Webinar Summary: Modern Human Society as seen by Primatologists

Dr Yamagiwa's talk:

I have studied gorillas in Africa for more than 40 years. I would like to give an overview of human social evolution from the perspective of gorillas and explore our future path after Covid-19. We have suffered from COVID-19 this year. We still do not have effective treatments or vaccines at present, and we have to socially distance and wear masks, to avoid the risk of infection. Given the increase in new infectious diseases in recent decades, including AIDS, Ebola Haemorrhagic Fever (EHF), SARS, MERS, Zika and others, how has COVID-19 managed to create such disruption? Furthermore, even when this virus is quelled, it's doubtful that we'll easily be able to return to the way things were before. Along with the formulation of a robust plan to combat infectious diseases, consideration must be made as soon as possible for what a new economic order, new international relations and new lifestyles will look like.

Now we realize that the Earth is not our property but the planet of microorganisms and viruses. Many viral genes are integrated in wild animals. Recent population growth and globalism, combined with ecosystem destruction due to human activity and climate change, are the main causes of this pandemic. If no effective treatment or vaccine were being developed, the only precautions we could take would be to avoid gatherings, unventilated rooms, and close contact. But these conditions constitute basic human life, and their avoidance will have a negative social and economic impact on our daily activities.

First from an evolutionary viewpoint, our brains have grown larger as social groups increased in size, a process facilitated by communication and close contact with others. The human brain is three times as large as a gorilla's. I suspect many of you believe that high intelligence created by language is the main cause of brain enlargement. But this is not true.

Looking at the order in which unique human characteristics appeared over the course of 7 million years of human evolution, the human brain began to grow 2 million years ago, and reached the size of the modern human brain 400,000 years ago. In contrast, languages first appeared only 70,000 years ago. Robin Dunbar, a British anthropologist, found a positive correlation in non-human primates between the neocortex ratio and average group size. It means that their brains grew as the number of peers increased, that is, in response to increasing social complexity. The human brain may have followed this trend.

Based on this hypothesis, the average group size of ancient humans was 30 at the beginning of enlargement and grew to 150 by the time the brain reached its current size. Interestingly, the average community size of modern-day hunter-gatherers is 150. As a result, we can estimate that modern humans lived as groups of 150 people until the beginning of agriculture 12,000 years ago. So what kind of communication caused the growth in human brain size before the advent of language? Humans are phylogenetically grouped as Hominidae with great apes, orangutans, gorillas and chimpanzees.

Among the great apes, I learned the answer from gorillas. In contrast with monkeys, who usually avoid prolonged eye contact, gorillas often stare at each other in close proximity. Chimpanzees act in a similar manner in in various social contexts. Humans have face-to-face contact as often as gorillas and chimpanzees, but we usually keep our distance. Why? I think many of you believe that we do this for conversation.

The real reason is that we read others' feelings by the movement of their eyes. The figure shows the eyes of monkeys on the left, and eyes of apes on the right. You can see the distinct difference of ours from both monkeys and apes, that is, the presence of the white part in the human eye. Thanks to this, we can read the feelings of another person from minute movements of the eyes. Because apes do not have this white part, only humans evolved this feature, probably far before the emergence of language. Face-to-face interactions by reading eye movements may have increased our capacity for empathy and sympathy.

Why and how did our human ancestors develop empathic abilities? I think that it was fostered by food sharing and communal breeding. This phylogenetic tree based on 68 species represents all the major taxonomic groups of primates. The presence of food sharing with offspring, left column, and food sharing among adults, right column, are marked in black, while its absence is marked in white. Two distinct trends can be seen here. First, food sharing among adults is only observed in species where food is shared with offspring. Secondly, food sharing among adults is observed in particular branches of the phylogenetic tree, such as great apes and small New World monkeys. Great apes are characterised by slow growth, and small New World monkeys have twin or triplet infants with communal care. This suggests that the heavy burden of caring for offspring may promote food sharing.

Gorillas, which I study, are not classified as a food sharing species among adults. This is because previous studies have been mostly based on mountain gorillas, whose diet is highly folivorous, and they do not need to share food. We have conducted research on western lowland gorillas in lowland tropical forests, where they prefer a variety of fruits, and found food sharing among adult gorillas, like chimpanzees.

Food sharing in humans is widespread. It is already expected when an individual collects more food than required for their own consumption. Collected foods are usually brought to camp, shared and eaten with colleagues. We use food as a social tool and for communication. We decorate a feeding place by preparing tables and chairs, various dishes, cups and bottles, tablecloths, and other accessories. We have various customs and table manners according to cultures, but a basic style of food sharing is common across all cultures. It is amazing!

Another feature unique to humans is our life history traits. A comparison of growth among great apes and humans shows four periods in the lifespan of all taxa. The infant period is defined as suckling. Juveniles can eat solid foods as adults. Adult individuals participate in reproduction. Old age may weaken or end reproductive ability. In addition to these, humans have two special periods. First, humans in the child period are already weaned, but they cannot eat solid foods as adults do. Second, adolescents are physically able to reproduce but generally do not do so at their age. Moreover, modern humans have a long lifespan after menopause. Why, how, and when did these human-specific features emerge in human evolutionary history?

When early hominids left forests and started to live in the savanna, they faced high predation pressure. Early weaning stops suckling so mothers can resume ovulation and the inter-birth interval can be reduced. This increased fertility, to supplement increased child mortality. If modern human weaning coincided with the eruption of the first molar in non-human primates, it should have occurred at the age of 5-7 years. In fact, this assumption is far older than the actual weaning age. As a result of early weaning, the human child period - when soft foods need to be provided by adults -emerged in human evolutionary history.

Apparently, our ancestors chose rapid population growth by early weaning, despite its high risks. This feature probably evolved in open land with high predation pressure, as observed in non-human

primates living in savanna or desert regions. It has also co-evolved with encephalization, which is the increase in brain mass as a proportion of an animal's total body mass. Natural selection in humans has favoured not merely the survival but also the intellectual potential of children.

Moreover, it has been suggested that the early shift to adult foods became necessary before a critical period of neurological development. Therefore, early weaning would have been accompanied by innovation in foods and improved security in the savanna. Then, about 2 million years ago when brain size started to increase, somatic growth slowed down to provide more energy for brain growth. Human babies are born with large body fat deposits as insurance for the developing brain.

Such changes required cooperative breeding and pair bonding, while risky environments strengthened kin-based alliances among males. Cooking and control of fire increased digestive ability and expanded dietary repertories. This may have caused a reduction in feeding and digestion time and resulted in increased time for social interactions. The prevalence of food giving and food sharing in adulthood facilitated the development of reciprocity and pro-sociality, which possibly led to the creation of multi-level community structures consisting of families, as observed in modern hunter-gatherer societies.

This social structure might have increased the resilience of the Homo clade to severe conditions in new environments and led them in their first steps out of Africa. Until recent civilization and urbanization, frequent food sharing and communal breeding have contributed to the maintenance of community structure. A long childhood enabled hominids to extend the learning period for complex social interactions, and the recent creation of speech using languages may have enabled hominids to extend their post-reproductive period.

The human population at the beginning of agriculture 12,000 years ago was 5-8 million. Since then, it has increased rapidly, through industrial and information revolutions, reaching almost 8 billion today. However, our brain size has neither increased nor decreased during this time. The communication revolution created a global world by taking knowledge out of the human brain and sharing it with others. It should be noted, however, that only the informatised part of intelligence can be taken out of the brain. The emotional part, which forms our feelings and intuitional decisions, still remains in the brain. This is the critical period for us humans and the earth. If we continue to rely largely on ICT and AI, we will live in a virtual world rather than the real one. We must reconsider the connection between our present lives and the new normal of human life after COVID-19.

Today is an era of anxiety. Safe environments do not fully provide us with peace of mind. Individuals are separated from the community. Self-actualization and self-responsibility are expected of everyone. The world is global, but has no centre, becoming flat and homogeneous. People spend time not on physical connections, but on virtual connections through social media networks.

I am afraid that a digital society constructed by ICT and biotechnology will lead us to large economic, social and biological disparities, and to destruction that exceeds the limit of the earth's capacity. We have learned many lessons from COVID-19. Many social interactions necessary for daily life are constrained, and we are reminded of the importance of unpaid labour practices, such as childcare, laundry, meal preparation, and long-term care. We have found that much of our work can be done at home, and learned that various events, such as sport and concerts, that we had considered as merely leisure, are indispensable to our lives.

In order to construct a new normal after COVID-19, we should expand sharing and the commons. The Internet provides us with a global commons, and we can also regard universal insurance and free tuition as commons. People are starting to move to the countryside to avoid overcrowding and to seek safety and health. However, we cannot live in closed groups. A family must be open and connect with

people. We should use communication appropriate to our group size, in a wise combination of ICT and our own five senses. Finally, we should design a lifestyle that suits the characteristics of the region in which we live.

We are now entering an era of the new nomad, like the way of life of ancient hunter-gatherers. Young people do not prefer lifetime employment but seek a double-track life, changing jobs or having multiple jobs, which will lead to a reduction in property and promote a sharing economy. Labour will shift from making money to finding meaning in life with the unique characteristics of land. These trends will lead us to think locally and act "glocally", instead of "think globally, act locally". We have already built international platforms in locations across the world and have gradually lost the cultures rooted in these areas. Digital transformation has forced us to informatize and homogenize everything, but we must remember that diversity and uniqueness of culture will create innovation. We must not lose cultural diversity and should preserve it at all costs.

Dr Strier's talk:

I am going to talk about what the societies of New World monkeys can tell us about our own. Before I start, I just want to mention that the primates of the Americas represent a third of the world's primates. This is important to keep in mind, because 75% of the world's primates are at some level of threat or facing a declining population, and this is true also of the New World primates. New World primates are divided into five different families representing a huge range of diversity, from the largest muriqui weighing up to 12 kilogrammes, down to the smallest pygmy marmoset at 100 grammes. One of the reasons that New World monkey diversity is so interesting is that they were neglected for many years in the history of primatology. As Dr Yamagiwa said, the apes have always been a strong phylogenetic and behavioral comparative model for humans, and so research focused intensively on them to look at our ancestral evolutionary pathways for behaviour. Research also focused on Old World monkeys such as macaques and baboons because of their ecological parallels as semi-terrestrial monkeys that use the ground in a way that we know our ancestral humans began to do.

It has only been in recent times that New World monkeys and other primates have been increasingly studied. Looking at the history of primatology, in the first 50 years of study only one New World primate, the howler monkey, ranked among the top 10 primates studied. In the last few years, the balance has changed, and although chimpanzees are still the most well-studied primate, now four out of the top ten primates studied are New World primates. This is important because it is far more representative of their relative representation in the primate order. It was mostly in the 1980s that field research on New World primates got under way in earnest.

It was known from many field and captive studies that the small group of marmosets and tamarins (known collectively as callitrichids) have very unusual reproductive patterns: a family focus with a very fast life history, with the production of twins up to twice a year. This necessitates high levels of alloparental care, with help from fathers and other group members, and a degree of reproductive competition, which enables a single breeding pair to produce all the offspring in a group with the other group members acting as helpers. It is very common among this group of primates to see males carrying infants, with females usually only carrying the infants when it is time to suckle, as well as strongly-bonded family groups which are associated with one another with quite variable patterns for long-term dispersal.

Howler monkeys, which have been studied in many locations, live in very diverse kinds of social groups ranging from single male to multi-male groups with bi-sexual or sex-biased dispersal. Further, much

of this variation corresponded with demography and ecological patterns. This proved to be very valuable when populations and societies took only a few years to reconfigure after a devastating yellow fever outbreak killed 90% of the population in southeastern Brazil.

With the shift in the 1980s to looking at broader comparisons across primates, I was led to study the northern muriqui, and my following talk will partially be about what the primate world looks like through the eyes of a muriqui. One key factor is that female dispersal is actually quite common across primates. In many primate species, both apes and New World primates, females leave their natal groups to reproduce in unfamiliar groups. In these societies (and this is true for chimpanzees, bonobos, muriquis, spider monkeys, and so on) the males stay in their natal groups in patrilineal societies for the duration of their lives. This bias of male kinship in dispersal patterns has important implications for kinship systems. It had previously been thought that matrilineal societies with male-biased dispersal were concentrated in more genetically distant species such as macaques and baboons, while chimpanzees in patrilineal societies with female-biased dispersal were thought to be different, and more similar to humans. However, as primates across the order were studied, it became clear that there was much more variation than previously realised, and that patterns of both female-biased dispersal with no patrilines, and bi-sexual dispersal where kin bonds are weak (except among parents and their offspring), are more common across the primates. This has important implications for how primate social organisation (and our own social organisation) might evolve, with implications for our social relationships and mating patterns. It also has implications at a practical level for how we engage in management and conservation, through the process of housing animals or translocation.

Muriquis also brought to light another interesting phenomenon, which led to reconsideration of other primates: not all their sociality was mediated antagonistically. In most Old World primates, males and females are sexually dimorphic, while in muriquis, males and females are similar in body size. This allows for peaceful, egalitarian societies without any evidence of hierarchy among related males, or between males and females. In muriqui society males maintain close associations, spending more than 60% of their time in close proximity to one another, with many friends. In addition to males and females being similar in body size, they are also similar in canine size which gives females a rare advantage because they cannot be harassed or intimidated by the males' mouths, unlike most other species. This physical equality leads to a great deal of tolerance while meeting with a very low reproductive skew, the lowest reproductive skew in any primate societies that have so far been studied. Altogether, theirs are peaceful societies, with their egalitarian social organisation and promiscuous behaviours leading to the nickname of 'hippie monkeys'.

It is also important to note that these factors are interrelated: the high levels of tolerance among males may be promoted by the lifelong maternal investment that mothers have in all their sons, which in turn contributes to their very long lifespans. In fact, muriquis have one of the slowest life histories among any non-ape primates, with their life histories closer to apes than other monkeys. Females leave their natal group at six years of age, prior to the onset of puberty; they give birth to their first infant at age nine, which is comparatively old for a monkey; their subsequent birth intervals are roughly three years, and in the intervening years the mothers are taking close, extended maternal care of their offspring. During these years of contact with their mothers, the infants have much exposure to their mothers' social networks, learning the social dynamics of the group and social conventions, alongside practical skills and knowledge about what to eat.

They also have exposure to maternal siblings, and this is the beginning of the opportunities for extended family structures. Because males stay in their natal groups for their entire lives, sons and their mothers are together for life. Males are also with their fathers for life, but it is not currently known if they recognise them as fathers. The lifelong overlap also means that although females leave

their natal groups, if they return, then males may be exposed to their grandmothers and great grandmothers, but again it is not known if they recognise them. This dynamic between strong sociality and slow life histories provides the means for the transmission and maintenance of local traditions across generations. For primates, as for humans, this is incredibly important, as the interaction across generations buffers them against selective events which occur at intervals that are greater than their lifespans, without having to learn how to respond to these events from scratch every time. This can be seen in the well-documented tool use of bearded capuchin monkeys, where (like other primates that use tools, such as chimpanzees) young animals observe closely what their parents and other group members are doing. We also see information transmitted across generations, especially about the presence of valuable resources, such as the last remaining water sources during an extended drought, to which the older animals are able to lead the group.

Over the years, researchers have seen significant behavioural variability and flexibility, a phenomenon which characterises all primates, but is particularly notable in New World monkeys. With muriquis, when a particular group doubled in size, their entire pattern of interaction, shifted from one in which they lived in cohesive groups, to fission and fusion societies. When the group doubled again in size over time, more vertical use of space became apparent and the muriquis began to come down to the ground. This makes sense as a response to the limits of their habitat: like many primates, muriquis live in forest fragments with limited space, so while the population grows, the habitat remains the same. Therefore they have to use more three-dimensional space, using the ground to cross barren areas of the forest and coming down to the ground to feed. While all other sympatric primates occasionally use the ground to feed, the muriquis took it to a new level where they were walking bipedally and carrying food, and even starting to spend time on the ground merely relaxing – this is non-essential ground use. This use of forest fragments and anthropogenic landscapes is very important within the history of New World primate field research, and in fact fragmentation has been mentioned three times more often in primate research on the New World than elsewhere since 1942.

Primates have had much exposure to and experience of anthropogenic disturbances, and have manifested many adaptions as a response to these disturbances. This is important, because they need to be able to use disturbed habitats, which are a great constraint and threat. However, they have also learned how to colonise naturally regenerating habitats, and one encouraging sign for the future is how much regeneration can occur naturally in lands cleared for pasture that has been left to regrow (as long as there is still forest nearby). In muriquis and other primates, we can see behavioural patterns that show great flexibility, with facultative changes in response to local pathological or demographic conditions - for instance the grouping patterns and use of vertical space for the muriquis. At the same time, they have also displayed behavioural patterns that are very stable and resistant to change, such as female dispersal and the maintenance of a peaceful and egalitarian society despite the fact that their population was at one point seven times larger than it was forty years ago.

These patterns of flexibility and resilience have been seen among all species of primates that have been studied. What New World monkey societies teach us is that behavioural diversity is much greater that was previously thought: the more studies that are done, the clearer it becomes that behavioural flexibility and cooperation are common across the primate order, and primates are highly adaptive in almost every consideration of almost every context; this is something that we humans should take to heart. Further, they teach us that peaceful societies can persist over time and under extreme conditions. Muriquis are considered to be critically endangered, with only about a thousand left in the wild, and yet despite all the challenges they face, their peaceful societies have persisted. Peacefulness, persistence, and resilience: these are the things that I think New World primates have taught us. In this world of the Anthropocene, with so much widespread change, we need all the help we can get.

Therefore, we need to think about how we are going to protect these primates and continue to learn from then.

Conversation between Dr Yamagiwa & Dr Strier

Dr Yamagiwa: It is very interesting to compare African rainforests and South American rainforests. As Dr Strier pointed out, chimpanzees and muriquis have very similar features, including social dynamics, fission, fusion, and female dispersal. One historic difference between them is that primates in African forests (including chimpanzees, baboons,
and gorillas) usually move on the ground, while in Amazonian forests almost all primate species are arboreal, which means that they move in the trees. However, with the current state of the habitat, with the recent destruction of the much of the rainforest, they have adapted to descend to the ground to move. What has happened to them? Has this led to any change in their social structure, behaviour, or relationships between individuals?

Dr Strier: It is not as though they had never used the ground before – they would always come down to drink and then would immediately run back up, and sometimes they would have to cross the forest floor when there were gaps in the canopy. But we were fortunate to catch the transition to them coming down more than usual, for longer periods, non-essential activities, and rest. We think it was stimulated by demographic pressure, and they were increasingly coming down to the ground to eat. At the same time we saw a rise in mortality, which is probably due to the muriquis being vulnerable to predators on the forest floor, as evidenced by a rise in muriqui remains in resident feline scat (faeces), including from jaguars and pumas. In addition to predators, there is also greater danger from pathologies, parasites, and disease vectors.
However, it did lead to very interesting social behaviour. In the three-dimensional arboreal environment, the number of animals who can interact with each other is limited by space and the strength of branches. On the ground, animals are not constrained by space in the same way, and so I had expected them to form larger groups and sub-groups, although this did not exactly end up happening. In fact what happened was that the transmission of this new behaviour followed social network lines: the males would come to the ground first, and then the females would follow if the males were there. Using camera traps to identify their behaviour in the absence of humans nearby, we discovered that when there were no humans the muriquis would stand up, hug each other, and walk around bipedally, while remaining very vigilant. What is interesting is that while New World primates' bodies are so well adapted for arboreal life, they are able to stand with full leg extension, unlike chimpanzees, thanks to a flexible lumbar region necessitated by the prehensile tail. This raises fascinating anatomical, functional, and morphological questions around the fact that muriquis are seemingly able to walk bipedally with more efficiency and ease than chimpanzees.

Dr Yamagiwa: That 'gender equality' between males and females is surprising; it's such an equal interaction. With chimpanzees, males are always dominant over females. Why haven't the muriquis developed male dominance in the same way?

Dr Strier: Some of it is the similarity in body size and canine size as discussed earlier, which may (although this is just speculation) have evolved because of life in the trees, similarly to gibbons which are also monomorphic in body size and canine size, and have very similar forms of locomotion. The need for rapid energetic locomotion may have limited the ability of males to increase their body size due to selection pressure, while the social dynamics of female dispersal and male philopatry may inhibit some of the inter-male competition, compounded with the inability to assert physical dominance over females. In this respect, muriquis might be more similar to bonobos than chimpanzees, as although male bonobos are dominant over females, the role of mothers in influencing their sons is huge. We see this in muriquis as well, where mothers live long lives in proximity to their sons and achieve success not only through their own reproduction, but also by helping their sons and contributing to the maintenance of peaceful relationships among their sons and grandsons.
With gorillas, which also have strong family groups in which they live for extended periods of time, do these multi-generational interactions also occur?

Dr Yamagiwa: Well, gorillas have two types of social structure: in one, the sons all disperse from the natal groups, while in the other, males remain in their natal group to cooperate with their father and brothers, which is similar to the muriquis. It depends on the environment and the situation; infanticide can accelerate the move to multi-male groups, as females will choose multi-male groups for the sake of their security. Thus environmental factors can influence the formation of the two types of groups.

Dr Strier: In fact, they show just as much variability as the New World monkeys that I was talking about. Could you speculate about what gorillas' social behaviour would be like if males and females were the same size?

Dr Yamagiwa: I think things would still depend on female choice. Irrespective of male dominance, there is female dispersal in gorillas, chimpanzees, muriquis, spider monkeys and so on. These are all similar. Sexual dimorphism perhaps came about from an evolutionary perspective through the choices of females – female muriquis chose equal size males, while female gorillas chose bigger males who were more able to defend themselves. Why is there female dispersal in these species? It leads to great risk for the females, who have to reproduce and raise their offspring without help from their kin-related family groups. In the new group that they have moved to, there are no mothers or sisters to help them, and so they must depend on help from the unrelated males.

Dr Strier: Muriquis depend on their ability to make friends with the other females in the new group through playing with each other's infants and becoming tolerated by and integrated into the group that way. Then the young adult males become interested in them for mating, and so they become tolerated by the males as well. I think this is a difference from gorillas, in whose societies the females are highly dependent on males, while female muriquis are not dependent on the males. Another factor is that female muriquis do not always choose the biggest and strongest males to mate with. Muriquis have very strong seasonal reproduction patterns, so the females care more about getting pregnant than who they get pregnant with, which increases their promiscuity. It would make sense that males

with better traits for fertilising the females would be selected for mating, but despite much study into this issue, no evidence has been found for it.
I also think it is a good idea to come back to the point you made about thinking locally and acting globally. Humans have done so much damage to the natural world, and so many species of primates are endangered. My case study subjects, the muriquis, are living in environments that are very different from the ones they evolved in. So, we often do not know (and this is true for most primates) whether we are looking at primates that are in altered habitats, and so what we are witnessing may be the ways that a certain species adapts to living in altered habitats, which may be different from their evolutionarily selected behaviour. Also, the problem is not just habitat loss but also demographic issues. For instance, a certain species of monkey might be living in beautiful, pristine jungle, but due to extensive hunting or zoonotic diseases, the society is operating with very different demographics from what would have occurred in their evolutionary history. In this sense also we might not be looking at a representative picture of the evolutionarily selected behaviour. This is one of the most challenging and interesting questions in primatology today. When we think about looking at primates as models for human evolution and human behaviour, we are often guilty of interpreting the primates as if they're static. However, we know they are not static but in fact have been changing and evolving, and that what we're observing today may or may not be these ancestral patterns that we're looking for in ourselves.

Q&A session with audience

Guest: Do you think that the extension of communication from local to global forms, accentuated by the Covid-19 pandemic and increasing online communication during lockdown, constitutes a transition to a new form of human communication?

Dr Yamagiwa: I think that human society is based on three freedoms: moving freely, gathering freely, and conversing freely. During the pandemic, we are not able to move freely or gather freely, and online conversation is possible, but is a fundamentally incomplete form of conversation. In normal times, we are free to engage with a number of different social groups in a day, which stimulates creativity and imagination. With online communication, even with video, we miss much of the communication of body language and gestures. Language itself is an incomplete method of communication, and being physically distant means we are not able to appreciate the context and culture of the person we are speaking to. So, online communication is incomplete and insufficient, and for this reason I do not think we will move all our communication online.

Guest: If there had been a big savanna in South America, would a different type of human have evolved – a New World human?

Dr Strier: Well, it was not just the savanna which created modern humans as we know them. In fact, there were many species of hominids across Africa and Asia at the same time, although ultimately only one survived and evolved into homo sapiens. We know from DNA studies that many of us have Neanderthal genes as well, so we are not pure homo sapiens in many cases. But it is entirely possible that a different

kind of hominid could have evolved, or could even still evolve in the future, in the New World.

Guest: Human society seems to become ever more competitive and busy, and there is not much sign of it developing into a peaceful and sharing 'hippie-like' society. Do you think we can really learn from the muriquis?

Dr Strier: I think we should learn as much as we can from primates, not just about the fact that they are peaceful but also the particulars of how they resolve conflict, and how they avoid conflict and competition, and I think we can learn from the way that they avoid interactions before they escalate, how they find alternative modes of attaining resources in times of overpopulation or resource scarcity. I think as humans we should use every model we can find to make our own lives better, and perhaps one benefit of the pandemic is that we have had more time to be self-reflective about the ways we interact with one another, so perhaps we will emerge as better people.

Guest: Is there any evidence of music in primate societies?

Dr Yamagiwa: Music stems from dancing, which is a way to synchronise with others in order to increase empathy and sympathy. Going on from that, music provides feeling, and language provides meaning. Gorillas beat their chests simultaneously with other, and perhaps that is a kind of dancing, as is playing. So although they are not making music, they are doing something akin to dancing, which is a possible precursor to music.

Dr Strier: Muriquis have a form of social movement where they hang by their tails in the trees and form large groups of hugging embraces, while making a chuckling sound together. When you watch eight or ten males all doing this together you feel happy and peaceful. I have always previously called this behaviour "embrace with chuckle," and I had never thought of it as dancing. But perhaps, for the muriquis, it is music and dance – they are singing and dancing. It's a great idea.