe about thirty and ten of them...

BH: Hmm.

AS: ...have contributed to the album.

BH: So the album now exists, what's the purpose here, are you... is this gonna make you a millionaire?

AS: No. No, no, no. [laughs] So...

BH: Right.

AS: Another purpose of the album is, I thought, it would be really appropriate if all of the money raised from the streams and the downloads were to go to charity and the charity that we've chosen is Save the Children.

BH: Okay, so this is all for a good cause as well.

AS: It's all for a good cause.

BH: Alright then. Let's... I'm... this is the part I've been dreading.

AS: [laughs]

BH: [laughs] Because I'm so terrible at this, Alan. Tell me what a tuplet is and run me through a few examples of how this work. What's going on under the hood?

AS: Sure, sure. So I think to be able to understand why some of the ideas that the composers have used are so clever is you first of all have to have a basic understanding of how most nursery rhymes are counted.

BH: Okay.

AS: So the fundamental idea is here counting along with the music. So, I'll play an example of a typical nursery rhyme and how it would typically be counted, so the nursery rhyme is Frère Jacques, and it's counted in four, like this. [Plays Frère Jacques on piano and counts to the rhythm] One, two, three, four. One, two, three, four. One, two, three, four. [stops playing]

BH: So even, so there's not always four notes but there's always like a count of four?

AS: That's right.

BH: That the notes are sitting in?

AS: Absolutely, so...

BH: Couldn't you have just counted threes instead, it seems arbitrary that you chose four? You could've just counted three.

AS: Well, let's listen to what that sounds like, and there's gonna be something...

BH: Okay.

AS: ...a little bit off if I try counting to three. [Plays Frère Jacques on midi piano and counts of rhythm] One, two, three.

BH: Okay

AS: One, two... [loses rhythm, stops playing] Oh! I can't even do it. [laughs]

BH: Oh.

AS: Hang on, hang on.

BH: Okay.

AS: It's so difficult.

BH: [laughs]

AS: The reason that we count to four is this musical phrase, this... it's like a... like a sentence. It's [plays first four notes of Frère Jacques]. [pauses] That is a little parcel of time and the way that it's most logical to count it is by counting up to four.

BH: Okay. And is there a rule about how many notes you can stuff into that count?

AS: So, in... in simplistic terms, you can play a note that is the duration of a count of one, you could play notes that last for a count of two, you could play notes that last for a count of three or four, or you could subdivide that count into halves or into thirds. Now... to...

BH: Okay...

AS: ...to explain why some of these tracks are so clever with their counting I'd like to use Frère Jacques again but this time I'm gonna count up to eight.

BH: Mhm?

AS: To count up to eight I'm gonna have to count twice as fast, like this. [Plays and counts in double time] One, two, three, four, five, six, seven, eight. One, two, three, four, five, six, seven, eight.

BH: But [stutters] if I didn't hear you counting I wouldn't have noticed any difference.

AS: No of course not. But here's the clever bit.

BH: Hmm.

AS: So the composer David Bennet has arranged Frère Jacques but with a count of seven, now, seven...

BH: Hmm.

AS: ...it's an odd number and it's a little bit odd in music as well... I cannot think of the last time I heard a song that was in seven on the radio. What David Bennet has done is to take this Frère Jacques and perhaps imagine that it was

counted in eight, like I just did, but then chopped off...

BH: Hmm.

AS: ...the last eighth. So if I count along it would sound like this. [Plays and counts in 7/8 time] One, two, three, four, five, six, seven. One, two, three, four, five, six, seven. One, two, three, four, five, six, seven. One, two, three... [stops playing]. Does that sound... unusual to you?

BH: Well... it's hard because I heard you counting, it wasn't... it was harder to me concentrate on the notes you were playing but it sounded like the notes were arranged or packed together in a more uncomfortable way.

AS: That is such a good description. I... yeah. I think that's a great way to explain. They are packed together and it's a little bit uncomfortable because it's not what you're used to hearing. It's not what you're expecting. If I don't count with it, it sounds like the whole thing is rushing. It's kind of skipping ahead a bit.

BH: Here's some of David Bennet's composition as featured on the album.

[Clip from *Tuplets for Toddlers*, a Penguin Cafe Orchestra style version of *Frère Jacques*]

BH: [music continues] Okay, you still haven't told me what a tuplet is.

AS: [music continues] Ah, we'll get to that.

BH: [music continues] So David Bennet used seven, [music fades out] but David Bruce leveled up.

AS: Because what he's doing is, he's taken *Wind the Bobbin Up*, which is normally a count of four and he's gonna count up to eleven. Now I don't want

David Bruce's compositional process was but the way that I understand what he's done is he's taken Wind the Bobbin Up in four and then reimagined it in six. Can I play you what that might song like?

BH: Can you play it to me normally first as a four?

AS: Of course, I'll play it normally in four. [Plays Wind the Bobbin Up] One, two, three, four. One, two, three, four. [stops playing] That is very very standard for a nursery rhyme. Now... like I say I don't know how David Bruce imagined this as he was composing but one way perhaps to understand it is take that same tune [plays first few notes of Wind the Bobbin Up] but now let's have an underlying count of six, like this. [Plays wind the Bobbin Up in 6/4 time] One, two, three, four, five, six. One, two, three, four, five, six. [stops playing] Now already...

BH: Yeah.

AS: That's a little bit odd for a nursery rhyme, you don't hear many nursery rhymes with that kind of count. But now imagine that we double the rate of counting to twelve. [tsks] So something like this. [Plays a measures in 12/8 time and stops] I'm not gonna be able to count along with that, Brady 'cause I'm concentrating too hard [laughs] but I'm playing... with my left hand twice as many notes. I play twelve notes in total. Now what David Bruce has done is to cut off that last twelfth and the effect is...

BH: Right.

AS: ...to me, when I first heard David Bruce's submission, it just made me laugh for joy like... not laughing at it but just laughing appreciating how it transformed this very very [Clip of Tuplets for Toddlers' version of Wind Up the Bobbin fades in] normal nursery rhyme into something very peculiar indeed.

[clip fades up, multiple instruments join in and plays]

AS: [clip fades down and up and continues] Now quite a few of the other composers, they've also taken this idea of taking a normal [clip fades out] count of four and maybe adding to it or subtracting from it, so I've played all of the songs to my two sons and their favorite one by far is the one that Ben Levin has done, which is B. I. N. G. O. and what Ben Levin has done is to count up to five...

BH: Hmm?

AS: ...basically and, yeah, that's odd to have five underline the music but it's there throughout the piece. I cannot sample what Ben Levin has done because he is a creative genius and the only way to fully appreciate it why it's so good is to listen to it.

BH: Okay, let's have a little listen.

[Clip from Tuplets for Toddlers' version of B. I. N. G. O. plays]: [samples of dogs barking and panting]

AS: [clip fades out] Aimee Nolte is another composer who's contributed to this and what she's done is kind of the same, as David Bruce, in that you could count along with her London Bridge by counting up to eleven, but actually when you listen to it, it's far far more logical to count six, five and then, five, six.

BH: Ah, so changing the count during the song? [Clip from Tuplets for Toddlers' version of London Bridge fades in]

AS: [clip continues] Exactly, so we're kind of... cranking up for the complexity level here by having the count changing.

[clip continues]

AS: [clip continues] Now, 12tone, who is another composer on the album, has [clip fades out] taken this idea of changing the count and he's taken it to an extreme. Can I read out... the counting that is required for Twinkle Twinkle Little Star?

BH: Of course.

AS: I don't know how interesting this would be to listen to on a podcast but, I dunno... okay, so, in Twinkle Twinkle Little Star, in order to count along successfully you need to count, three, two, three, two, two, three, two, two, three, two, two, three, two, two, two...

BH: [laughs]

AS: ...three, two, three, two, two, three, two, two, three, three, three, two, two, three, two, two, three, two, two, three, three, two, two, one [pause] two, three, two, two, three, two, three, two, two, three, three, three, two, three, two, two, three, one.

[clip of Tuplets for Toddlers' version of Twinkle Twinkle Little Star plays]

BH: [laughs] Well that's just gone... it occurs to me Alan, this would be a great way to send secret messages to people like, through like coding into the timing of a song, like play some weird bit of music and only other... other composers would be able to tell what the secret message was. [laughs]

AS: Brady. It's been done.

BH: Has it? Right.

AS: How... in fact Brady...

BH: Yeah, sure everything...

AS: How do you know Brady that I haven't done it in a Numberphile video?

BH: Oh... I... I expect it has been done.

AS: [laughs]

BH: [laughs]

AS: Yeah. Yeah. So...

BH: Alright.

AS: So yeah, Twinkle Twinkle Little Star takes the idea of counting and it just pushes it as far as it can go and it's like... when I heard Twinkle Twinkle Little Star immediately I felt like it was a challenge, like, I wanted to be able to count along with this music and... you know, I'm not ashamed to say it took me about... probably twenty minutes to be able to nail down exactly how this music has been counted. It's just so...

BH: [laughs]

AS: It's just complicated.

BH: Is that a humble brag, Alan?

AS: Well maybe.

BH: That sounds like a humble brag, it was so complicated! It took me twenty

minutes! [laughs]

AS: [laughs] [claps]

BH: [laughs]

AS: [laughs]

BH: [laughs]

AS: [laughs]

BH: It would take me a lifetime. [laughs]

AS: Yeah.

BH: You still haven't told me what a tuplet is.

AS: Here we are! We've arrived.

BH: Alright.

AS: So.

BH: Ah! Thank goodness.

AS: The quintessential tuplet on the *Tuplets for Toddlers* have been performed for us by Shawn Crowder, a jazz and electronic drummer, and I think being a drummer, perhaps he has got a lot of experience with time and counting and what he's done is *Itsy Bitsy Spider* but he is counting...

BH: Yeah.

AS: ...in a way which is, well, fundamentally it's the same as what everyone else has done except this is to do with the speed at which he's counting. So when you first start listening to Shawn Crowder's Itsy Bitsy Spider, you'd be forgiven for thinking that it's a count of four, because, he even starts the song by clapping [claps along] one, two, three, four.

[Clip from Tuplets for Toddlers' version of Itsy Bitsy Spider plays]

AS: [clip cuts out] And you could probably listen to the whole track and not even detect that anything strange is happening at all and I think I can say that with confidence because when I first heard this concept of tuplets in a song, I couldn't recognize like... my brain wasn't wired to be able to identify what was going on with the rhythm and I heard it wrong. So, Brady for Itsy Bitsy...

BH: Yeah?

AS: ...Spider, I've sent you a clip of me counting along to it, and I think what makes this special is the speed at which I have to count, because what Shawn Crowder has done is to take these regular beats, one, two, three, four, and he subdivided them into tuplets. A tuplet is when you take a beat and you cut it up into equal duration segments but the number of segments that you cut it into is in some way... uh... unusual. And so what Shawn Crowder's done is to cut it into five, and when you cut a beat into five that's known as a quintuplet. Counting along to quintuplets is not easy. Physically vocalizing the count requires practice, and you'll hear it in the clip but the way that some drummers count this is they count, one ticky tacker, two ticky tacker, three ticks tacker, four ticky tacker.

[Clip of AS counting along to Tuplets for Toddler's version of Itsy Bitsy Spider plays]: One, two, three, four [counting along to claps], one ticky tacker, two ticky tacker, three ticks tacker, four ticky tacker.

[clip cuts out]

AS: It's quite an unusual idea to use quintuplets and it's very difficult to find songs that use quintuplets. It is possible and increasingly musicians are starting to incorporate these into their songs... and my hope that is that if little children get to hear quintuplets at a young age, they're gonna be ready or at least better prepared than most grownups are [clip fades back in] for understanding what's going on.

[clip continues and cuts out]

BH: Your sort of more sophisticated nursery rhymes is kind of... conditioning children to appreciate and explore more sophisticated music?

AS: I think so, yeah, it's exposing to them to something that they probably wouldn't hear unless they went searching for it and I'm not sure how many toddlers are au fait with the Spotify interface.

BH: Alan, why haven't nursery rhymes been written like this before. Why is this sort of, you know, experimental and new? Surely, evolution would have seen these more experimental nursery rhymes exist. Is there something wrong with them? Is there a reason they're not suited to kids?

AS: That, yeah, that's a great question. So why hasn't someone done this before? I think the reason that these ideas haven't been utilized is possibly because they do sound strange, like, you yourself Brady described Frère Jacques in seven as sounding a bit uncomfortable. I don't wanna say it doesn't sound nice but it doesn't sound like what we we're used to hearing. Another reason I think is that psychologically and physically some of these rhythms are very difficult to perform and later on, I'll get onto polyrhythm which is where you're counting two different rates simultaneously, and that is hard to do for the

musician.

BH: So one of the reasons we don't have these complex nursery rhymes is just 'cause they're... [chuckles] they're complex, they're hard to play, they're hard... [laughs]

AS: Yeah, yeah, I think so. And, but also, there is something slightly uncanny about some of them, perhaps because we're so conditioned to hearing songs that have this counting scheme of four, that whenever we hear a different counting scheme something in our brain says, ooh, that's a bit odd. Like literally odd.

BH: Alan, do you think this is a nice album? Do you think this is a good... a nice good listen? Like are people gonna enjoy this or is this like you know, an intellectual exercise where a bunch of composers have slapped themselves on the back and said aren't we clever? But to listen to it is not a pleasant experience?

AS: I think this album can be enjoyed by anyone and I think it'd be totally possible to listen through and not feel like anything was... weird. I think it's got this added layer for all of the mathematics nerds and all of the music nerds that we've got some really complicated stuff going on underneath.

BH: I'll tell you what I liked about it. I listen... I had a listen to it earlier today from like start to finish and the thing that I liked was it did seem a bit odd and interesting and experimental but because you were using such familiar famous songs from my childhood, it had this kind of nostalgia... working for it, so it was kind of like alright, I'm willing to go with this because you're also making me have these warm feelings about childhood. I think that's kind of the cleverness of it. You've kind of smuggled the new stuff in by you know, it's like you've sugar coated something that's complicated with enough nostalgia that I'm willing to go with you for the ride.

AS: Thank you, Brady. That...

BH: You can put that quote on the album cover if you like. [laughs]

AS: Yeah, yeah, yeah, that's a great quote.

BH: [laughs]

AS: 'Cause you know I haven't... you know I haven't wanted to play this to... loads of people because of course these composers have sent in their work and it's kind of, you know, it's... it's a project, it's in progress and... and so it's really interesting, Brady, to hear what your reaction to it is.

BH: Yeah.

AS: And I don't mean this at all offensively, Brady, but as you've said yourself, like, you don't have... loads of musical training...

BH: Hmm.

AS: ...and so it's particularly interesting to hear what your impression of it was. All of the tracks so far have involved taking a familiar tune and changing the underlying counting scheme. In *Three Blind Mice*, which is the one that I did... what I've done is something called polyrhythm. So they're actually two counts going on at the same time. With my left hand I'm counting up to four, and that's four equal division of time. And with my right hand I'm counting up to three, but the important thing here is that my counting to four and my counting to three are taking the same period of time.

[clip of *Three Blind Mice* fades in]

BH: Hmm.

[music continues]

AS: [clip continues] Now, polyrhythm [clip cuts out] does get used. You won't hear it in most songs on the radio but it's a nice device and some of the composers have taken this idea of counting to different numbers and they've really gone to an extreme. So in Row Row Row the Boat, there are four different counts running simultaneously by the time you get to the end of the track.

BH: Wow.

AS: And... I would challenge anyone [clip of Row Row Row the Boat fades in] to figure out what those counts are. They're whole numbers... [clip continues] but... yeah... it's good fun.

[clip continues]

AS: [clip continues and fades out] Row Row Row The Boat was by 8-bit Music Theory. London's Burning, taking this idea of perhaps different parts, different instruments that are all playing the same tune but counting at different rates. So London's Burning uses a very very old technique called mensuration canon. Mensuration canon was a very popular in the 15th and 16th century and what composers like to do with it was kind of show off their mathematical prowess by following some very strict rules and then creating music that sounded nice. [pause] Can I explain what the rules are in mensuration canon?

BH: You can try. [laughs]

AS: I can try. So... in... I'll simplify it, in London's Burning, which is a great example for this, there are basically three different lengths of note, there are short notes, there are long notes, and there are very long notes.

[clip of London's Burning plays and cuts out]

AS: Now, the long notes are twice as long as the short ones, and the very long notes are four times as long as the short notes. And that's the way that London's Burning would normally be played, in a ratio of one to two to four. In the version that's on *Tuplets for Toddlers*, we've got four different instruments and they're all playing London's Burning but the ratio of the note lengths is different for each instrument.

BH: Right.

AS: Can I tell you what the ratios are?

BH: Go ahead.

AS: This one has been arranged by Sam Shackleton, and what he's got is the clarinet playing the normal tune in a ratio of one to two to four, then he's got an oboe playing in one to two to six. He's got a flute playing one to three to six and a bassoon playing one to three to nine. Now, not all of the instruments start together but what Sam Shackleton has managed to do is to kind of stagger their start time so that the finished piece sounds quite pleasant.

[clip fades back in]

AS: [clips fades out] I will admit that if Sam had not sent me... a three page document explaining what he'd done, I would never...

BH: [laughs]

AS: ...I can't listen to it and think, oh yeah there's a ratio of one to three to nine.

BH: Yeah.

AS: But it's in there and it's very, I think it's very clever.

BH: I was hoping you were gonna drop the Golden Ratio on me there, or something like that, or pi.

AS: Well, some composers have taken this idea of playing the same melody at different speeds and they've taken the idea and run, really as far as possible, so there's a composer called Conlon Nancarrow who liked to incorporate some irrational ratios in his music, so for example he's got a piano piece where it's the same melody but the ratio at which these melodies are played is e to pi.

BH: You... that's just making my brain melt, so...

AS: Yeah, so... if you're looking for the most complicated rhythmic concept on the album, [clip of Ants Go Marching fades in] look no further than Ants Go Marching which Adam Neely has arranged. [clip continues] What he has done is to take all of the ideas that we've looked at and [clip fades out] kind of blend many of them together and created something of a monster.

BH: Right. [chuckles]

AS: There's no way that I could ever perform this, and, if I'm honest, when I listen to it, I'm not sure that I can follow all of the stuff that's happening.

[clip continues and cuts out]

AS: So the song starts out at... seventy-eight beats per minute, but straight away there's something a little bit off because rather than subdividing the beat into four, which might be quite normal, Adam Neely has subdivided it into seven, then, what he starts to do is accentuate every sixth tuplet... [pauses] so they become slightly... slightly stronger and what we now get an increase in

speed by a very specific ratio of seven-sixths. So for verse two it's now slightly faster by a factor of seven over six, but not content with that, Adam Neely has also changed the tuplet division to quintuplets, then every fourth quintuplet starts to be accented and it becomes the new pulse, the new beat, and we modulate into a new tempo, we've increased the speed again but this time by a factor of five-quarters, but he's also changed the tuplet division, now the beats are going to have four subdivisions in them.

BH: Nursery rhymes are supposed to be simple, Alan.

AS: I know! I know. I know, it's crazy. Then... as his final flourish he's got every beat subdivided into four and what he does is to take one of those subdivisions, increase it's length by fifty percent and allow that to become the new count, so we get another tempo increase, but this time by a factor of four-thirds, but not satisfied with just sampling increasing the tempo, we also change the subdivision into triplets.

[clip of Ants Go Marching plays and ends]

AS: Obviously we've been talking about these different ways of counting and subdividing time and so the track that's been submitted by Jessica Kion doesn't have any counting.

BH: What do you do then?

AS: Well... you should listen to it! There's no... there's no underlying pulse at all and if you try to impose some kind of regular count on it, you'll never succeed.

BH: Like a prime number.

AS: Just like... I wrote that down in my notes, Brady, it cannot be subdivided

into equal units. [clip of Ring a Ring o' Roses cuts in]

[clip continues]

AS: [clip continues] What I think is interesting about this concept [music cuts out] in music is called free-time, is it can be very very difficult to perform because musicians are trained to play along with a pulse, and when you take that pulse away, what do you have to cling on to?

BH: But also does that make it hard to enjoy because, isn't our enjoyment of music, our subconsciously enjoying patterns, and if you take away all the patterns are you taking away some of the enjoyment of music?

AS: Yeah, music is patterns modified by humanity, um... no you're right, you're right. I think that's a great question about can it be enjoyed if it doesn't have that underlying pattern. I would say yes, because it does still have melody, and it sounds very pleasant. [clip cuts back in]

BH: [clip cuts out] What do you want people to do? What should people do if they're intrigued by this, and how could they not be? Presumably you want them to go and buy this thing or download it or listen to it or what's the call to action here?

AS: It would be fantastic if people went to have a listen on Spotify or wherever they want to listen.

BH: Yeah.

AS: And if they want to buy it, then all of the money from purchases is going to go to Save the Children.

BH: Amazing. I will include links in the notes for this podcast for people to go

and click on and do that or you can search out Tuptets for Toddlers. Amazing, what next? Are you already working on the second album?

AS: [laughs] Uh... well... [laughs] I've just started back at college...

BH: Ahh...

AS: ...after a long summer holiday so I don't think I'm gonna be doing much music for a while.

BH: Back to the classroom.

[clip of Three Blind Mice plays]

BH: That's all for today but I really encourage you to check out Tuptets for Toddlers, you'll see links in all the usual places. [clip continues] Also thanks to all the composers and musicians who've been part of the project, many of whom, you've heard featured today. This album is a fascinating listen for old and young alike and your downloads and listens are a nice way to encourage to musicians involved and remember all the money raised is going to Save the Children. [clip continues] I'm Brady Haran, and you've been listening to the Numberphile Podcast.

[clip continues and fades out]