

Chimpanzee Ai and her son Ayumu: An episode of education by master-apprenticeship **Tetsuro Matsuzawa**

Introduction

I have been studying chimpanzee intelligence both in the laboratory and in the wild (Matsuzawa 2001).

Chimpanzees in the wild use and manufacture a wide variety of tools such as twigs to fish for termites or a pair of stones to crack open hard-shelled nuts. Recent studies comparing different communities of chimpanzees have shown that each community has developed its own unique set of cultural traditions.

Chimpanzees in the laboratory can also master various kinds of skills including, to some extent, linguistic and numerical abilities. One question arising from these studies concerns the social transmission of knowledge and skills across generations: How and when does such learning occur, and from who to who is it passed? To address these questions, this article briefly summarizes our attempts at synthesizing two distinct approaches to understanding the nature of chimpanzee intelligence: ethological observation in the wild, and psychological experiments in the laboratory. In addition, it will also provide an account of one of the most impressive episodes of learning by an infant chimpanzee from a skillful mother.

Wild chimpanzees at Bossou

The forests of Bossou, Guinea-Conakry in West Africa are home to a group of about 20 chimpanzees. They are known to use a pair of stones as hammer and anvil to crack open oil palm nuts in order to gain access to the kernel inside the hard shell (Fig. 1). Through long-term observation of the nut-cracking behavior, my colleagues and I have identified various interesting aspects of this tool-using behavior (Matsuzawa 1994).

Insert Fig 1 about here

For example, each chimpanzee shows perfect laterality in using hammer stones. The "right-handers" always use the right hand for hammering, while the "left-handers" use their left hand exclusively. Such perfect laterality in tool use has never before been found in non-human animals. Humans show strong hand preference on the individual level, and there is also a strong right-bias at the population level. The chimpanzees of Bossou show a slight bias toward the right for hammering at the population level, with about 67% of group members being right-handers. However, there is perfect correspondence in siblings' hand preference: members of every sibling pair we have come across prefer to use the same hand for hammering. Hand preference is thought to be related to functional lateral asymmetry of brain function, but, with many unanswered questions, remains a controversial issue in non-human animals.

Young chimpanzees require at least 3.5 years to master nut-cracking. Furthermore, there is a critical period for learning between the ages of 3.5 and 5 years. Chimpanzees who fail to learn to crack nuts by the end of this period will not acquire the skill in later life.

Learning is aided by a form of education by master-apprenticeship. Young chimpanzees learn the skill by carefully observing the behavior of adults for a long time after birth. Observation in this way tends to be a one-way process: Adult chimpanzees seldom observe the behavior of the younger members of the community.

In addition to nut-cracking, Bossou chimpanzees possess a unique repertoire of tool-manufacturing and tool-using skills. These include behaviors such as the use of leaves for drinking water, pestle-pounding of oil-palms, fishing for safari ants with a wand, scooping algae floating on a pond with a stick, and so forth.

Chimpanzees in the wild have to learn many things beside tool use. For example, there