HOPE-GM REPORT

Primate Origins of Human Evolution: From Genes to Mind

Japan Society for the Promotion of Science (JSPS)

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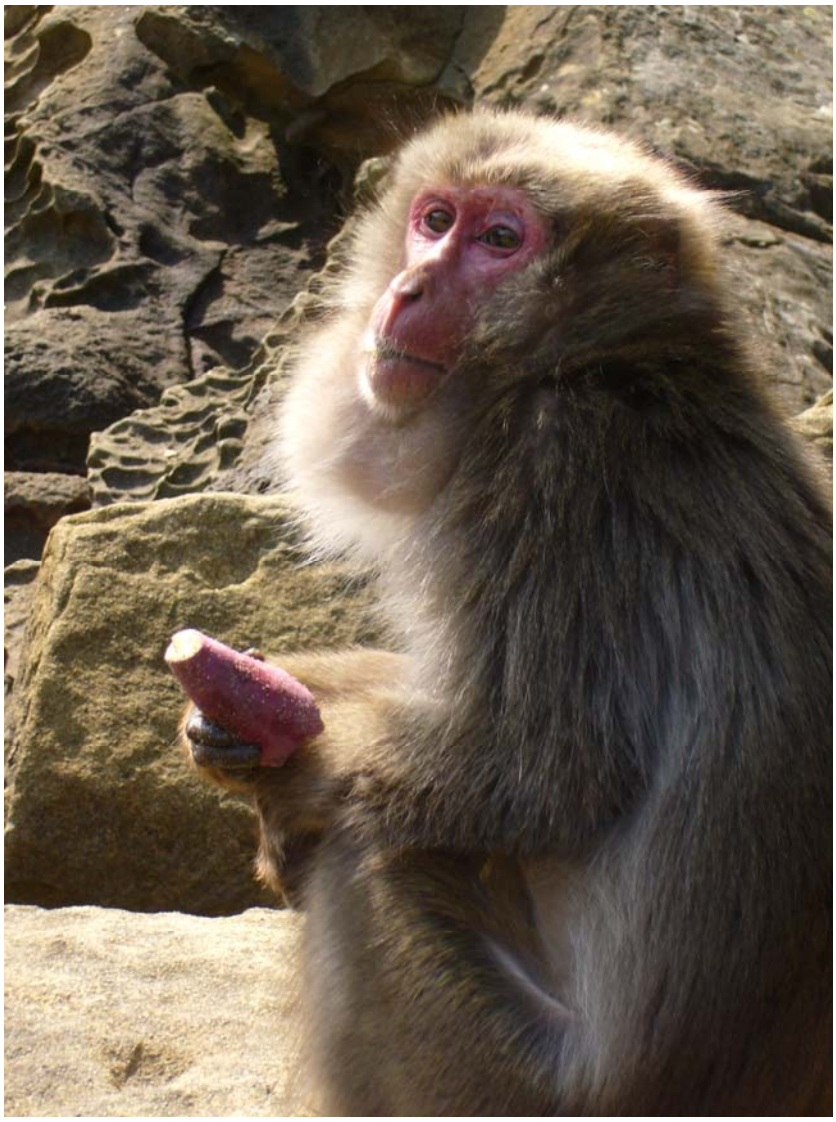

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INTRODUCTION

The “Primate Origins of Human Evolution: From Genes to Mind” (HOPE-GM) , is a program funded by the Japan Society for the Promotion of science (JSPS) that promotes international collaboration to explore human evolutionary origins through a multidisciplinary approach. Within this frame Prof. Tetsuro Matsuzawa, director of the Primate Research Institute (PRI, University of Kyoto, Japan), invited 3 senior researchers and 7 junior scholars from foreign countries to spend 3 months in Japan, based at the Centre for International Collaboration of Advanced Studies in Primatology (CICASP). The HOPE-GM guests enjoyed and hopefully contributed to create a stimulating scientific environment that resulted in knowledge gain, exchange of ideas and fruitful collaborations that hopefully will continue in the future.

ACTIVITIES UNDERTAKEN

During my three-month stay in Japan most of the time I was based at the CICASP facilities, together with some of the other HOPE-GM guests. From there, we had the opportunity to join all the routine activities held at the PRI and therefore become familiar with the building, the researchers, the chimpanzees and the dynamics of the place. Also, we were shown some of the numerous outdoor facilities for the macaques, which gave us a better picture of the institute as a whole.

Fig 1. View from the Primate Research Institute (PRI)

Routine activities

1. **Psychology Seminars**. These weekly seminars organized by the Department of Behavioral and Brain Sciences were a great opportunity for us to get to know the work done by our Japanese colleagues at the PRI and also to present our own work (see "Oral Presentations"), and provided an excellent context for scientific discussion.

2. **Journal Reading Club**. Also held on a weekly basis, the JRC consisted of the exposition of a scientific paper by one student and the following discussion by all the assistants. It was useful to keep updated with new publications and, especially, to gain insight into the interests of our Japanese colleagues and to engage in interesting debates.

3. **Foreigners Meeting**. Every month Prof. Matsuzawa organized a meeting with all the foreigners present at the institute. The main aim was keeping us informed of all the news related to the PRI, asking us for feedback in some questions related to our stay and providing us with the opportunity to share our experiences as foreigners in Japan. I found in these meetings a beautiful example of Japanese hospitality. Prof. Matsuzawa was dedicating his precious time to show us the PRI better and deeper and to listen to us, and all in a nice atmosphere that facilitated communication not only between Japanese and foreigners but also among foreigners from different programs.

4. **Chimpanzee feeding sessions**. Given my plans to work with the chimpanzees at PRI (see "Research") I often attended the afternoon feeding sessions, in order to learn to distinguish them and to provide them with the opportunity to know me.

5. **Testing sessions**. I was invited to attend several cognitive testing sessions with the chimpanzees. That way I saw the worldwide known numeric memory tests, accompanied (and nicely instructed) by Prof. Matsuzawa; I saw the chimpanzees performing in a decision-making test using touch-screens, with Christopher Martin, and I had the opportunity to watch chimpanzees being tested with an eye-tracker, with Fumihiro Kano. Moreover, I was present the first time that the Japanese team put eye-

tracker glasses on a chimpanzee. I could not understand the discussions of the experts, but the sight of that big room full of books and computers and the testing booth in the middle, the expectation of all the assistants, Prof. Tomonaga sitting inside the booth face-to-face with the chimpanzee, gently placing the glasses on her, and the chimpanzee staying so calm and obeying all the commands will stay forever in my mind. More than science that seemed science-fiction!

Tours around the institute

1. **Tour at the PRI**. Tadatoshi Ogura very kindly showed several of the macaque enclosures to some of us. Furthermore, he gave us time to observe the macaques during feeding from a privileged position that allowed us to compare Japanese and Rhesus macaques living in very similar conditions. I found that very enlightening.

2. **Tour at the Research Resource Station (RRS)**. This time it was Prof. Matsuzawa who showed us the newer facilities for macaque captive breeding situated a bit further from the institute. We were all very impressed by the good quality of the enclosures, and also by the good quality of the home-made noodles that followed, thanks to his generosity!

Fig 2. Visiting the Research Resource Station (RRS)

Fig 3. RRS enclosure

Despite the fact that just being at the institute already provided us with many good opportunities to interact and exchange ideas with our Japanese colleagues, in order to better introduce ourselves and our work the HOPE-GM guests were invited to give oral presentations in several scientific events. Personally I found that very enriching, because I gained knowledge on my colleagues' work and because I received valuable feedback.

Oral presentations

1. Albiach A. (2010). They bring the food, but do they know how? Causal knowledge of strip-pulling tasks in Great Apes and Corvids. Invited paper, *HOPE-GM Lectures on Primate Mind and Society*, Kyoto, Japan.

2. Albiach A. (2010). The knowledge of object-object physical relations in Great Apes and Corvids. Invited paper, *The Intersection of Comparative Cognitive Science and Field Science*, Nagoya, Japan.

3. Albiach A. (2010). How well do monkeys inhibit themselves? Two experimental case studies. Invited seminar at the PRI, Inuyama, Japan.

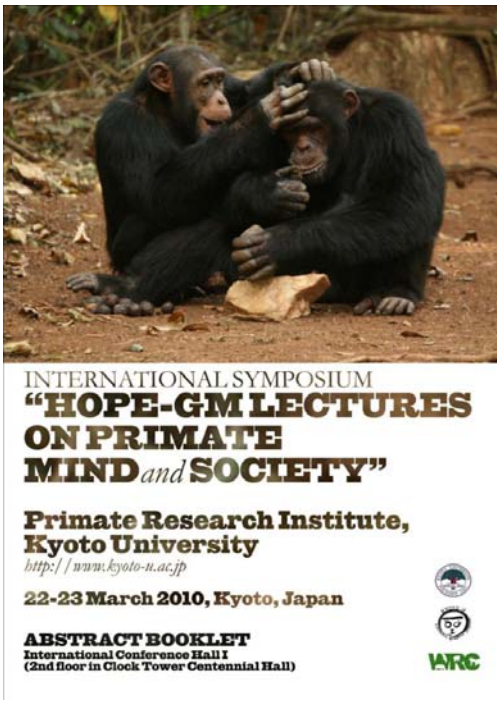

Fig 4. Poster of the HOPE-GM conference

We also had the chance to travel around Japan, in a series of scientific trips with which we gained a global vision of Japanese Primatology and a better knowledge of the work carried in each place. No need to say that those trips were also an excellent opportunity for us to explore the country!

Scientific trips

1. Koshima Island (29th-30th March). Koshima is famous for its macaques washing potatoes, classical example of social learning in any lesson on animal behavior. What I did not know was that this small island was the scenario of the beginning of Japanese Primatology! In 1948, Kinji Imanishi started his studies on the evolution of society with the Koshima macaques, and he used a new style of field research (consisting on individual recognition, habituation and long-term observation) that nowadays is considered the standard method worldwide. I could not wait to see that place! Fumihiro Kano and Yoshiaki Sato were our guides in this trip. On the first day, we arrived at Koshima Field Station (Wildlife Research Center of Kyoto University), situated on the mainland but very close to the islet.

The morning of the second day Fujio Kanchi and Takafumi Suzumura guided us to the dike and conducted us on a boat to the only sand beach of the otherwise rocky island. And then all the macaques (there are 113 in total) came out from everywhere running to the beach! It was the first time for me to see primates in the wild, and I found it mesmerizing. It was very impressive to see how they washed the potatoes and the wheat we brought them. I could have spent the whole day observing them, but the strong wind forced us to leave. While sailing away from the island I thought that I would not mind being shipwrecked there. What a beautiful place!

Fig 5. Koshima Island

Fig 6. Koshima macaques eating sweet potatoes

2. **Toi Peninsula (30th March).** During our stay at Koshima Field Station we had the chance to visit the wild horses at Toi, a peninsula situated close-by. They looked small and furry, and could be observed from very close. I was fascinated by the idea that it was in this same place, but more than 60 years ago, where Kinji Imanishi was observing the horses when a troop of Japanese macaques crossed by, changing the history of Primatology.

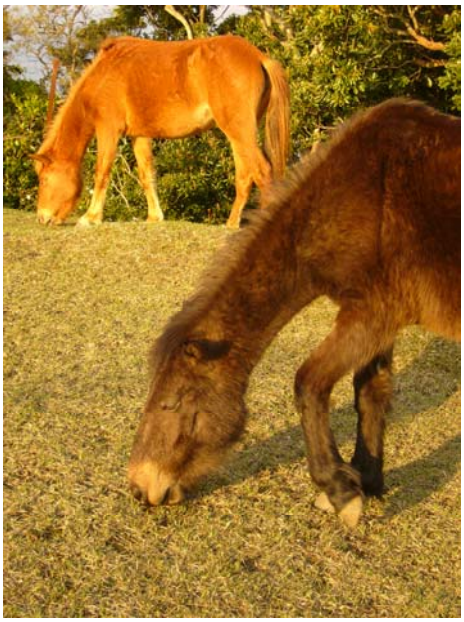

Fig 8. Wild horses in Toi Peninsula

3. **Yakushima Island (31st March-2nd April).** On the 31st March we left Koshima and headed south to Yakushima, a UNESCO World Heritage Site known for its astonishing nature. There we spent two nights in a ryokan with beautiful sights on the sea, where we enjoyed traditional Japanese food, dressed traditional Japanese clothes and relaxed in an onsen. During the day we explored the island looking for macaques. Under the helpful guidance of Yosuke Otani, we found two groups. They were not habituated, so we could not approach too much, but this made it even more exciting. One interesting aspect was that the macaques often moved close to sika deer. We also did a trekking in the Shiratani Unsuikyo, a forest area with ancient cedars, magnificent rhododendrons, winding streams and mossy stones that looked to me as if it was from another world. On that day we also visited a beautiful 80m high waterfall.

Fig 9. Walk at Shiratani Unsuikyo

Fig 10. Sika deer

4. **Great Ape Research Institute, GARI (6th-8th April)**. Tadatoshi Ogura and Yumi Yamanashi accompanied us in the visit to this institute situated in Okayama prefecture. Dr. Satoshi Hirata and his colleagues gave us a warm welcome and showed us around. We even entered the chimpanzee outside enclosures and went up on their climbing structures!!! We witnessed touch-screen testing carried by Dr. Shinya Yamamoto and Sana Inoue in the outdoor enclosure, and face-to-face testing carried by Dr. Hirata and some colleagues in the inside enclosure. This was very impressive and so different from the Western style!

Fig 11. GARI outdoor enclosures

Fig 12. Dr. Hirata testing a chimp

5. **Chimpanzee Sanctuary Uto, CSU (9th-10th April)**. Right after the visit to GARI we visited this old Pharmaceutical laboratory in Kumamoto. Recently converted in a chimpanzee sanctuary, it holds the chimpanzees that were previously used for invasive research. I was shocked by the big impact this kind of research had on the chimpanzees but also by the huge efforts that are done at CSU to rehabilitate them.

6. **Amakusa dolphin watching (10th April)**. During our trip to GARI and CSU we found time to go dolphin watching in Amakusa, also in Kumamoto prefecture. We still do not know if the hand clapping that our Japanese guide recommended us to attract the dolphins worked, but soon after we left the shore the water seemed to boil around us! 300 dolphins inhabit this big bay, taking profit of the waste thrown into the sea by the fishermen. It was very interesting to observe them from so close.

Fig 13. Chimpanzee at CSU

Fig 14. Dolphins in Amakusa

But I did not go to Japan just to see! I was given the chance to do some research, and I took it. The first thing was obtaining the Certificate of Husbandry and Experiments on Primates, and for that I had to do an exam. After that I could start testing. In these three months in Japan I carried one study with Japanese macaques and started another one with chimpanzees.

Fig 15. Certificate of Husbandry and Experiments on Primates

Research

1. **Study 1: Inhibitory control in Japanese macaques**.

In a previous study on inhibitory control in Mangabeys (*Cercocebus torquatus*) we showed that Mangabeys were able to solve the Reverse Contingency Task (RCT) in its original version and that their performance was intermediate between that of Great Apes and Rhesus macaques, in terms of the number of sessions needed to solve it (see Albiach-Serrano et al. in Anim Cogn 10:387-395, 2007). Our data showed high individual variability but, unfortunately, as happened in other studies, we were unable to conclude anything about the possible explanation for that variation, due to our small sample size. My stay in Japan seemed a perfect opportunity to further explore inhibitory control in monkeys, given the availability of big groups of macaques.

Phase I. I bought the materials, built the apparatuses and prepared the datasheets at the PRI. Then I spent one week at the RRS habituating a group of 20 macaques to the apparatus and the interaction with the experimenter, the keeper Naoko Suda. The macaques responded very well and we were ready to start testing but finally we had to abandon our plans,

due to bureaucratic problems and time restrictions. In any case, the experience served me to test the adequacy of the materials, to have a better idea of what to expect in the next phase of our study and to learn from Ms Suda how to behave with the macaques.

Phase II. I bought more materials and built another set of apparatuses at the PRI. Then I travelled for a second time to Koshima, accompanied by Yoshiaki Sato. The plan was testing macaques in what would be my first (and maybe only) field experiment! I could not be more excited.

During two weeks (18th May-2nd June) Sato and I stood at Koshima Field Station. Whenever the weather conditions allowed us, we went to the island to test macaques together with Suzumura and often also with Mr Kanchi. The team worked very well: While I was the one carrying the tests, Suzumura gave me incalculable help attracting potential subjects (and keeping the others away) and Sato recorded the testing and gave me support in everything I needed. Finally, our efforts were rewarded: we managed to finish all testing with 20 subjects and therefore fulfilled our most optimistic plans! Also, the results obtained were very interesting and gave some answers to the questions that brought us there. Hopefully they will be published in a close future.

Fig 15. Testing team: Yoshiaki Sato, Anna Albiach-Serrano and Takafumi Suzumura

2. **Study 2: Gravity bias in chimpanzees**.

Tomonaga and colleagues (Tomonaga et al. in Develop Sci 10:411-421, 2007) designed a modified opaque-tubes task where the subjects needed to predict the exit location of an object before it was dropped into one of two opaque crossed tubes. The chimpanzees tested did not solve the task, showing a gravity bias. Albiach-Serrano & Call (in prep., to be presented at the next conference of the International Primatological Society, Kyoto, Japan) used a similar paradigm to explore the reasons why the chimpanzees find this task so difficult. We wanted to build on that work.

Always based at the CICASP, I designed the study (together with Call, Tomonaga and Adachi), I bought some materials and I prepared the experiment, with the indispensable help of Adachi. Once everything ready, we did a pilot study with Japanese students. The results are still being analyzed. The chimpanzee study will come later, and we really hope it will add some light on the nature of the difficulty chimpanzees find in this kind of task.

Although not everything was working, giving talks, attending seminars and doing scientific trips. In our three months in Japan there was also time for leisure. We visited places around Inuyama and also reserved some days to travel around Japan.

<u>Leisure time</u>

We were lucky enough to assist to the famous **Sakura**, the cherry blossoming that brings all the Japanese to the parks to enjoy the beautiful sight of the white trees and the petals falling. Coincident with the Sakura there was the **Inuyama festival**, with the streets full of food stands and the floats with paper lamps moving at the rhythm of the drums. In Inuyama I also visited the **castle**, which is claimed to be the most ancient in Japan, and some of us went down the rapids of the **Nihon Rhine**. With the electric bikes lent to us by the PRI, some of us also explored the surroundings of the city. I especially enjoyed the sunset at the flooded **rice fields**.

Fig 17. Japanese enjoying the Sakura

Fig 18. Inuyama castle

Outside of Inuyama I visited the two most important cities in Japan. **Kyoto** fascinated me with its old taste, its thousands of temples and so many museums and handcraft shops. **Tokyo** was a big surprise. The skyscrapers were higher than I thought, and the view from them was extremely beautiful, but I also found old neighborhoods where the houses were low and the people could walk in the middle of the street because there were no cars. The fish market was also remarkable. In Osaka we enjoyed an exciting **Sumo** championship. In Kumamoto we climbed on the volcano **Aso**. In my last days in Japan I visited a Spanish friend who was staying in **Okinawa** for some months. There we visited the castle and played the tourists dressing up as samurais! We enjoyed a lot, but the time was over.

Fig 19. Temple in Kyoto

Fig 20. Tokyo at night

ACKNOWLEDGEMENTS

First of all, I want to give special thanks to Prof. Matsuzawa for his invitation to go to Japan, for his care and efforts so that we could enjoy our stay, for the time he dedicated to us and for the wisdom he shared. I also want to thank Prof. Tomonaga, my tutor during this time, for making it possible for me to carry my research projects and for his help during the design and the preparation of the experiments. To Dr. Adachi I need to acknowledge so many things! Inside and outside the office he made my days better, and that I will never forget. Mami Shikuwa helped in every detail of my stay in Japan, thank you for that.

I am deeply grateful to Fujio Kanchi, Yoshiaki Sato and Takafumi Suzumura for all their help with my work in Koshima. Without them I would have never completed my study. But my gratitude goes far beyond work. Suzumura and Sato not only put all their efforts in the project but also shared my enthusiasm, and that was very important for me. The presence of Yamato Tsuji and his Masters students Takashi Hayakawa, Tomoko Isomura, Akiho Muramatsu, Anna Sato and Lira Yu during the first days in the Field Station also contributed to make this experience nice and inspiring. Thanks to all of them for the superb cooking and the lively table talks. I would not learn more about Japanese culture reading one hundred books than I did in these two weeks at the Field Station!

Many thanks to Fumihiro Kano and Yoshiaki Sato, Tadatoshi Ogura and Yumi Yamanashi, for being our excellent guides in the trips to Koshima-Yakushima and GARI-CSU. Also, thanks to our hosts Fujio Kanchi, Takafumi Suzumura, Professors Hirata and Yamamoto, Sana Inoue and Dr. Morimura for their warm welcome and their dedication. Besides travelling with us, Tadatoshi Ogura examined me for the Certificate of Husbandry and Experiments on Primates and showed me the macaque facilities at the PRI, I thank him for this. I am also very grateful to Fumihiro Kano and Chris Martin for allowing me to observe their experiments, with which I learnt a lot, and to Naoko Suda, for her help and nice company at the RRS. Thanks to Susana Carvalho, Misato Hayashi, Kim Hockings, Tetsuro Matsuzawa and Masaki Tomonaga for organizing the HOPE-GM conference in Kyoto, and to

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Finally, I would like to thank the HOPE-GM senior researchers William McGrew and Frans de Waal (unfortunately I did not meet Svante Pääbo during my stay in Japan) for their interesting presentations, the feedback and the support I received. And to my HOPE-GM junior colleagues Paco Bertolani, Susana Carvalho, Kim Hockings, Kat Koops, Sonja Koski and Malini Suchak… my biggest thanks for being the best company in these amazing three months! I just hope our hosts enjoyed at least half as much as we did.

Fig 21. Eating Spanish tortilla with chopsticks

Fig 22. Waiting for the food at a farewell dinner