MATSUZAWA AFFIDAVIT

STATE OF NEW YORK
SUPREME COURT COUNTY OF SUFFOLK

In the Matter of a Proceeding under Article 70 of the CPLR for a Writ of Habeas Corpus,

THE NONHUMAN RIGHTS PROJECT, INC., on behalf of HERCULES and LEO,

Petitioners,

v.

SAMUEL L. STANLEY JR., M.D., as President of State University of New York at Stony Brook a/k/a Stony Brook University and STATE UNIVERSITY OF NEW YORK AT STONY BROOK a/k/a STONY BROOK UNIVERSITY,

Respondents.

AFFIDAVIT OF TETSURO MATSUZAWA

Index No.:

COUNTRY OF INDIA)
)
STATE OF MAHARASHTRA) ss:
)
CITY OF PUNE)

Tetsuro Matsuzawa being duly sworn, deposes and says:

Introduction and Qualifications

1. My name is Tetsuro Matsuzawa. I reside and work in Kyoto, Japan. I was awarded a Ph.D. in Science from Kyoto University in 1986.

2. I submit this affidavit in support of Petitioners The Nonhuman Rights Project, Inc. ("NhRP"), on behalf of Hercules and Leo, for a writ of habeas corpus. I am a non-party to this proceeding.

3. I am currently a Full Professor of Language and Intelligence at Kyoto University and was the Director of the Primate Research Institute of Kyoto University in 2006-2012. I am

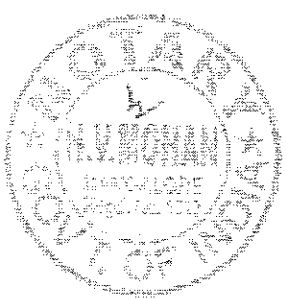
Primatology at Kyoto University, which promotes scientific research across disciplines and collaborators.

4. I am currently President of the *International Primatological Society*. I sit on the editorial board of *The Royal Society, Philosophical Transactions B*, and am the Chair of the Scientific Program for the 2016 *International Congress of Psychology*. I am the recipient of several professional honors including the Prince Chichibu Memorial Award for Science in 1991 and the Jane Goodall Award in 2001.

5. My specialization is in chimpanzee intelligence both in the wild and in the laboratory. I have studied tool use in wild chimpanzees in West Africa (Bossou-Nimba, Guinea) since 1986 and have been Director of the on-going laboratory study of captive chimpanzees known as the "Ai-project" since 1978. The "Ai-project" focuses upon language-like skills and the understanding of numbers in a female chimpanzee named Ai, her son Ayumu and three generations of chimpanzees constituting one of the longest-running laboratory research projects on chimpanzee intelligence. This combination of field and laboratory studies provides me with a uniquely comprehensive and in-depth view of chimpanzee intelligence.

6. I have written or co-edited 4 books including: *Primate Origins of Human Cognition and Behavior* (2001, Springer), *Cognitive Development in Chimpanzees* (2006, Springer), *The Mind of the Chimpanzee: Ecological and Experimental Perspectives* (2010, University Of Chicago Press), and *The Chimpanzees of Bossou and Nimba* (2011, Springer).

7. I have published 123 peer-reviewed scientific articles on cognition, intelligence, development, and welfare of chimpanzees and other primates in the world's most prominent scientific journals: *Nature*, *Proceedings of the National Academy of Sciences*, *Journal of Comparative Psychology*, *International Journal of Primatology*, *American Journal of*



Primatology, *Current Biology*, *Animal Cognition*, *Animal Behaviour*, *American Journal of Physical Anthropology*, among others. I have also authored and co-authored 17 book chapters. The specific topics I have researched and written about on chimpanzees include: tool-making and use, culture, memory of numerals, facial perception, caregiving, development and maturation, food sharing, handedness, gaze following, and categorization and classification of colors and objects.

8. I have given over 58 invited talks at international venues in countries such as: Austria, China, France, Germany, Korea, Italy, Japan, Mexico, Scotland, Switzerland, the United Kingdom and the United States, among others. I continue to regularly give both local and international presentations at academic conferences, wildlife conservation meetings, and other scientific venues. My Curriculum Vitae fully sets forth my educational background and experience and is annexed hereto as **"Exhibit A"**.

Basis for Opinions

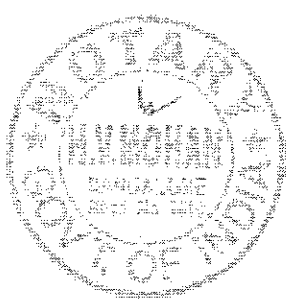
9. The opinions I state in this Affidavit are based on my professional knowledge, education, training, and over 37 years of laboratory research and field work with chimpanzees, as well as my review of peer-reviewed literature about primatology published in the world's most respected journals, periodicals and books that are generally accepted as authoritative in the field of primatology, many of which were written by myself and colleagues with whom I have worked for many years and whose research and field work I am personally familiar with. A full reference list of peer-reviewed literature cited herein is annexed hereto as **"Exhibit B"**.

Opinions

10. As chimpanzees and humans share close to 99% of their DNA, their brains, too, are very similar (Semendeferi and Damasio, 2000). There are a number of shared characteristics in the brain that are relevant to such capacities as self-awareness and autonomy as well as

general intelligence. Both have larger brains than expected for their body size (Armstrong, 1985; Bauchot and Stephan, 1969; Bronson, 1981). This means they both evolved to possess above-average mental abilities compared with other species of the same body size. Both share similar circuits in the brain which are involved in language and communication (Gannon, Holloway, Broadfield, and Braun, 1997; Taglialatela, Russell, Schaeffer, Hopkins, 2008; and see below). Both have evolved large frontal lobes of the brain, which are intimately involved in the capacities for insight and foreplanning (Semendeferi and Damasio, 2000). Both share a number of highly specific cell types which are thought to be involved in higher-order thinking (see below) and chimpanzee and human brains also share a number of important functional characteristics related to sense of self. Finally, both human and chimpanzee brains are similar in terms of how the brain develops and matures, indicating that chimpanzees and humans go through similar cognitive developmental stages.

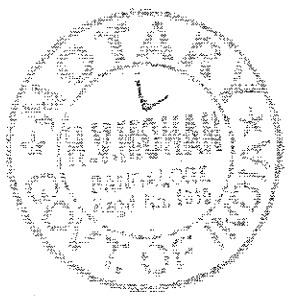
11. Developmental delay (a long protracted period of brain development over many years) is a key feature of human brain evolution and is thought to play a role in the emergence of complex cognitive abilities, such as self-awareness, creativity, foreplanning, working memory, decision making and social interaction. Delayed development of the brain, and specifically the prefrontal cortex, provides a longer period in which this part of the brain may be shaped by experience and learning (Fuster, 2002; Goldberg, 2002). Likewise, chimpanzee brains exhibit a very similar level of developmental delay in the prefrontal cortex, leading to the neuroanatomical basis for such high-level capacities as self-awareness, forethought, decision-making, and working memory in chimpanzees (Sakai et al., 2011; 2010). Consistent with these similar functions in humans and chimpanzees, chimpanzee infants share some common mental features and patterns with human infants (Matsuzawa, 2007). These features include the ways in which



mothers and infants interact and use social smiling and mutual gaze (looking into each other's eyes) as ways of strengthening their bond (Tomonaga et al., 2004) as well as how and when they first start to manipulate objects, which is related to their shared capacity for tool-making and use.

12. One of the hallmarks of sophisticated communication and even language-like capacities is brain asymmetry. In humans the left and right parts of the brain have different shapes which are related to language capacities. Furthermore, these brain asymmetries are correlated with handedness. That is, most humans are right-handed and process language in the left hemisphere. This is referred to as a "population-level right-handedness." Studies of the anatomy of the brain reveal that chimpanzees possess very similar patterns of asymmetry (Cantalupo and Hopkins, 2001; Dadda, Cantalupo and Hopkins, 2006; Gannon, Holloway, Broadfield and Braun, 1997). Furthermore, chimpanzees exhibit population-level right-handedness in captivity (Hopkins et al., 2010) as well as in patterns of tool use in the wild (Humle and Matsuzawa, 2009). These overall findings point to a key similarity in the way chimpanzee and human brains are structured, particularly in ways that are relevant to language and communication.

13. Language is a volitional process in humans that involves creating intentional sounds for the purpose of communication, and is, therefore, a reflection of autonomous thinking and behavior. Findings regarding functional aspects of the chimpanzee brain demonstrate volitional control over their vocalizations as well. Certain sounds are produced by chimpanzees selectively to capture the attention of an inattentive audience (Hopkins et al., 2007). These sounds are produced almost exclusively in the presence of an audience and are, therefore, under volitional control as they serve the purpose of informing others about the presence of various items, such as food or a play object or tool. Not only do chimpanzees create purposeful



vocalizations, like humans, their brain responds differently to their own name than other sounds. In a study of brain wave patterns, one captive chimpanzee, "Mizuki", showed specific brain wave responses to the sound of her own name, suggesting that this response might signify self-relevance in chimpanzees as for humans. Her name may have evoked a specific memory, emotion or mental representation (Ueno et al., 2009).

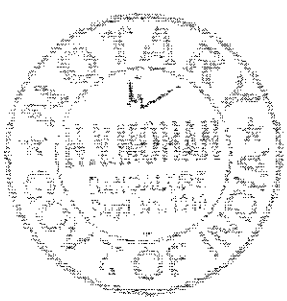
14. Further evidence for the similarity between human and chimpanzee brains comes from the finding that they both possess a specialized type of cell – known as a spindle cell (or von Economo neuron) – in the same area of the brain. This area, known as the anterior cingulate cortex is involved in emotional learning, the processing of complex social information, decision-making, awareness, and, in humans, speech initiation. Therefore, the presence of spindle cells in both chimpanzees (and other great apes) and humans strongly suggest they share a number of these higher-order brain functions (Allman et al., 2011; Hayashi et al., 2001).

15. The concept of self is an integral part of being able to have goals and desires, intentionally act towards those goals, and the ability to understand whether they are satisfied or not. There is abundant and robust evidence that chimpanzee possess a sense of self, as they have repeatedly demonstrated the ability to recognize themselves in mirrors (Gallup, 1970; Povinelli et al., 1993) and show a number of capacities which stem from being self-aware, such as metacognition, that is, the ability to think about and reflect upon one's own thoughts and memories (Beran et al., 2013; Call, 2010; Call and Carpenter, 2001). For instance, when given a task in which the identity of a food item is a critical piece of information needed to obtain a reward, chimpanzees, like humans, first check a container they are unfamiliar with before making their choice. They show efficient information-seeking behavior that strongly suggests they are aware of what they know and do not know (Beran et al., 2013). They, like human

children, also know when they have enough visual information to complete a task (Call and Carpenter, 2001), and, also know that they could be wrong about the information they have and, again like human children, will check if they are uncertain (Call, 2010). All of these abilities are related to self-monitoring and self-reflection in chimpanzees as in humans.

16. The ability to distinguish actions and effects caused by oneself from events occurring in the external environment is called "self-agency" and is a fundamental component of autonomy and purposeful behavior. Chimpanzees are able to distinguish between movement of an object, e.g., a computer cursor, controlled by themselves and motion caused by someone else. These and many other similar findings demonstrate that chimpanzees and humans share the fundamental cognitive processes underlying the sense of being an independent agent (Kaneko and Tomonaga, 2011).

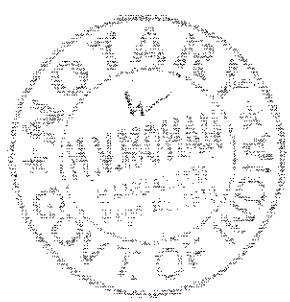
17. Not only do chimpanzees reflect upon their own thoughts and states of knowledge but they understand the mind's and experience of others. For instance, chimpanzees cannot only imitate the actions of others but anticipate the intentions of others when watching a human or another chimpanzee try to complete a task (Myowa-Yamakoshi and Matsuzawa, 2000). Chimpanzees know what others can and cannot see (Hare et al., 2000, 2001). Chimpanzees know when another's behavior is accidental or intentional (Call and Tomasello, 1998; Call et al., 2004). And chimpanzees use their knowledge of others' perceptions tactically to deceive another chimpanzee and obtain hidden food (de Waal, 2005; Hirata and Matsuzawa, 2001). In situations where two chimpanzees are in competition for hidden food they show a number of strategies and counter-strategies to throw each other "off the trail" and obtain the food for themselves (Hirata and Matsuzawa, 2001). This kind of complexity in understanding others' minds is key evidence of being aware of one's own mind and that of others, as chimpanzees clearly are.



18. Finally, chimpanzees who were shown videos of other chimpanzees yawning or just showing open-mouth facial expressions that were not yawns, showed higher levels of yawning in response to the yawn videos but not to the open-mouth displays but not the other (Anderson et al., 2004). These findings are very similar to contagious yawning effects observed in humans, and are thought to be based on the capacity for empathy, the ability to put oneself in another's situation. Contagious yawning in chimpanzees provides even further evidence that they possess very complex levels of self-awareness and empathic abilities.

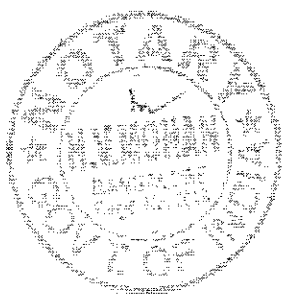
19. Numerosity, the ability to understand numbers as a sequence of quantities, requires not only sophisticated working memory (in order to keep numbers in mind) but also a conceptual understanding of a sequence, which is closely related to mental time travel (thinking about something in the future) and planning out the right sequence of steps towards a goal, two critical components of autonomy. Not only do chimpanzees excel at understanding sequences of numbers but they understand that Arabic symbols ("2", "5", etc.) represent discrete quantities, outperforming humans in some of these tasks (see below).

Sequential learning can be defined as the ability to encode and represent the order of discrete items occurring in a sequence (Conway and Christiansen, 2001). Sequential learning is critical for human speech and language processing, the learning of action sequences, or any task that requires putting items into an ordered sequence. Chimpanzees can count or sum up arrays of real objects or Arabic numerals (Beran et al., 1998; Beran and Rumbaugh, 2001; Boysen and Berntson, 1989; Rumbaugh et al., 1987) and display the concepts of ordinality and transitivity (the logic that if A = B and B = C, then A = C) when engaged in numerical tasks, demonstrating a real understanding of the ordinal nature of numbers (Boysen, Berntson, Shreyer, and Quigley, 1993). Chimpanzees also understand proportions (e.g., 1/2, 3/4, etc.) (Woodruff and Premack,



1981). Chimpanzees are able to learn to name (using a symbol-based computer keyboard) the number, color and type of object shown on the screen (Matsuzawa, 1985). They can use a computer touch screen to count from 0 to 9 in sequence (Inoue and Matsuzawa, 2007; Kawai and Matsuzawa, 2000; Tomonaga and Matsuzawa, 2000). Moreover, they have an understanding of the concept of zero, using it appropriately in ordinal context (Biro and Matsuzawa, 2001). Moreover, chimpanzees display indicating acts" (pointing, touching, rearranging) similar to what human children display when counting up a sum. So just as human children touch each item when counting an array of items, chimpanzees do the same thing, suggesting further similarity in the way numbers and sequences are conceptualized in chimpanzees and humans (Boysen, Berntson, Shreyer, and Hannan, 1995).

20. Not only do chimpanzees understand numbers and sequences, but their working memory of numbers is superior to that of adult humans. Working memory (or, short-term memory) is the ability to temporarily store, manipulate and recall items (numbers, objects, names, etc.). In other words, working memory has to do with how good someone is at keeping several items in mind at the same time. Working memory tasks require monitoring (i.e., manipulation of information or behaviors) as part of completing goal-directed actions in the setting of interfering processes and distractions. The cognitive processes needed to achieve this include attention and executive control (reasoning, planning and execution). Chimpanzees were shown the numerals 1-9 spread randomly across a computer screen. The numbers appeared for a very limited duration (210, 430a and 650 milliseconds and then were replaced by white squares, which had to be touched in the correct order (1-9). To complicate matters, in another version of the task, as soon as the chimpanzees touched the number 1, the remaining either were immediately masked by white squares. In order to successfully complete the task they had to



the task, as soon as the chimpanzees touched the number 1, the remaining either were immediately masked by white squares. In order to successfully complete the task they had to remember the location of each concealed number and touch them in the correct order. The performance of a number of the chimpanzees on these seemingly impossible memory tasks was not only accurate but much better than that of human adults, who could not even complete most of the versions of the task (Inoue and Matsuzawa, 2007). Therefore, the chimpanzees have an extraordinary working memory capability for numerical recollection better than that of adult humans, which underlies a number of mental skills related to mental representation, attention, and sequencing.

Tetsuro Matsuzawa

Sworn to before me
this 23rd day of November, 2013

23 NOV 2013

Notary Public

SWORN TO BEFORE ME
B.V. MOHAN, B.A., LL.B.,
NOTARY PUBLIC, GOVT. OF INDIA
#1032, 2nd Main, N.G. Layout,
Vijayanagar, Bangalore- 560 040.
23-11-13.

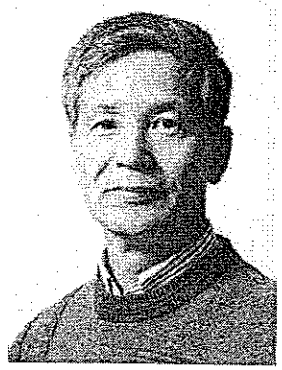
SL. No. 266
Page No. 38
Book No. 2
Date 23.11.13

GOVT OF KARNATAKA
HAS DISCONTINUED THE
USE OF STAMP W.E.F. 1-4-2003

MY COMMISSION EXPIRES
ON 22-10-2015

EXHIBIT A

Curriculum Vitae



Tetsuro Matsuzawa

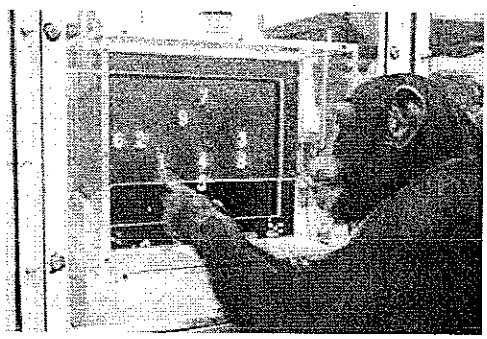
Current Position
Professor, Section of Language and Intelligence,
Director, Center for International Collaboration and Advanced Studies
Primate Research Institute, Kyoto University
President of the International Primatological Society
Editorial Board of The Royal Society, *Phlosophical Transaction B*
Chair of Scientific Program of International Congress of Psychology 2016

Birth day: 15th Oct. 1950, born in Japan (Nationality: Japanese)
1969: Entered Kyoto University (Philosophy major)
1974: Graduated the Faculty of Letters, Kyoto University; Entered Graduate School of Kyoto University (Psychology major): PhD (Science) from Kyoto University in 1986
1976-present: Primate Research Institute of Kyoto University
(1976: Assistant professor, 1987: Associate professor, 1993: full professor, 2006-2012: Director)
Major: Primatology, Psychology, especially establishing "Comparative Cognitive Science"

Research Summary

Matsuzawa has been studying chimpanzee intelligence both in the laboratory and in the wild. The laboratory work is known as "Ai-project" since 1976. He has also been studying the tool use in the wild chimpanzees at Bossou-Nimba, Guinea, West Africa, since 1986. Matsuzawa tries to synthesize the field and the lab work to understand the nature of chimpanzees. He published journal papers and also the books such as "Primate origins of human cognition and behavior", "Cognitive development in chimpanzees", "The chimpanzees of Bossou and Nimba". He also published several popular books to the public too, that have been translated into Chinese and Korean. He got several prizes including Prince Chichibu Memorial Award for Science in 1991, Jane Goodall Award in 2001, and The Medal with Purple Ribbon in 2004.

Please see the web site: http://www.pri.kyoto-u.ac.jp/ai/



Publications list

Books

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Book chapters

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Invited talks **(2004-2013)**

2013

1) Conakry University, Jan 4, Conakry, Guinea

2) AAAS, Feb 15, Boston, USA

3) Malaysia Science University, Department of Biology, March 5, Penang, Malaysia

4) Malaysia Science University, Department of Education, March 6, Penang, Malaysia
5) Kunming University of Science and Techonology, March 24, Kunming, Yunnan, China
6) Kunming Institute of Zoology, March 25, Kunming, Yunnan, China
7) Southwest Forestry University, Kunming, Yunnan, China
8) Yunnan University of Finance and Economics, March 26, Kunming, Yunnan, China
9) Royal University of Bhutan, May, May 5, Thimpu, Bhutan
10) Archives Jean Piaget, University of Geneve, May 14, Geneve, Switzerland
11) University of Neuchatel, May 15, Neuchatel, Switzerland
12) University of St Andrews, May 20, St Andrews, Scotland, UK

2012

1) American Psychological Association, Aug 2, Florida, USA
2) International Primatological Society, Aug 15, Cancun, Mexico
3) President plenary, International Primatological Society, Aug 16, Cancun, Mexico
4) University Autonoma Metropolitana-Iztapalapa, Aug 20, Mexico City, Mexico
5) Ecole Normale Superieure, Nov 5, Paris, France
6) Le Muséum national d'Histoire naturelle, Nov 8, Paris, France
7) International Institute of Advanced Studies, Dec 8, Tokyo, Japan

2011

1) Malaysia Science University, Department of Biology, Feb 17, Penang, Malaysia
2) Boreneo Rainforest Lodge, Malaysia-Sabah University, March 26, Danum Valley, Malaysia
3) Harvard University Dept of Psychology and Dept of Anthropology, April 27, Boston, USA
4) New York Consortium for Primatology, April 28, New York, USA
5) New York City University, April 29, New York, USA
6) University of Pennsylvania, Department of Psychology, May 2, Philadelphia, PA, USA
7) UCL, Institute of Child Health, May 17, London, UK
8) Cambridge University, Department of Anthropology and Archaeology, May 18, Cambridge, UK
9) Tamagawa-CALTEC joint symposium on Neuroscience, June 7, Kyoto, Japan
10) Association for the Scientific Study of Consciousness (ASSC15), June 12, Kyoto, Japan
11) Nairobi Workshop on Lithic Techonology, Nairobi National Museum, Aug 6, Nairobi, Kenya
12) Wellcome Trust School on Biology of Social Cognition, Cambridge, UK
13) Ecole Normale Superieure, Paris, France

2010

1) i-Brain symposium, University of Ghent, March 6, Brussels, Belgium
2) Seoul National Zoo, April 28, Seoul, Korea
3) Ewha Womans University, April 29, Seoul, Korea
4) UCL, Birkbeck and Institute of Cognitive Neuroscience, May 18, London, UK
5) Cold Spring Harbor Laboratory School on Biology of Social Cognition, July 15, CSHL, NY,

USA

6) International Society for the Study of Behavioral Development (ISSBD), July 21, Lusaka, Zambia

7) International Primatological Society, September 13, Kyoto, Japan

2009

1) Chimpanzee mind: a combining effort of fieldwork and laboratory work. 2009 AAAS Annual Meeting. February 12-16, Chicago, USA.

2) ESF-JSPS Frontier Science Conference Series for Young Researchers. February 28, Napoli, Italy.

3) Chimpanzee Mind. The Primate Mind, The "Ettor Majorana" symposium, June 4-7, Erice, Italy.

2008

1) Chimpanzee mind: a combining effort of fieldwork and laboratory work. Decade of the Mind3. May 7, Des Moines, USA.

2) Comparative cognitive science: trade-off theory of memory and symbolization in humans and chimpanzees. ASSC 12th Annual Meeting. June 21, Taipei, Taiwan.

3) Chimpanzee mind: evolution of human mind viewed from panthropology. XXIX International Congress of Psychology. July 24, Berlin, Germany.

4) Trade-off theory of memory and symbolization in humans and chimpanzees. International primatological society XXII. August 5, Edinburgh, UK.

2007

1) The history of the understanding chimpanzees conference series. The Mind of the Chimpanzee: An International Multidisciplinary Conference on Chimpanzee Cognition. March 22-25, Chicago, USA.

2) Cognitive development in chimpanzees: A synthesis of field and lab study. Comparative Cognition in Context Group. March 29, Toronto, Canada.

2006

1) Numerical processing in chimpanzees. The 24th European Workshop on Cognitive Neuropsychology. January 22-27, Bressanone, Italy

2) Green corridor: An attempt at saving chimpanzees in Bossou and Nimba. The Symbol of Collaboration between Guinea and Japan: Bossou 30 ans. November 27-29, Conakry, Guinea

2005

1) Animal behavior about number processing. NUMBRA/ESCOP Summer School "Neuroscience of number processing". July 3-10, Erice, Italy.

2) How do animals think? European Forum Alpbach. August 18-25, Alpbach, Austria.

2004

1) On HOPE project. The signing ceremony of JSPS and MPG. February 12, Munich, Germany.

2) Prerequisites of cultural transmission in chimpanzees. 21COE International Symposium on African Great Apes: Evolution, Diversity, and Conservation. March 4, Kyoto, Japan.

3) HOPE: A project of KUPRI and MPIEVA 2004-2009. First International Workshop of HOPE. March 6, Kyoto, Japan.

4) The mind of the chimpanzee: In the wild and in captivity. ROH Public Symposium on "Sequencing the Chimpanzee Genome: What Have We Learned?" March12, La Jolla, CA, USA.

5) Cognition and personality in chimpanzees. ROH Expert Meeting on "Sequencing the Chimpanzee Genome: What Have We Learned?" March 13, La Jolla, USA.

6) Conservation of wild chimpanzees in West Africa. The 1st Meeting of the Section on Great Apes of the IUCN/SSC Primate Specialist Group. 17-19 April, Chicago, USA.

EXHIBIT B

EXHIBIT B

References:

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