

Declaration of Joyce Poole

I, Joyce Poole, declare as follows:

Introduction and Qualifications

1. My name is Joyce Poole. I graduated with a Bachelor of Arts with High Honors in the Biological Sciences from Smith College in 1979. I received my PhD from the University of Cambridge in 1982 from the Sub-Department for Animal Behaviour, under the supervision of Professor Robert Hinde. I completed a Postdoctoral Research Fellowship from 1984-1988 at Princeton University under the guidance of Professor Daniel Rubenstein. I reside and work in Sandefjord, Norway, and in Il Masin, Kajiado County, Kenya. I have run elephant behavior and conservation projects in Amboseli and Maasai Mara ecosystems, Kenya, and in Gorongosa National Park, Mozambique.

2. I submit this Declaration in support of the Nonhuman Rights Project, Inc.'s petition for a writ of habeas corpus regarding the captive elephants at the Pittsburgh Zoo & Aquarium. I am a nonparty to this proceeding.

3. I have studied wild elephants in Africa and worked toward their conservation and welfare for 50 years. My research interests are focused on social and reproductive behavior, acoustic and gestural communication, cognitive science, decision-making, and conservation. I am currently Scientific Director of ElephantVoices, a California 501(c)(3) non-profit organization I co-founded in 2002, which aims to inspire wonder in the intelligence, complexity and voices of elephants, and to secure a kinder future for them. We advance the study of elephant cognition, communication and social behavior, and promote the scientifically sound and ethical management and care of elephants through research, conservation, advocacy, and the sharing of knowledge. Specifically, I direct the research, conservation, and welfare work for ElephantVoices.

4. In addition to directing the science at ElephantVoices, I have worked and conducted research for a number of organizations, including: (1) as the Research Director of the Amboseli Elephant Research Project from 2002-2007, for the Amboseli Trust for Elephants, where I oversaw the elephant monitoring, collaborative research projects, and training programs for the then 3 decades-long study of elephants; (2) as a scientific advisor for Discovery in July, 1996 and July, 1997, for the IMAX production *Africa's Elephant Kingdom*; (3) as a Consultant for Richard Leakey & Associates from 1994-

1997 performing training, lecturing, and advising for wildlife documentaries; (4) as an Author from 1994-1995 for *Coming of Age with Elephants* (Hyperion Press, 1996; Hodder & Stoughton, 1996); (5) as a Coordinator of the Elephant Program for the Kenya Wildlife Service from 1991-1994, setting and implementing Kenya's elephant conservation and management policy, supervising management-oriented research, reconciling land use and other conflicts between elephants and people, and building local expertise; (6) as a Consultant for the World Bank, from 1990-1991, developing Pre-Project Facility by drafting the Elephant Conservation and Management Policy and Research Policy Framework and Investment Program for the Kenya Wildlife Service; (7) as a Consultant for the International Union for the Conservation of Nature, in 1990, compiling an overview of elephant conservation in Eastern Africa for the Paris Donors Conference; (8) as a Consultant for the Tanzanian Wildlife Department in 1989, drafting a successful proposal to the Convention on Trade in Endangered Species to up list the African elephant to Appendix I of the Convention; (9) as a Consultant to the World Wildlife Fund in 1989, engaging in discussions with Japanese and Chinese government officials and ivory carvers regarding detrimental impacts of the ivory trade on elephant survival; (10) as a Researcher for the African Wildlife Foundation in 1989, assembling data on effects of poaching on East African elephant populations; and (11) as a Researcher for the Amboseli Elephant Research Project from 1975-1980.

5. I have conducted field work as part of my scientific research in multiple sites in multiple countries over my career, including: (1) elephant monitoring, conservation and research as part of the Gorongosa Restoration Project in Mozambique, from 2011-2019; (2) elephant monitoring and conservation project in the Maasai Mara ecosystem in Kenya, from 2010-2016; (3) the initiation of Asian elephant monitoring and conservation in the Minneriya-Kaudulla National Parks in Sri Lanka in 2008; (4) the study of elephant communication, cognition, and social behavior, conducting playback experiments, and recording elephant vocalizations and behavior in the Amboseli National Park in Kenya, 1998-2009; 2020; (5) recording elephant vocalizations and behavior in Maasai Mara National Park, Tsavo National Park, and Laikipia District in Kenya in 1998; (6) assessing the numbers and habitat use of elephants in West Kilimanjaro, Tanzania in 1997; (7) overseeing numerous elephant surveys and studies of elephants carried out under my direction by the Kenya Wildlife Service Elephant Program in Kenya from 1990-1994; (8) studying elephant vocal and olfactory

communication via vocal, visual, and chemical signaling and assessment between musth males in Amboseli National Park, Kenya from 1984-1990; (9) studying the contextual use of very low frequency calls by elephants and assessing the effects of poaching on the age structure and social and reproductive patterns of elephant populations in Amboseli, Tsavo, Queen Elizabeth, and Mikumi National Parks in Kenya, Uganda, and Tanzania in 1989; (10) Focal animal sampling musth and male-male competition among elephants in Amboseli National Park, Kenya from 1980-1982; and (11) participating in Cynthia Moss' long-term studies of elephants in Amboseli National Park, Kenya from 1975-1979.

6. Over the course of my career, I have received several awards and honors related to my research, including: (1) the Horace Dutton Taft Alumni Medal awarded by the Taft School in 2017, for “going beyond the call of duty in service”; (2) an Outstanding Lifetime Achievement Award from the Jackson Hole Wildlife Film Festival in 2015; (3) a Certificate of Recognition from the California State Legislature and Assembly in 2007, for “tireless efforts in educating people on elephant captivity”; (4) the Smith College Medal in 1996 for elephant research and conservation work “exemplifying the true purpose of a liberal arts education”; and as a student (5) an F32 National Research Service Award (NRSA) Individual Postdoctoral Fellowship from the National Institute of Mental Health from 1985-1988; (6) a Research Fellowship from the Harry Frank Guggenheim Foundation in 1984; (7) a Research Fellowship from the New York Zoological Society from 1980-1981; (8) a Graduate Study Fellowship from Smith College in 1981; (9) the Sarah W. Wilder and Sarah W. Whipple Fellowship from 1979-1980; (10) Sigma Xi from 1979-1980; and (11) the A. Brazier Howell Award in 1979 for my paper on *musth* in African elephants, presented at the 1979 American Society of Mammalogists meetings.

7. I am affiliated with a number of professional organizations and hold several board and advisory memberships, including: (1) member of the Board for the Global Sanctuary for Elephants, from 2015-present; (2) member of the Board of Directors for ElephantVoices, from 2008-present; (3) member of Kenya Elephant Forum 2010-present; (4) member of the Scientific Advisory Committee for the Amboseli Elephant Research Project, from 2002-2009; (5) member of the Science Advisory Board for the Captive Elephant Management Coalition, from 1988-2001; (6) member of the Panel of Experts for the Species Survival Network, in 2004; (7) Trustee for the Amboseli Trust

for Elephants, from 2002-2011; and (8) member of the African Elephant Specialist Group, as part of the Species Survival Commission for the IUCN, from 1988-2001; 2017-present; (9) National Geographic Explorer 1988-present.

8. I have written two books concerning my work with elephants: (1) *Elephants* (1997, Colin Baxter Photography, Grantown-on-Spey, Scotland), and (2) *Coming of Age with Elephants* (1996, Hyperion Press, New York; 1996, Hodder & Stoughton, London).

9. I have published 50 peer-reviewed scientific articles over my career. These articles have been published in many of the world's premier scientific journals, including: *Nature*, *Science*, *Frontiers in Zoology*, *Biology Letters*, *Proceedings of the Royal Society B*, *Immunogenetics*, *PLoS ONE*, *The Ecologist*, *Animal Behaviour*, *Oryx*, *Behavioral Ecology and Sociobiology*, *Behavior*, *Journal of Reproduction and Fertility*, *Molecular Ecology*, *Journal of Consciousness Studies*, *Current Biology*, *Journal of the Acoustical Society of America*, *Etica and Animali*, and *Conservation Biology*. Specific topics of these publications include: Female African elephant rumbles differ between populations and sympatric social groups; African elephants address one another with individually specific name-like calls; Stop elephant hunting in Tanzania borderlands; A culture of aggression: the Gorongosa elephants' enduring legacy of war; Promoting positive interactions with the traumatized elephants in Gorongosa National Park; Who's Who & Whereabouts: an integrated system for re-identifying and monitoring African elephants; The Gorongosa elephants through war and recovery: tusklessness, population size, structure and reproductive parameters; Ivory poaching and the rapid evolution of tusklessness in African Elephants; Does social complexity drive vocal complexity? Insights from the two African elephant species; The Elephant Ethogram: A Library of African Elephant Behavior; Persistence of effects of social disruption in elephants decades after culling; Persistence of early life experiences 40 decades later on survival and success among African elephants; Poaching and wildlife conservation; Leadership in elephants: The adaptive value of age; Elephants, ivory, and trade; Simulated oestrus behavior in African elephants; Major histocompatibility complex variation and evolution in two genera of elephants; Fine-scaled population genetic structure in a fission-fusion society; Do elephants show empathy?; Elephant cognition; Behavioural inbreeding avoidance in wild African elephants; African elephants have expectations about locations of out-of-sight family members; Elephants can classify human ethnic groups by odour and garment colour; Age, musth, and

paternity success in wild male African elephants; Wild African elephants discriminate between familiar and unfamiliar conspecific seismic alarm calls; Social trauma early in life can affect physiology, behavior, and culture of animals and humans over generations; Elephants are capable of vocal learning; Older bull elephants control young males; African elephants assess acoustic signals; The Aggressive state of musth in African elephants; Mate guarding, reproductive success, and female choice in African elephants; Rutting behavior in African elephants; and Musth in the African elephant. Additionally, my research has been published in six non-peer reviewed publications.

10. My scientific work has also been published as chapters in several peer-refereed books, including *Mammals of Africa* (2013, Academic Press), *The Amboseli Elephants: A Long-Term Perspective on a Long-Lived Mammal* (2011, University of Chicago Press), *An Elephant in the Room: The Science and Well Being of Elephants in Captivity* (2008, Tufts University Cummings School of Veterinary Medicine's Center for Animals and Public Policy), *Elephants and Ethics: Toward a morality of Co-existence* (2003, Johns Hopkins University Press), *Behavioral Ecology and Conservation Biology* (1998, Oxford University Press), *The Differences Between the Sexes* (1994, Cambridge University Press), *Primate Social Relationships* (1983, Blackwell Scientific Publications). In addition to these peer-reviewed book chapters, my scientific work has been published in three additional book chapters, which were not refereed.

11. My scientific research has additionally been published in several peer-reviewed symposia proceedings, including "Vocal imitation in African savannah elephants (*Loxodonta Africana*)" in *Razprave IV* (2006, Rezreda Sazu XLVII-3); "Conservation biology: The ecology and genetics of endangered species," in *Genes in Ecology* (1991, Blackwell Scientific Publications, London, The 33rd Symposium of the British Ecological Society); "Elephant mate searching: Group dynamics and vocal and olfactory communication" and in *The Biology of Large African Mammals in their Environment* (1989, Clarendon Press, Oxford, Proceedings of the Symposium of the Zoological Society of London).

12. In addition to my peer-reviewed scientific publications, I have also published numerous technical reports for various foundations, working groups, and organizations. These reports include: (1) a series of reports relating to our work on elephants in the Maasai Mara from 2012-2015; (2) a series of reports relating to our work on elephants

in Gorongosa National Park from 2012-2019; (3) a 2010 critique of “The status of African elephants (*Loxodonta africana*) in the 2008 IUCN Red List of Threatened Species”; (4) a 1997 Typescript Report describing a survey of elephants and other wildlife of the West Kilimanjaro Basin, Tanzania; (5) a 1996 report in “Decentralization and Biodiversity Conservation” as part of a World Bank Symposium; (6) a 1994 report in the *Proceedings of the 2nd International Conference on Advances in Reproductive Research in Man and Animals* about the Logistical and ethical considerations in the management of elephant populations through fertility regulation; (7) a 1993 report detailing Kenya’s Initiatives in Elephant Fertility Regulation and Population Control Techniques in *Pachyderm*; (8) a 1992 survey of the Shimba Hills elephant population for the Elephant Programme, Kenya Wildlife Service; (9) a 1992 report on the Status of Kenya’s Elephants by the Kenya Wildlife Service and the Department of Resource Surveys and Remote Sensing; (10) a 1991 Elephant Conservation Plan for the Kenya Wildlife Service, Ministry of Tourism and Wildlife; (11) a 1990 Regional Overview of Elephant Conservation in Eastern Africa, in *Regional Perspectives and Situation Regarding Elephant Conservation and the Ivory Trade*, produced for the Paris Donors Meeting of the IUCN; (12) a 1990 report on Elephant Conservation and Management in *The Zebra Book, Policy Framework and Five-year Investment Programme* for the Kenya Wildlife Service; and (13) a 1989 report on The effects of poaching on the age structures and social and reproductive patterns of selected East African elephant populations in *The Ivory Trade and the Future of the African Elephant* for the 7th CITES Conference of the Parties.

13. In addition to my scientific publications, I have published 17 popular articles in more general publications, including: National Geographic’s blog *A Voice for Elephants*, *Basecamp Explorer AS*, *Swara*, *Care for the Wild News*, *Sotokoto*, *Wildlife News*, *Komba*, *Animal Kingdom*, and *Natural History*.

14. I have been an invited speaker at international meetings and symposia throughout the world, including: (1) Keynote, Jackson Hole Wildlife Film Festival, 2015; (2) National Geographic Retreat, International Council of Advisors in Stockholm, Sweden, 2014; (3) Chinese Zoo Directors Meeting on Animal Welfare, in Shenzhen, China in 2013; (4) the Royal Geographical Society, Hong Kong, China in 2013; (5) the Explorer’s Club in New York, 2013; (6) the Explorer’s Symposium for National Geographic, in Washington, DC in 2012; (7) “Nature’s great masterpiece: Stories of

Elephants,” the 2012 Sabine Distinguished Lecture in Psychology, Colorado College; (8) Panel discussion for the National Geographic Society, Washington DC in 2008; (9) Seminar on Language Evolution and Cognition held by Communication Research Centre, Northumbria University & Language Evolution and Computation Research Unit, University of Edinburgh, Scotland in 2007; (10) Public lecture at the Explorer’s Club, New York in 2007; (11) lecture on communication, behavior, and social life among elephants, for the Science Museums of the la Caixa Foundation, Barcelona, Spain in 2006; (12) speaker in series of lectures on Animal Communication, for the Science Museums of the la Caixa Foundation, in Madrid, Spain in 2006; and (13) lecture on Animal Cognition and Communication, at the Tufts Center for Animals and Public Policy in Boston in 1999.

15. In addition to my scientific research, I have also focused extensively throughout my career on public education and outreach. I have utilized many different media formats in pursuit of this goal. I currently maintain several web channels, including: (1) www.ElephantVoices.org - about elephant social behavior, communication and welfare; (2) www.facebook.com/elephantvoices; (3) www.Intagram.com/elephantvoices; (4) www.twitter.com/elephantvoices; (5) www.vimeo.com/elephantvoices; (6) www.YouTube.com/elephantvoices; (7) www.soundcloud.com/elephantvoices; and (8) <http://www.theelephantcharter.info> – The Elephant Charter, co-written in 2008 by Joyce Poole, Cynthia Moss, Raman Sukumar, Andrea Turkalo and Katy Payne. I also currently maintain The Elephant Ethogram: A Library of African Elephant Behavior (on [The Elephant Ethogram](http://www.theelephantethogram.org)), which documents close to 500 behaviors with written descriptions and some 2,400 video clips.

16. My research concerning elephant social behavior and communication, as well as my conservation work, has been featured in a number of printed articles, including publications such as *Readers’ Digest*, *Scientific American*, *Science*, *National Geographic Kids*, *National Geographic Magazine*, *National Geographic Adventure*, *New York Times Magazine*, *National Geographic Explorer*, *LA Times*, *Highlights for Children*, *Scholastic*, *The New York Times*, *Science Times*, *Science*, *Science News*, *Spektrumdirekt*, *National Geographic News*, *Kyodo News Washington Bureau*, *Daily Telegraph*, and *The Guardian*. Additionally, my life and work have been featured in several books, including: (1) Jodi Picoult’s novel *Leaving Time*; (2) Martin Meredith’s 2001 *Africa’s Elephant*, a biography, and (3) Doug Chadwick’s 1992 *Fate of the*

Elephant. My work was also highlighted by Doug Chadwick in his 1992 feature article for National Geographic Magazine. My elephant recordings have featured in (1) Paul Winter's Summer Solstice Concert in New York Cathedral, in 2013; (2) in the Emmy award winning work by Paul Winter, Miho in 2010; (3) in Avatar in 2009; (4) in Pulse of the Planet.

17. I have been interviewed and my research has been featured on a number of radio programs, including: (1) a 2012 Sam Litzinger interview on The Animal House/NPR (WAMU 88.5); (2) Elephant welfare views featured on WBUR's Inside Out Documentary on American Zoos with Diane Toomey in 2009; (3) Elephant communication research featured in Up Front Radio, San Francisco with Sandip Roy Chowdhury in 2008; (4) Elephant communication, cognition, and welfare with Karl Losken Animal Voices 102.7fm in Vancouver, BC Canada in 2008; (5) Science Update, American Association for the Advancement of Science (AAAS) in 2005; (6) BBC Radio Science, the Leading Edge in 2005; (7) German Public Radio (SWR) program Campus in 2005; (8) NPR in 2005 about elephant vocal learning; (9) BBC News Scotland in 2005 about vocal learning in elephants; (10) ABC's Radio 702 with Rory McDonald about elephant welfare in 2005; (11) Elephant communication research featured in BBC's Beyond our Senses program Sounds of Life with Grant Sonnex, in 2004; (12) Elephant communication research featured in NPR program on elephant language in 2004; (13) WETA-FM, News 820's Openline & WNYC in 1996; and (14) Musth in the African elephant, BBC Radio 4, The living World in 1981. In addition to these radio appearances, I have also appeared on the Science and the city Podcast, in 2007.

18. I have also appeared and been featured in a variety of Television programs, including in: (1) Secrets of the Elephants (2023); (2) Gorongosa Park: Rebirth of Paradise (2015), a PBS six-part series about the restoration of Gorongosa National Park in which my elephant work is highlighted in episodes 2 and 5; (3) An Apology to Elephants, an award winning 2013 documentary that explores abuse and brutal treatment of elephants; (4) War Elephants (2012), an award winning documentary about the traumatized elephants in Gorongosa National Park, Mozambique, and their recovery, by National Geographic Wild, worldwide; (5) Elephant communication research is featured in "Elephant having tales to tell" (2008), NHK, Japan (Japanese and English versions); (6) Interview on elephant communication and cognition for

Smart Planet for REDES-TVE, Spain (2006); (7) Elephants and vocal learning, Daily Planet Discovery Channel Canada (2005); (8) Elephant cognition and conservation views featured on National Geographic Explorer *Elephant Rage* (2005); (9) Elephant recordings featured in Discovery Channel's Echo III (2004); (10) Elephant communication research, Elephant's Talk, featured in BBC documentary *Talking with Animals* (2002); (11) Work featured on News and Talk shows such as CNN (1993), ABC news Women and Science, The Today Show, (1996), West 57th Street CBS News (1989), PM Magazine (1987); (12) Research featured in *Inside the Animal Mind Part 3 Animal Consciousness*, WNET Nature (1999); (13) Featured on Episode 16, *Elephants*, in series, *Champions of the Wild*, Omni Film Productions, Vancouver, Canada (1998); (14) Life, elephant research, and conservation work subject of National Geographic Special, *Coming of Age with Elephants* (1996); (15) *Wildlife Warriors*, National Geographic Special (1996); (16) *A Voice for Elephants* USIA AfricaPIX (1996); (17) Discovery Channel documentary "Ultimate Guide to Elephants" (1996); (18) *Elephants like us*, Rossellini and Associates (1990); (19) *The language of the elephants*, Rossellini and Associates (1990); (20) Elephant research and conservation work featured in National Geographic Special *Ivory Wars* (1989); (21) Research highlighted in BBC production *Trials of Life* with David Attenborough (1988); (22) Work on elephant infrasound featured in *Supersense* BBC Natural History Unit series on animal senses (1988); and (23) Featured in Sports and Adventure, *Women of the World* (1987).

19. I have testified as an expert witness in court cases in several countries, including: (1) In 1998 in South Africa in the Case of NSPCA v. Riccardo Ghiazza regarding the capture, mistreatment of 34 baby elephants. Ghiazza was eventually found guilty of cruelty; (2) In 2005 via video link in International Fund for Animal Welfare, et al. v. Minister for the Environment and Heritage et al., N2005/916 regarding the export of Asian elephants from Thailand to Australia; (3) In 2008 in Washington DC in American Society for the Prevention of Cruelty to Animals, Animal Welfare Institute, The Fund for Animals, Animal Protection Institute & Tom Rider Plaintiffs in ASCPA v. Ringling Brothers and Barnum & Bailey Circus; and (4) In 2012 in Los Angeles in Aaron Leider vs. John Lewis, City of Los Angeles, in a case regarding the welfare of the elephants of Los Angeles Zoo.

20. My Curriculum Vitae fully sets forth my educational background and experience and is annexed hereto as "Exhibit A".

Basis for Opinions

21. The opinions I state in this Declaration are based on my professional knowledge, education, training, and years of experience observing and studying elephants, as well as my knowledge of peer-reviewed literature about elephant behavior and intelligence published in the world's most respected journals, periodicals, and books that are generally accepted as authoritative in the field, and many of which were written by myself or colleagues whom I have known for several years and with whose research and field work I am personally familiar. A full reference list of peer-reviewed literature cited herein is annexed hereto as "Exhibit B".

Opinions

Premise

22. Elephants are autonomous beings. Autonomy in humans and nonhuman animals is defined as self-determined behavior that is based on freedom of choice. As a psychological concept it implies that the individual is directing their behavior based on some non-observable, internal cognitive process, rather than simply responding reflexively. Although we cannot directly observe these internal processes in other beings, we can explore and investigate them by observing, recording and analysing their behavior, as I have done with elephants for my entire career.

23. I shall indicate which species, African (*Loxodonta Africana*) or Asian (*Elephas maximus*), specific observations relate to. If the general term 'elephants' is used with no specific delineation, it can be assumed the comment relates to the African species, though it is likely that it applies to the Asian species as well.

Brain and Development

24. Elephants are large-brained, with the biggest absolute brain size of any land animal (Cozzi et al. 2001; Shoshani et al. 2006). Even relative to their body sizes, elephant brains are large. Encephalization quotients (EQ) are a standardised measure of brain size relative to body size and illustrate by how much a species' brain size deviates from that expected for its body size. An EQ of one means the brain is exactly the size expected for that body, and values greater than one indicate a larger brain than expected (Jerison 1973). Elephants have an EQ of between 1.3 and 2.3 (varying between sex and African and Asian species). This means an elephant's brain can be up to two and a half times larger than is expected for an animal of its size; this EQ is similar to that of the

great apes, with whom elephants have not shared a common ancestor for almost 100 million years (Eisenberg 1981, Jerison 1973). Given how metabolically costly brain tissue is, the large brains of elephants must confer significant advantages; otherwise their size would be reduced. A large brain allows for greater intelligence and behavioral flexibility (Bates et al. 2008a).

25. Generally, mammals are born with brains weighing up to 90% of the adult weight. This figure drops to about 50% for chimpanzees. Human baby brains weigh only about 27% of the adult brain weight (Dekaban & Sadowsky 1978). This long period of brain development over many years (termed ‘developmental delay’) is a key feature of human brain evolution and is thought to play a role in the emergence of our complex cognitive abilities, such as self-awareness, creativity, forward planning, decision making, and social interaction (Bjorkland 1997). Delayed development provides a longer period in which the brain may be shaped by experience and learning (Fuster 2002). Elephant brains at birth weigh only about 35% of their adult weight (Eltringham 1982), and elephants show a similarly protracted period of growth, development and learning (Lee 1986). This similar developmental delay in the elephant brain is therefore likewise associated with the emergence of similarly complex cognitive abilities.

26. Despite nearly 100 million years of separate evolution (Hedges 2001), elephants share certain characteristics of our large brains, namely deep and complex folding of the cerebral cortex, large parietal and temporal lobes, and a large cerebellum (Cozzi et al. 2001). The temporal and parietal lobes of the cerebral cortex manage communication, perception, and recognition and comprehension of physical actions (Kolb and Whishaw 2008), while the cerebellum is involved in planning, empathy, and predicting and understanding the actions of others (Barton 2012). Thus, the physical similarities between human and elephant brains occur in areas that link directly to the capacities necessary for autonomy and self-awareness.

27. Elephant brains hold nearly as many cortical neurons as do human brains: humans: 1.15×10^{10} ; elephants: 1.1×10^{10} (Roth & Dicke 2005). Elephants’ pyramidal neurons are larger than in humans and most other species (Cozzi et al. 2001). Pyramidal neurons are found in the cerebral cortex, particularly the pre-frontal cortex – the brain area that controls executive functions (a set of cognitive processes that are required for choosing and monitoring behaviors that facilitate an individual to reach certain goals, e.g., problem solving, planning, working memory, inhibitory and attentional control and

cognitive flexibility).

28. The degree of complexity of pyramidal neurons is linked to cognitive ability, with more (and more complex) connections between pyramidal neurons being associated with increased cognitive capabilities (Elston 2003). Elephant pyramidal neurons have a large dendritic tree, i.e. a large number of connections with other neurons for receiving and sending signals (Cozzi et al. 2001).

29. As described below, along with these common brain and life-history characteristics, elephants share many behavioral and intellectual capacities with humans, including: self-awareness, empathy, awareness of death, intentional communication, learning, memory, and categorisation abilities. Many of these capacities have previously been considered – erroneously – to be uniquely human, and each is fundamental to and characteristic of autonomy and self-determination.

Awareness of Self and Others

30. Asian elephants exhibit Mirror Self Recognition (MSR) using Gallup's classic 'mark test' (Gallup 1970; Plotnik et al. 2006). MSR is the ability to recognise a reflection in the mirror as oneself, and the mark test involves surreptitiously placing a coloured mark on an individual's forehead that it could not see or be aware of without the aid of a mirror. If the individual uses the mirror to investigate the mark, the individual recognises the reflection as herself. Besides elephants, the only other mammals that have successfully passed the mark test and exhibited MSR are the great apes (chimpanzees, bonobos, gorillas and orangutans) and bottlenose dolphins (Parker and Mitchell 1994, Reiss and Marino 2001). MSR is significant because it is considered to be the key identifier of self-awareness. Self-awareness is intimately related to autobiographical memory in humans (Prebble et al. 2013) and is central to autonomy and being able to direct one's own behavior to achieve personal goals and desires. By demonstrating that they can recognize themselves in a mirror, elephants hold a mental representation of themselves from another perspective, and are thus aware that they are a separate entity from others (Bates and Byrne 2014).

31. A being who understands the concept of dying and death possesses a sense of self. Based on the research conducted to date, observing reactions to dead family or group members suggests an awareness of death in only two animal genera beyond humans; chimpanzees and elephants (Anderson et al. 2010, Douglas-Hamilton et al. 2006).

Having a mental representation of the self – a pre-requisite for mirror-self recognition – contributes to the ability to comprehend death. Wild African elephants have been shown experimentally to be more interested in the bones of dead elephants than the bones of other animals (McComb et al. 2006), and have frequently been observed using their tusks, trunk or feet to attempt to lift sick, dying or dead individuals (Douglas-Hamilton 1972, Moss 1992, Poole 1996, Payne 2003, Douglas-Hamilton et al. 2006). Although they do not give up trying to lift or elicit movement from the body immediately, elephants appear to realise that once dead, the carcass cannot be helped anymore, and instead engage in more ‘mournful’ behavior, such as standing guard over the bodies, and protecting it from the approaches of predators (e.g. Douglas-Hamilton 1972, Croze cited in Moss 1982, Moss 1988, Poole 1996, Payne 2003, McComb et al. 2006). Others have observed them covering the bodies of dead elephants with dirt and vegetation (Moss 1992; Poole 1996). In the particular case of mothers who lose a calf, although they may remain with the calf’s body for an extended period, they do not behave towards the body as they would a live calf. Indeed, the general demeanour of elephants who are attending to a dead elephant is one of grief and compassion, with slow movements and few, if any, vocalisations (Poole 1996). These behaviors are akin to human responses to the death of a close relative or friend, and illustrate that elephants possess some understanding of life and the permanence of death. Furthermore, elephants’ interest in the bodies, carcasses and bones of elephants who have passed is so marked that when one has died, trails to the site of death are worn into the ground by the repeated visits of many elephants over days, weeks, months and even years (Poole, personal observation). The accumulation of dung around the site attests to the extended time that visiting elephants spend touching and contemplating the bones. I have observed that, over years, the bones may become scattered over tens or hundreds of square meters as elephants pick up the bones and carry them away. The tusks are of particular interest and may be carried and deposited many hundreds of meters from the site of death (Poole, personal observation).

32. The capacity for mentally representing the self as an individual entity has been linked to general empathic abilities (Gallup 1982), where empathy can be defined as identifying with and understanding another’s experiences or feelings by imagining what it would be like to be in their situation. Empathy is an important component of human consciousness and autonomy and is a cornerstone of normal social interaction.

It goes beyond merely reading the emotional expressions of others. It requires modelling of the emotional states and desired goals that influence others' behavior both in the past and future, and using this information to plan one's own actions; empathy is only possible if one can adopt or imagine another's perspective, and attribute emotions to that other individual (Bates et al. 2008b). Empathy is, therefore, a component of and reliant on 'Theory of Mind' – the ability to mentally represent and think about the knowledge, beliefs and emotional states of others, whilst recognising that these can be distinct from your own knowledge, beliefs and emotions (Premack and Woodruff 1978, Frith and Frith 2005).

33. Elephants clearly and frequently display empathy in the form of protection, comfort and consolation, as well as by actively helping those who are in difficulty, such as assisting injured individuals to stand and walk, or helping calves out of rivers or ditches with steep banks (Bates et al. 2008b, Lee 1987, Poole 1996). Elephants have been observed to react when anticipating the pain of others (e.g. seen to wince when a nearby elephant stretched her trunk toward a live wire – Poole, personal observation) and have even been observed feeding those who are not able to use their own trunks to eat (Moses Kofi Sam, personal communication) and to attempt to feed those who have just died (Croze, cited in Moss 1982).

34. In an analysis of behavioral data collected from wild African elephants over a 40-year continuous field study, I have concluded that as well as possessing their own intentions, elephants can diagnose animacy and goal directedness in others, understand the physical competence and emotional state of others, and attribute goals and mental states (intentions) to others (Bates et al. 2008b), as evidenced in the examples below:

'IB family is crossing river. Infant struggles to climb out of bank after its mother. An adult female [not the mother] is standing next to calf and moves closer as the infant struggles. Female does not push calf out with its trunk, but digs her tusks into the mud behind the calf's front right leg which acts to provide some anchorage for the calf, who then scrambles up and out and rejoins mother.'

'At 11.10ish Ella gives a 'lets go' rumble as she moves further down the swamp . . . At 11.19 Ella goes into the swamp. The entire group is in the swamp except Elspeth and her calf [<1 year] and Eudora [Elspeth's

mother]. At 11.25 Eudora appears to ‘lead’ Elspeth and the calf to a good place to enter the swamp — the only place where there is no mud.’

In addition to the examples analyzed in Bates et al. 2008b, in what appeared to be a spontaneous attempt to prevent injury to the newborn, I observed two adult females rush to the side of a third female who had just given birth, back into her and press their bodies to her. In describing the situation I wrote:

‘The elephants’ sounds [relating to the birth] also attracted the attention of several males including young and inexperienced, Ramon, who, picking up on the interesting smells of the mother [Ella], mounted her, his clumsy body and feet poised above the newborn. Matriarch Echo and her adult daughter Erin, rushed to Ella’s side and, I believe, purposefully backed into her in what appeared to be an attempt to prevent the male from landing on the baby when he dismounted.’

Examples such as these demonstrate that the acting elephant(s) (the adult female in the first example, Eudora in the second, and Erin and Echo in the third) was able to understand the intentions or situation of the other (the calf in the first case, Elspeth in the second; Ella’s newborn and the male in the third) – i.e. to either climb out of or into the water, or be trampled on by the male – and they could adjust their own behavior in order to counteract the problem being faced by the other. While humans may act in this helpful manner on a daily basis, such interactions have been recorded for very few non-human animals (Bates et al. 2008b). In footage of [Helping](#) behaviour in [The Elephant Ethogram](#) an allo-mother in Maasai Mara, Kenya moves a log from under the head of an infant, in what appears to be an effort to make him more comfortable (see video [here](#)). There are numerous other examples of empathy in The Elephant Ethogram under Helping behaviour, including a [dramatic rescue](#) of an infant by two allomothers who, among other behaviours, prevent him from drowning by lifting his trunk out of the water so he can breathe. In a further example of understanding goal directedness of others, elephants appear to understand that vehicles drive on roads or tracks and furthermore they appear to know where these tracks lead. In Gorongosa, Mozambique, where elephants exhibit a culture of aggression toward humans, charging, chasing and attacking vehicles, adult females anticipate the direction the vehicle will go and attempt to cut it off by taking shortcuts *before* the vehicle has begun to turn (Poole personal observation 2012). The roots of empathetic behavior begin early in elephants. Just as

in humans where rudimentary sympathy for others in distress has been recorded in infants as young as 10 months old (Kanakogi et al. 2013, see <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0065292>), young elephants exhibit behavior that indicates that they feel sympathy for others. For instance, during fieldwork in the Maasai Mara in 2011 I filmed a mother elephant using her trunk to assist her one-year-old female calf up a steep bank. Once the calf was safely up the bank she turned around to face her five-year-old sister, who was also having difficulties getting up the bank. As the older calf clambered up the bank with effort the younger calf approached her and first touched her mouth (a gesture of reassurance among family members) and then reached her trunk out to touch the leg that had been having difficulty. Only when her sibling was safely up the bank did the calf turn to follow her mother ([video](#) filmed by Poole, 2011).

35. Experimental evidence from captive African elephants further demonstrates that elephants attribute intentions to others, as they follow and understand human pointing gestures (the only animal so far shown to do so spontaneously). The elephants understood that the human experimenter was pointing in order to communicate information to them about the location of a hidden object (Smet and Byrne 2013). Attributing intentions and understanding another's reference point is central to empathy and theory of mind. Further documentation of pointing in elephants is described in a chapter I co-authored with Lucy Bates and Richard Byrne for an upcoming book about pointing behavior in humans and other animals entitled, *Pointing With Your Nose: Do Elephants Point, And How Do We Know?*

36. Our analysis of simulated oestrus behaviors (see [Simulate-Estrus](#)) in African elephants – whereby a non-cycling, sexually experienced older female will simulate the visual signals of being sexually receptive, even though she is not ready to mate or breed again – shows that these knowledgeable females adopt false oestrus behaviors in order to demonstrate to naïve young females how to attract and respond appropriately to suitable males. The experienced females may be taking the youngsters lack of knowledge into account and actively showing them what to do; a possible example of true teaching as it is defined in humans (see an example [here](#)). Whilst this possibility requires further investigation, this evidence, coupled with the data showing that they understand the ostensive cues in human pointing, demonstrates that elephants do share some executive skills with humans, namely understanding the intentions and

knowledge states (minds) of others. Ostensive communication refers to the way humans use particular behavior such as tone of speech, eye contact, physical contact to emphasize that a particular communication is important. Lead elephants in family groups use ostensive communication frequently (e.g. [Ear-Flap-Slide](#), [Ear-Slap](#), [Walk-Wait](#), [Foot-Swinging](#), [Trunk-Sweep](#), [Body-Axis-Pointing](#) as described in Poole & Granli 2011 and The Elephant Ethogram; [Comment-Rumble](#) described in Poole, 2011) as a way to say, “Heads up – I am about to do something that you should pay attention to.”

37. Further related to empathy, coalitions and cooperation have been documented in wild African elephants, particularly to defend family members or close allies from (potential) attacks by outsiders, such as when a family group tries to ‘kidnap’ a calf from an unrelated family (Lee 1987, Moss and Poole 1983) or during the extraordinary teamwork executed by elephants when they defend themselves against predators, particularly, human beings (Poole and Granli 2011; Poole 2011). These latter behaviors are preceded by gestural and vocal signals typically given by the matriarch and acted upon by family members and have been documented many times amongst the Gorongosa elephants and in elephant behavior footage from there that we are currently analyzing. These behaviors are based on one elephant understanding the signals, emotions and goals of the coalition partner(s) (Bates et al. 2008b).

38. Cooperation is also evident in experimental tests with captive Asian elephants, whereby elephants demonstrated they can work together in pairs to obtain a reward, and understood that it was pointless to attempt the task if their partner was not present or could not access the equipment (Plotnik et al. 2011). Problem-solving and working together to achieve a collectively desired outcome involve mentally representing both a goal and the sequence of behaviors required to achieve that goal; thus, cooperation is based on (at the very least) short-term action planning.

39. Wild elephants have frequently been observed engaging in cooperative problem solving, for example when retrieving calves that have been kidnapped by other groups, when helping calves out of steep, muddy river banks (Bates et al. 2008b), when rescuing a calf attacked by a lion (acoustic recording calling to elicit help from others (Poole 2011) by or the vocal and gestural communication used when they are negotiating a plan of action (e.g. when elephants use [Cadenced-Rumbling](#), Poole 2011, or [High-Fiving](#) to lend their “voice” to a proposed or targeted plan of action; see video

[here](#)) or when they must navigate through human-dominated landscapes to reach a desired destination (e.g. habitat, salt-lick, waterhole) as evidenced in video footage of Selengei and her family filmed in 2015. These behaviors demonstrate the purposeful and well-coordinated social system of elephants and show that elephants can hold particular aims in mind and work together to achieve those goals. Such intentional, goal-directed action forms the foundation of independent agency, self-determination, and autonomy.

40. Elephants also show innovative problem-solving in experimental tests of insight (Foerder et al. 2011), where insight can be defined as the ‘a-ha’ moment when a solution to a problem ‘suddenly’ becomes clear. (In cognitive psychology terms, insight is the ability to inspect and manipulate a mental representation of something, even when you can’t physically perceive or touch the something at the time.) Or more simply, insight is thinking and using only thoughts to solve problems (Richard Byrne, *Evolving Insight*, Oxford Online Press, 2016). A juvenile male Asian elephant demonstrated just such a spontaneous action by moving a plastic cube and standing on it to obtain previously out-of-reach food. After solving this problem once, he showed flexibility and generalization of the technique to other, similar problems by using the same cube in different situations, or different objects in place of the cube when it was not available. This experiment again demonstrates that elephants can choose the appropriate action and incorporate it into a sequence of behavior in order to achieve a goal, which they kept in mind throughout the process.

41. Further experiments also demonstrate Asian elephants’ ability to understand goal-directed behavior. When presented with food that was out of reach, but with some bits resting on a tray that could be pulled within reach, the elephants learned to pull only those trays that were baited with food (Irie-Sugimoto et al. 2007). Success in this kind of ‘means-end’ task demonstrates causal knowledge, which requires understanding not just that two events are associated with each other but also that there is some mediating force that connects and affects the two which may be used to predict and control events. Moreover, understanding causation and inferring object relations may be related to understanding psychological causation, i.e., the appreciation that others are animate beings that generate their own behavior and have mental states (e.g., intentions).

Communication and Social Learning

42. Speech is a voluntary behavior in humans, whereby a person can choose whether to utter words and thus communicate with another. Therefore, speech and language reflect autonomous thinking and intentional behavior. Elephants also intentionally use their vocalizations to share knowledge and information with others (Poole 2011). Females and dependents call to emphasize and reinforce their social units and to coordinate movement. Male elephants primarily communicate about their sexual status, rank and identity, though like females they also use calls to coordinate movement and interactions in their social groups. Call types (47 have been described by Poole 2011) can generally be separated into [laryngeal calls](#) (such as rumbles, cries, roars) or [trunk calls](#) (such as trumpets, snorts), with different calls in each category being used in different contexts (Poole et al. 1988; Poole 2011; Poole and Granli 2004; Soltis et al. 2005; Wood et al. 2005). Field experiments have shown that African elephants distinguish between different call types (for example, [Contact-Calls](#) – rumbles that travel long distances to maintain associations between elephants that could be several kilometres apart, [Estrous-Rumbles](#) – that occur after a female has copulated or Musth-Rumbles that are made by males in the heightened sexual and aggressive state of musth) and these different call types elicit different responses in the listeners. Elephant vocalisations are not simply reflexive, they have distinct meanings to listeners and they are truly communicative, similar to the volitional use of language in humans (Leighty et al. 2008; Poole 1999; Poole 2011).

43. Elephants display a wide variety (> 300 described) of gestures, signals and postures, used to communicate information to the audience (Poole and Granli 2011 and [The Elephant Ethogram](#)). Such signals are adopted in many different contexts, such as aggressive, sexual or socially integrative situations, and each signal is well defined and results in predictable responses from the audience. That is, each signal or gesture has a specific meaning both to the actor and recipient. Elephants' use of gestures demonstrates that they communicate intentionally and purposefully to share information with others and/or alter the others' behavior to fit their own will.

44. Elephants use specific calls and gestures to plan and discuss a course of action. These may involve responding to a threat by a group retreat or mobbing action (including celebration of successful efforts - See [High-Fiving](#)), or planning and discussing where, when and how to move to a new location (Let's-Go-Rumble and Cadenced-Rumble as described earlier). I have studied elephant communication for two

decades and have field notes, acoustic recordings, and raw footage of numerous examples of such communication.

45. In group-defensive situations elephants respond with highly coordinated behavior, both rapidly and *predictably*, to specific calls uttered and particular gestures exhibited by group members. In other words, these elephant calls and gestures hold specific meanings not only to elephant listeners, but also, through experience, to human observers. The rapid, predictable and collective response of elephants to these calls and gestures indicates that elephants have the capability of understanding the goals and intentions of the signaling individual. For example, as was documented and described by me in Episode 2 of PBS six-part series *Gorongosa Park: Rebirth of Paradise*, matriarch Provocadora's contemplation of us ([Listening](#), [J-Trunk](#)) followed by her purposeful [Perpendicular-Walk](#) (in relation to us) toward her family and her [Ear-Flap-Slide](#) was a clear indication to her family to begin a [Group-Advance](#) (on us). This particular elephant attack is a beautiful example of elephants' use of empathy, coalition and cooperation. Provocadora's instigation of the Group-Advance led to a two and a half minute [Group-Charge](#) in which the three other large adult females of the 36-member family took turns to lead the charge, passing the baton, in a sense, from one to the next. Once they succeeded in their goal of chasing us away they celebrated their victory [High-Fiving](#) (with their trunks) and engaging in an [End-Zone-Dance](#). High-Fiving is also typically used to initiate a coalition and is both preceded by and associated with other specific gestures and calls that lead to very goal oriented collective behavior. Elephant group defensive behavior is highly evolved and involves a range of different tactical manoeuvres adopted by different elephants. The calls and gestures used are too many to mention here but are described in Poole 2011 and on The Elephant Ethogram.

46. In planning and communicating intentions regarding a movement, elephants use both vocal and gestural communication. For example, I have observed that a member of a family will use the axis of her body, [Body-Axis-Pointing](#), to point in the direction she wishes to go and then vocalize, every couple of minutes, with a specific call known as a [“Let's-Go” Rumble](#) (Poole et al. 1988; Poole 2011), “I want to go this way, let's go together.” The elephant will also use intention gestures – such as [Walk-Wait](#), [Foot-Swinging](#) – to indicate her intention to move and will [Look-Back](#) to see whether anyone is coming. Such a call may be successful or unsuccessful at moving the group or may lead to a longer (45 minutes or more) discussion (series of rumble exchanges known as

[Cadenced-Rumbles](#)) that I interpret as negotiation. A nice example of this behaviour, though without sound, can be seen in this [video](#) filmed in the Maasai Mara when members of Big Mama's family wanted to go in opposite directions. Sometimes such negotiation leads to disagreement and the group may split and go different ways for a period of time. In situations where the security of the group is at stake, for instance when a movement is planned through or near to human settlement, all group members are focused on the decision of the matriarch. So while “Let’s-Go”-Rumbles are uttered, others adopt a [Waiting](#) posture until the matriarch, after much [Listening](#), and [Contemplation](#) decides it is safe to proceed (see for example [this video](#) of matriarch [Selengei](#)), where upon they bunch together and move purposefully, and at a fast pace in a [Group-March](#) (see [this example](#) led by [Selengei](#) in Maasai Mara, 2015). Elephants typically move through dangerous habitats at high speed and at night in a very goal-oriented manner known as “streaking,” which has been described and documented through the movements of elephants wearing satellite tracking collars (Douglas-Hamilton et al. 2005). The many different signals – calls, postures, gestures and behaviors elephants use to contemplate and initiate such movement (including others e.g. [Ear-Slap](#), [Ear-Flap-Slide](#)) are clearly understood by other elephants (just as they can be by long-term study by human observers) – mean very specific things and indicate that elephants 1) have a particular plan which they can communicate with others; 2) can adjust this plan according to their immediate assessment of risk or opportunity; and 3) can communicate and execute the plan in a coordinated manner.

47. Furthermore, elephants have been shown to vocally imitate the sounds they hear around them, from the engines of passing trucks (see for example [Trunk-Like-Call](#)) and the calls of other species to the commands of human zookeepers (Poole et al. 2005, Stoeger et al. 2012). Imitating another’s behavior demonstrates a sense of self, as it is necessary to understand how one’s own behavior relates to the behavior of others. We now know that they use this ability in their daily lives to create and use names for one another (Pardo et al 2024).

48. Our recent groundbreaking discovery showing that elephants create and use names for one another helps to explain how elephants use the ability to imitate and create novel sounds in their daily lives (Pardo et al 2024). Our results have significant implications for elephant cognition, as inventing or learning sounds to address one another suggests that elephants have the capacity for some degree of symbolic thought.

49. Experimental evidence demonstrates that African elephants recognize the importance of visual attentiveness of the intended recipient (in this case, human experimenters) of gestural communication (Smet & Byrne 2014), further supporting the conclusion that elephants' gestural communication is intentional and purposeful. Furthermore, the ability to understand the visual attentiveness and perspective of others is crucial for empathy and mental-state understanding.

Memory and Categorisation

50. Elephants have both extensive and long-lasting memories, just as the folk stories and adages encourage us to believe. McComb et al. (2000), using experimental playback of long-distance contact calls in Amboseli National Park, Kenya, showed that African elephants remember and recognize the voices of at least 100 other elephants. Each adult female elephant tested was familiar with the contact-call vocalizations of individuals from an average of 14 families in the population. When the calls were from a familiar family – that is, one that had previously been shown to have a high association index with the test group – the test elephants contact-called in response and approached the location of the loudspeaker. When a test group heard unfamiliar contact calls (from groups with a low association index with the test group), they bunched together and retreated from the area.

51. McComb et al. (2001) went on to show that this social knowledge accrues with age, with older females having the best knowledge of the contact calls of other family groups. McComb et al. (2011) also showed that older females are better leaders, with more appropriate decision-making in response to potential threats (in this case, in the form of hearing lion roars). Younger matriarchs under-reacted to hearing roars from male lions. Sensitivity to hearing this sound increased with increasing matriarch age, with the oldest, most experienced females showing the strongest response to this danger. These experimental studies show that elephants continue to learn and remember information about their environments throughout their lives, and this accrual of knowledge allows them to make better decisions and better lead their families as they grow older.

52. Elephants' long-term memory is further demonstrated by data on their movement patterns. African elephants are known to move over very large distances in their search for food and water. Leggett (2006) used GPS collars to track the movements of

elephants living in the Namib Desert. He recorded one group traveling over 600 km in five months, and Viljoen (1989) showed that elephants in the same region visited water holes approximately every four days, even though some of them were more than 60km apart. Elephants inhabiting the deserts of both Namibia and Mali have been described traveling hundreds of kilometers to arrive at remote water sources shortly after the onset of a period of rainfall (Blake et al. 2003; Viljoen 1989), sometimes along routes that researchers believe have not been used for many years. These remarkable feats suggest exceptional cognitive mapping skills, reliant on the long-term memories of older individuals who traveled that path sometimes decades earlier. Indeed it has been confirmed that family groups with older matriarchs are better able to survive periods of drought. The older matriarchs lead their families over larger areas during droughts than those with younger matriarchs, again apparently drawing on their accrued knowledge (this time about the locations of permanent, drought-resistant sources of food and water) to better lead and protect their families (Foley, Pettoirelli, and Foley 2008).

53. It has recently been shown that long-term memories, and the decision-making mechanisms that rely on this knowledge, are severely disrupted in elephants who have experienced trauma or extreme disruption due to ‘management’ practices initiated by humans. Shannon et al. (2013) demonstrated that elephants in South Africa who had experienced trauma decades earlier showed significantly reduced social knowledge. During archaic culling practices, these elephants were forcibly separated from family members and subsequently translocated to new locations. Two decades later, they still showed impoverished social knowledge and skills and impaired decision-making abilities, compared with an undisturbed population in Kenya. Disrupting elephants’ natural way of life can negatively impact their knowledge and decision-making abilities.

54. Elephants demonstrate advanced ‘working memory’ skills. Working memory is the ability to temporarily store, recall, manipulate and coordinate items from memory. Working memory directs attention to relevant information, and results in reasoning, planning, and coordination and execution of cognitive processes through use of a ‘central executive’ (Baddeley 2000). Adult human working memory is generally thought to have a capacity of around seven items. In other words, we can keep about seven different items or pieces of information in mind at the same time (Miller 1956). We conducted experiments with wild elephants in Amboseli National Park, Kenya,

manipulating the location of fresh urine samples from related or unrelated elephants. The elephants' responses to detecting urine from known individuals in surprising locations showed that they are able to continually track the locations of at least 17 family members in relation to themselves, as either absent, present in front of self, or present behind self (Bates et al. 2008a). This remarkable ability to hold in mind and regularly update information about the locations and movements of a large number of family members is best explained by elephants possessing an unusually large working memory capacity, apparently much larger than that of humans.

55. Elephants show sophisticated categorisation of their environment, with skills on a par with those of humans. My colleagues and I experimentally presented the elephants of Amboseli National Park, Kenya, with garments that gave olfactory or visual information about their human wearers – either Maasai moran (male warriors who traditionally attack and spear elephants on occasion as part of their rite of passage), or Kamba men (who are agriculturalists and traditionally pose little threat to elephants). In the first experiment, the only thing that differed between the cloths was the smell, derived from the ethnicity and/or lifestyle of the wearers. The elephants were significantly more likely to run away when they sniffed cloths worn by Maasai than those worn by Kamba men or no one at all. In a second experiment, we presented the elephants with two cloths that had not been worn by anyone, but here one was white (a neutral stimulus) and the other was red—the color that is ritually worn by Maasai moran. With access only to these visual cues, the elephants showed significantly greater reaction to red garments than white, often including signs of aggression. We concluded that elephants are able to categorize a single species (humans) into sub-classes (i.e. 'dangerous' or 'low risk') based on either olfactory or visual cues alone (Bates et al. 2007). McComb et al. went on to show that the same elephant population can also distinguish between human groups based on our voices: The elephants reacted differently (and appropriately) depending on whether they heard Maasai or Kamba men speaking, and also when they heard male or female Maasai (where female Maasai pose no threat as they are not involved in spearing events), and adult Maasai men or young Maasai boys (McComb et al. 2014). Scent, sounds and visual signs associated specifically with Maasai men are categorized as 'dangerous', while neutral signals are attended to but categorized as 'low risk'. These sophisticated, multi-modal categorization skills may be exceptional among non-human animals.

Zoo Captivity is an Unacceptable Place for Elephants: it Cannot Meet their Complex Physical, Psychological, and Social Needs.

56. Elephants are highly intelligent, social animals. In elephant society an intricate network of relationships radiates outward from the mother-offspring bond through the extended family and the bond group, to clan, population and beyond to strangers, including the primary predatory threat to their survival: Humans. Some 300 documented behaviors, gestures and calls have evolved helping to mediate and maintain these relationships, to communicate over miles, and to direct extraordinarily coordinated bonding ceremonies and group defense.

57. Over millions of years elephants have roamed the earth as intelligent and social mammals, capable of planning, negotiating and engaging in collective decision making. Active more than 20 hours each day elephants move many miles across landscapes to locate resources to maintain their large bodies, to connect with friends and to search for mates. Elephants have evolved to move. Holding them captive and confined prevents them from engaging in normal, autonomous behavior and can result in the development of arthritis, osteoarthritis, osteomyelitis, boredom, and stereotypical behavior. Held in isolation elephants become bored, depressed, aggressive, catatonic, and fail to thrive. Human caregivers are no substitute for the numerous, complex social relationships and the rich gestural and vocal communication exchanges that occur between free-living elephants. And while a captive elephant is generally better off with the company of another elephant, this is at best a small comfort and no justification for the deprivation of autonomy and free movement that results.

58. Elephants need sufficient space and social and environmental enrichment to maintain agility and good physical and mental health. It is simply not possible to meet an elephant's physical, social and emotional needs in a few acres. Without adequate space, no zoo can suitably manage and care for elephants. Suitable care of any captive elephant requires proper attention to their physical, social and emotional needs, but the space available to the elephants held at the Pittsburgh Zoo, and in zoo captivity generally, is grossly inadequate to address and satisfy their needs in any of these vital areas. There are multiple reasons for this conclusion.

59. Foremost among the considerations is the fact that elephants require large areas to travel. Life in a small area removes all autonomy from the elephants, destroys any

semblance of their ordinary social structure, and with it, removes most of their emotional support. Accordingly, it is no surprise that the elephants at the Pittsburgh Zoo have no autonomy; they have lived under the control of keepers who manage their every movement and make almost every decision on their behalf.

60. To make this point more clearly, the life histories, health and behavior of the over 2,200 free-ranging individuals who have been studied in Amboseli, can and should be compared with the health and behavior of elephants in captivity.

61. Elephants in the wild roam over large areas and move considerable distances each day. They are intelligent, highly social animals with a complex system of communication. Led by the oldest female--the matriarch--the family is bonded by kinship, affiliation, experience, great loyalty and affection. Elephants in the wild are raised in a positive and affiliative environment. In Amboseli, members of the elephant population range over approximately 5,000 sq km. Each elephant and its family have a core area of use encompassing at least 194 sq km. Elephants travel 8 to 20 kilometers a day, frequently walking further in areas of lower resource availability, or when a male is searching for receptive females. Figures for Asian elephants are similar with home ranges averaging 350 km for males and 100 to 115 km for females and daily movements ranging between 8 and 22 km.

62. In contrast, a Pittsburgh Zoo elephant, of necessity, must be confined to a small area, on compacted soil and concrete. The outdoor exhibit yards are roughly .75 acres.¹ In such a small area, any natural substrate, such as dirt, is converted into a hard compacted surface, and foot diseases, arthritis, weight-related diseases, infertility, heightened aggression, and other neurotic behaviors almost invariably develop. Concrete and compacted ground place great strain on the feet and legs of these multi-ton animals.

63. In the wild an elephant matriarch's strong leadership is obvious during a moment of crisis. Otherwise, any member of the family, including juveniles, can propose a course of action. Such a proposal may be followed by vocal negotiation during which members can make independent or group decisions regarding where to go and what to do. In other words, elephant society is democratic, not oppressive, authoritarian or

¹ <https://downloads.regulations.gov/FWS-HQ-IA-2019-0062-0010/content.pdf>, at 176 (The elephant barn at the zoo "has outside exhibit yards of roughly 3/4 acres.").

despotic as life is for elephants in captivity where they are subject to the continual dominance and instruction of the keepers. Autonomy, the freedom to choose, is an important component of an elephant's well-being that cannot be met in a small, confined, externally controlled environment like a zoo.

64. Social networking is a predominant and essential aspect of an elephant's daily life. The Pittsburgh Zoo simply cannot satisfy this requirement of an elephant's well-being. In fact, in captivity, elephants are frequently taken from the individuals with whom they are bonded, to be exchanged with elephants from other institutions.

65. In Amboseli, where elephants grow up in a nurturing social environment, have the freedom to move, and autonomy over their own lives, elephants do not develop foot or weight problems as they do in captivity in general, and at the Pittsburgh Zoo in particular.

66. Of the 2,200 elephants who have lived in Amboseli over 34 years of study, not one has been observed to develop the type of foot infections and arthritic conditions so commonly observed in captivity. None have been overweight or obese.

67. In over 34,000 sightings of groups containing 1 to 550 elephants, not one elephant has been seen engaging in stereotypic behavior—such as repetitive pacing. Yet, videos show the elephants at the Pittsburgh Zoo engaging in these abnormal behaviors: see [here](#) and [here](#). Stereotypic behavior is a coping mechanism for the loneliness, boredom and frustration that characterizes zoo life, and is among the neurotic behaviors that are uniquely developed in captivity. Confined in small spaces, without autonomy of movement and behavior, and kept in socially deprived conditions, elephants become dysfunctional, unhealthy, depressed, and aggressive.

68. In addition to these emotional issues, confinement and inactivity lead not only to obesity but also to foot diseases, joint problems, and arthritis. As a result, female zoo elephants are 31-72% heavier than their wild counterparts. Infertility, maternal rejection, maternal infanticide, high infant mortality, hyper-aggression are all common problems in captivity. Degraded by a life of repression, many captive elephants have inflicted deliberate injury and even death on their keepers.

69. The key biological and behavioral needs of elephants simply cannot be met in a zoo environment. As explained above, the space at the Pittsburgh Zoo is inadequate to provide for sufficient exercise, to promote social interactions, or to allow for sufficient

social group sizes to ensure emotional and behavioral development. Elephants need a chance to search for their own food, to roam on soft surfaces for hours, to interact with a range of companions, and to make their own choices.

Sanctuary is Often the Best Option for Captive Elephants

70. For elephants in captivity, especially those born into it or kept there for a majority of their lives, going back to the “wild” is unfortunately not normally an option (but see Elephant Reintegration Trust – <https://www.elephantreintegrationtrust.com/projects>). For these elephants, human-run sanctuaries are currently the best option. The reasons are explained in detail in Poole & Granli, 2008 and relate to the orders of magnitude of greater space that is offered in sanctuaries. Such space permits autonomy and allows elephants to develop more healthy social relationships and to engage in a near natural movement, foraging, and repertoire of behavior.

71. Elephants are highly social animals and, whether male or female, they are suited to the company of other elephants. Elephants in captivity often do not get on with the elephants their captors select to put them with. Being fenced into areas too small to permit them to select between different companions and when to be with them, they have no autonomy. Elephants need a choice of social partners, and the space to permit them to be with the ones they want, when they want, and to avoid particular individuals, when they want.

72. Compliance with Association of Zoos and Aquariums (AZA) Standards for Elephant Management and Care, the United States federal Animal Welfare Act, or similar standards, laws, and regulations is inadequate for ensuring the wellbeing of elephants. I have long promoted the development of elephant sanctuaries and co-founded one of them (Santuário de Elefantes Brasil), because our more than four decades long study of free living elephants shows that the AZA specifications are woefully inadequate for meeting the needs of elephants (Poole & Granli 2008).

Examples of Successful Releases of Elephants to Sanctuary

73. Elephants with serious physical or psychological problems in zoos have usually become more normal functioning elephants when given more appropriate space in a sanctuary such as the Performing Animal Welfare Society (PAWS) in Northern California, The Elephant Sanctuary in Tennessee or Santuário de Elefantes Brasil.

74. For example, Maggie was considered to be an anti-social, aggressive elephant, and by the time she was moved from the Alaska Zoo to PAWS she was in such poor condition she could barely stand. Yet until her death in 2021, she thrived at PAWS. Indeed, she was considered to be PAWS' most social elephant (Ed Stewart, pers. comm.).

75. Ruby was transferred from the LA Zoo to the Knoxville Zoo in Tennessee where she did not successfully integrate with their elephants. When she was moved to PAWS she integrated easily with the other elephants and became a respected leader of her group (Ed Stewart, pers. comm.).

76. Sissy is another classic example. She had been transferred four times and had spent a decade and a half alone before being sent to the Houston Zoo, where she was labeled autistic and antisocial. She was returned to her solitary zoo where she killed a person. She was moved again to El Paso Zoo, where she was beaten because she was a killer elephant. In 2000 she was transferred to The Elephant Sanctuary in Tennessee (TES) and within six months of arrival she was calm and cooperative. She became a leader, putting all elephants at ease. In 2000 the United States Department of Agriculture (USDA) had given Sissy only a year to live. More than two decades later she is still going strong (Scott Blais, pers. comm.).

77. Bunny had been transferred four times and had only known a less than half an acre exhibit when she arrived at TES. She was 47 years old and had spent 40 years alone. Within 24 hours of arriving at sanctuary she was completely and seamlessly integrated into the group (Scott Blais, pers. comm.).

78. Maia and Guida, the first two elephants at Santuário de Elefantes Brasil, had lived together for 40 years. For most of these years, Maia was aggressive to Guida, knocking her over, pushing her down and pinning her to the ground. Within 12 hours of arriving at the sanctuary the gates were opened up between them. From the moment of arrival onward, no further aggression was seen. The sanctuary is currently home to six rescued elephants, with more on the way, who share 75 acres, including one area of 40 acres, another of 22 acres and three other smaller areas ranging from 1.5 to 4 acres. The three smaller yards are introductory areas to help assimilate and provide flexible care depending on the physical and emotional needs of the elephants, and they are generally left open into the larger habitats to permit a greater level of exploration and autonomous

living. This combination of possible spaces allows for adaptable integration of new elephants. Presently, there is one female African elephant residing within 5.3 acres, divided into three interconnected spaces, with expansion up to 80 acres under construction. Conversations advance for the retirement of elephants from other Latin American zoos. Santuário de Elefantes Brasil owns a total of 2800 acres (Scott Blais, pers. comm.).

79. In South Africa, African elephants that have been released from long-term captivity to the wild, after a period of suitable rehabilitation, have all adapted entirely, successfully resuming life as wild elephants despite decades in captivity, and not having lived in the 'wild' since they were juveniles (see Elephant Reintegration Trust – <https://www.elephantreintegrationtrust.com/projects>).

80. As the above examples illustrate, the problems seen in captive elephants can usually be mitigated with the proper attention and environment. There is no basis for arguing that captive and wild elephants are fundamentally different. They have the same biology and needs, but the failure of captivity to meet these needs results in physical and psychological problems.

81. Captive elephants have been safely and successfully transferred long distances to sanctuary. For example, PAWS has been involved in moving more than a dozen elephants over the years without incident. These moves include older females and from places as far away as Alaska and Toronto, Canada. Some of these elephants had lived in their prior facilities for over 40 years. There is no evidence that the inevitable stress of these moves has had a long-term effect on any of the elephants. Santuario de Elefantes Brasil moved Rana (<https://globalelephants.org/rana/>), a confiscated ex-circus elephant in her 50s, 1,675 miles to their sanctuary in late December 2018. In May 2020, in the midst of the global COVID-19 pandemic, an elephant named Mara (<https://globalelephants.org/mara/>) was transferred nearly 1,700 miles from the Buenos Aires Zoo to the same sanctuary, where she almost immediately bonded with Rana and has adapted well to life in sanctuary.² In November 2020, following an order of the Islamabad High Court, a male Asian elephant named Kaavan was flown about 2,500 miles from the Marghazar Zoo in Islamabad, Pakistan to the Kulen Promtep Wildlife

² Brook Jarvis, "How to Move Your Elephant During a Pandemic," New York Times (Aug. 9, 2020), available at: <https://www.nytimes.com/2020/08/09/science/coronavirus-elephants-wildlife-zoo.html>.

Sanctuary in Cambodia, where he is adjusting and immediately began interacting with other elephant residents.³

Summary

82. Scientific knowledge about elephant intelligence has been increasing rapidly in the past decade: what we currently know is only a tiny fraction of what elephant brains are likely capable of, and yet more amazing abilities are still likely to be discovered. But even based on what we know at this stage, including through my own and my colleagues' extensive experience, observations and studies, both African and Asian elephants share many key traits of autonomy with humans and like humans are autonomous beings.

I declare under penalty of perjury under the law of the Commonwealth of Pennsylvania that the foregoing is true and correct.

Signed on the 18 day of June,

at Bordya,

(date) 18 (month) 06 (year) 2025

(county or other location, and state) Trondheim

Agder

(country) Norway

(printed name) Joyce H. Poole

(signature) Joyce H. Poole

³ Kelli Bender, "Kaavan the 'World's Loneliest Elephant' Makes an Elephant Friend for the First Time in 8 Years," People (Dec. 1, 2020), available at: <https://people.com/pets/kaavan-worlds-loneliest-elephant-meets-first-elephant-in-8-years/>.

CURRICULUM VITAE

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Facebook: [www.fb.com/elephantvoices](https://www.facebook.com/elephantvoices); **Instagram:** www.instagram.com/elephantvoices

Twitter: www.twitter.com/elephantvoices

RESEARCH INTERESTS

Acoustic communication, Cognitive science, Decision-making, Conservation.

EDUCATION

Postdoctoral Princeton University Research Fellow 1984-1988; Advisor: Daniel Rubenstein.

Ph.D. 1982 University of Cambridge, U.K, Sub-Department Animal Behaviour. Dissertation: *Musth and male-male competition in the African elephant*; Supervisor: Robert Hinde.

B.A. 1979 Smith College, High Honours in the Biological Sciences. Dissertation: *Behavioral-Ecology of the African elephant*.

HONOURS AND AWARDS

2017 The Taft School - Horace Dutton Taft Alumni Medal

2015 Jackson Hole Wildlife Film Festival - Outstanding Achievement Award

2007 California Legislature Assembly - Certificate of Recognition for *tireless efforts in educating people on elephant captivity*.

1996 Smith College Medal - for elephant research and conservation work, *exemplifying the true purpose of a liberal arts education*.

1979 American Society of Mammalogists - A. Brazier Howell Award for paper on *musth* in African elephants.

PROFESSIONAL SOCIETIES/ BOARD and ADVISORY MEMBERSHIPS

2019 Member, Honorary Board of Directors, Performing Animal Welfare Society, PAWS

2017-present Member, African Elephant Specialist Group, IUCN

2015-present Member, Board of Directors, Global Sanctuary for Elephants

2015-present Member, Conservation Alliance of Kenya

2010-present Member, Kenya Elephant Forum

2010 Member, Alliance for Captive Elephants

2008-present Member, Board of Directors, ElephantVoices

2004 Member, Panel of Experts, Species Survival Network

2002-2009 Member, Scientific Advisory Committee, Amboseli Elephant Research Project

2002-2011 Trustee, Amboseli Trust for Elephants

2001 Member, Science Advisory Board, Captive Elephant Management Coalition

1988-present National Geographic Explorer

1988-2001 Member, African Elephant Specialist Group, Species Survival Commission, IUCN

EMPLOYMENT

- 2002-present **Scientific Director, ElephantVoices:** Directing the research, conservation and welfare work of the US non-profit organisation, ElephantVoices.
- 2002-2007 **Research Director, Amboseli Elephant Research Project:** Amboseli Trust for Elephants: Overseeing the elephant monitoring and collaborative research projects, and training programs for the 3 decades long study of elephants.
- 1999-2001 **Consultant, Basecamp Explorer AS:** Wildlife issues.
- 7/96 & 7/97 **Consultant, IMAX:** Scientific Advisor *Africa's Elephant Kingdom*, Discovery.
- 1994-1997 **Consultant, Richard Leakey & Associates:** Training; Lecturing; Advisor, wildlife documentaries.
- 1994-1995 **Author, *Coming of Age with Elephants*** (Hyperion Press, 1996; Hodder & Stoughton, 1996).
- 1991-1994 **Coordinator, Elephant Program, Kenya Wildlife Service:** Setting and implementing Kenya's elephant conservation and management policy; supervising management-oriented research; reconciling land use and other conflicts between elephants and people; building local expertise.
- 1990-1991 **Consultant, World Bank:** Pre-Project Facility, drafting the Elephant Conservation and Management Policy and Research Policy Framework and Investment Program, Kenya Wildlife Service.
- 1990 **Consultant, International Union for the Conservation of Nature:** Compiling overview of elephant conservation in Eastern Africa for Paris Donors Conference.
- 1989 **Consultant, Tanzanian Wildlife Department:** Drafting successful proposal to the Convention on Trade in Endangered Species to up list the African elephant to Appendix I of the Convention.
- 1989 **Consultant, World Wildlife Fund:** Discussions with Japanese and Chinese government officials and ivory carvers regarding detrimental impacts of the ivory trade on elephant survival.
- 1989 **Researcher, African Wildlife Foundation:** Assessing effects of poaching on East African elephant populations.

FIELD RESEARCH

- 2020-ongoing **Kenya:** Amboseli National Park: Documenting elephant behavior and communication for The Elephant Ethogram
- 2011-2019 **Mozambique:** Elephant monitoring and research, as part of the Gorongosa Restoration Project, Gorongosa National Park.
- 2011-2016 **Kenya:** Elephant conservation and citizen-science project in the Maasai Mara ecosystem.
- 2008 **Sri Lanka:** Minneriya-Kaudulla National Parks: Initiating an Asian elephant conservation project and behavior study.
- 1998-2009 **Kenya:** Amboseli National Park: Elephant communication, cognition and social behavior, conducting playback experiments and recording elephant vocalisations and behavior.
- 1998 **Kenya:** Maasai Mara National Park, Tsavo National Park & Laikipia District: Recording elephant vocalisations and behavior.
- 1997 **Tanzania:** West Kilimanjaro: Assessing elephant numbers and habitat use.
- 1990-1994 **Kenya:** Overseeing numerous elephant surveys and studies of elephants carried out under my direction by the Kenya Wildlife Service Elephant Program.
- 1975-1990 **Kenya:** Amboseli National Park: Male elephant behaviour; reproductive behavior; elephant vocal, gestural and olfactory communication.
- 1989 **Kenya, Uganda, Tanzania:** Amboseli, Tsavo, Queen Elizabeth and Mikumi National Parks: Assessing the effects of poaching on the age structure and social and reproductive patterns of elephant populations in East Africa.
- 1980-1982 **Kenya:** Amboseli National Park: Focal animal sampling *Musth* and male male competition among elephants.
- 1975-1979 **Kenya:** Amboseli National Park: participating in Cynthia Moss' long-term studies of elephants, identifying individual elephants, and collecting social behavior, demographic and ranging data.
-

LANGUAGES

English: Mother tongue

Kiswahili: Fluent

Norwegian: Working knowledge

PUBLICATIONS

Refereed articles, chapters, theses:

Published:

Lee, P.C., Moss, C.J., Njiraini, N., Poole, J.H., Sayialel, K. Fishlock, V.L. 2021. Cohort consequences of drought and family disruption for male and female African elephants. *Behavioral Ecology*, <https://doi.org/10.1093/beheco/arab148>

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Pardo, M.A. Poole, J.H., Stoeger, A.S., Wrege, P.H., O’Connell-Rodwell, C.E., Padmalal, U.K., de Silva, S. 2019 Differences in combinatorial calls among the three elephant species cannot be explained by phylogeny. *Behavioral Ecology*. 30(3), 809-820. <https://doi.org/10.1093/beheco/arz018>.

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Shannon, G., Slotow, R., Durant, S.M., Sayialel, K.N., Poole, J., Moss, C., McComb, K. 2014. Effects of social disruption in elephants persist decades after culling. *Frontiers in Zoology*, 10:62; <http://www.frontiersinzoology.com/content/10/1/62>

Poole, J.H., Whyte, I. & Kahumbu, P. 2013. *Loxodonta Africana* Savannah elephant. In: *Mammals of Africa*. Volume I. Jonathon Kingdon, David Happold & Thomas Butynski (Eds.). Academic Press.

Nowak, K., Dobson, A., Poole, J., Granli, P., Kahumbu, P., Lee, P., Kiiru, W., Joram, P., Malima, C., Moss, C. 2013. [Elephants are not diamonds. The Ecologist](#).

Lee, P.C., Bussière, L.F., Webber, C.E., Poole, J.H., Moss, C.J. 2013. [Enduring consequences of early experiences: 40 year effects on survival and success among African elephants \(*Loxodonta africana*\)](#). *Biology Letters*. 04/2013; 9(2):20130011. <https://royalsocietypublishing.org/doi/10.1098/rsbl.2013.0011>.

Chiyo, P.I., Archie, E.A. Hollister-Smith, J.A., Lee, P.C. Poole, J.H., Moss, C.J., Alberts, S.C. 2011. [Association patterns of African elephants in all-male groups: the role of age and genetic relatedness](#). *Animal Behaviour* 81: 1093-1099.

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- Poole, J.H. 1989. Mate guarding, reproductive success and female choice in African elephants. *Anim. Behav.* 37: 842-849.
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- Poole, J.H. 1987. [Rutting behavior in African elephants: The phenomenon of musth](#). *Behavior*. 102: 283-316.
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Technical Reports:

- Poole, J., B. Okita-Ouma, P. Granli, D. Kimanzi, M. Goss, L. Tiller, S. Kiambi, and I. Douglas-Hamilton. 2016. [Mara ecosystem connectivity: Information on elephant population status and movements for spatial planning and conservation in Narok County](#). Pages 1-28.
- Poole, J., Granli, P. 2018. Gorongosa elephant project: ElephantVoices 2017 report to the Gorongosa Restoration Project.
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Popular Articles:

- Cowell, G., Poole, J., Granli, P. 2017. Nalakite: The story of a Maasai Mara Matriarch. National Geographic Society Newsroom.
- Poole, J., Granli, P. 2014. Gift to the Maasai Mara, a Male Elephant is Born. National Geographic Society Newsroom.
- Poole, J., Granli, P. 2013. Little Fellow knew nothing about CITES. National Geographic Society Newsroom.
- Poole, J. 2003. Online with a big communicator. The Taft Bulletin. Fall 2003.
- Poole, J.H. 2000. *Trees of Dream Camp - Cultural uses by the Maasai*. Basecamp Explorer AS.
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- Poole, J.H., W. Njiraini, S. Sayialel. 1988. Elephant supersense. *Komba*. Wildlife Clubs.
- Poole, J.H. 1988. Elephant trunk calls. *Swara* 11(6): 28-31.
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Books:

- Poole, J.H. 1997. *Elephants*. Colin Baxter Photography, Grantown-on-Spey, Scotland.
- Poole, J.H. 1996. *Coming of Age with Elephants*. Hyperion Press, New York; Hodder & Stoughton, London.

PUBLIC EDUCATION

Websites and Social Media

ElephantVoices website	www.ElephantVoices.org
ElephantVoices on Facebook	www.facebook.com/elephantvoices
ElephantVoices on Instagram	www.instagram.com/elephantvoices
ElephantVoices on Twitter	www.twitter.com/elephantvoices
ElephantVoices on Vimeo	www.vimeo.com/elephantvoices
ElephantVoices on SoundCloud	www.soundcloud.com/elephantvoices
The Elephant Charter	www.theelephantcharter.info

Online Databases & Apps

[The Elephant Ethogram: A Library of African Elephant Behavior](#) Over 400 African savanna elephant behaviors documented with written descriptions, 2,400+ educational video clips and hundreds of audio files and images.

[Gorongosa Elephants Who's Who & Whereabouts](#) houses identity, demographic and sightings data for 396 adult elephants from Gorongosa National Park population, Mozambique. (Password-protected)

[Mara Elephants Who's Who & Whereabouts](#) houses identity, demographic and sightings data for 1,282 adult elephants from the Maasai Mara population, Kenya.

Mara EleApp: A [cellphone application for data collection](#) by scientists and citizen scientists for upload to the [Mara Elephants Who's Who & Whereabouts](#)

Gorongosa EleApp: A multi-language (English, Portuguese) cellphone application for data collection by scientists and citizen scientists for upload to the [Gorongosa Elephants Who's Who & Whereabouts](#) (Password-protected)

Printed Articles and books highlighting the work of Joyce Poole (a selection)

Elephant social behavior and communication research and conservation work featured in:

Aftenposten, Daily Telegraph, LA Times, Highlights for Children, Kyodo News, National Geographic Adventure, National Geographic Explorer, National Geographic Kids, National Geographic Magazine, National Geographic News, New York Times Magazine, New York Times, Readers' Digest, Science, Science News, Science Times, Scientific American, Scholastic, Spektrumdirekt, The Guardian.

2021 [What Has Four Legs, a Trunk and a Behavioral Database](#), New York Times.

2021 [The First Google Translate for Elephants Debuts](#), Scientific American.

2021 [What are elephants saying? First-ever library reveals communication mysteries](#), National Geographic.

2021 [Roar-Rumble And Squeal-Trumpet: Scientists Compile An Elephant Lexicon](#), Forbes.

2014 Jodi Picoult, *Leaving Time*, a novel.

2005 Kay Redfield Jamison, *Exuberance: A Passion for Life*, non-fiction.

2001 Martin Meredith's *Africa's Elephant*, a biography.

1992 Doug Chadwick, *Fate of the Elephant*.

1992 Doug Chadwick in his feature article for National Geographic Magazine.

Artistic work featuring elephant calls recorded by Joyce Poole (a selection)

2016 Carlos Casas, *Cemetery*, film, a visual and acoustic work in progress.

2013 Paul Winter, *Summer Solstice Celebration Performance* June 22 at the Cathedral in New York.

2010 Paul Winter, *Miho, Journey to the Mountain*.

2009 James Cameron, *Avatar*, film.

2002 Ruichi Sakamoto, *Elephantism*, DVD Book interviews and discussions.

2002 Jim Metzner, *Pulse of the Planet: Extraordinary Sounds from the Natural World*.

Radio (a selection)

- 2021 Scientist Joyce Poole [On What Elephants Have To Say](#), NPR.
- 2012 Sam Litzinger interview on The Animal House/NPR (WAMU 88.5).
- 2009 Elephant welfare views featured on WBUR's Inside Out Documentary on American Zoos with Diane Toomey.
- 2008 Elephant communication research featured in Up Front Radio, San Francisco with Sandip Roy Chowdhury.
- 2008 Elephant communication, cognition and welfare with Karl Losken Animal Voices 102.7fm in Vancouver BC Canada.
- 2005 Science Update, American Association for the Advancement of Science (AAAS).
- 2005 BBC Radio Science, the Leading Edge.
- 2005 German Public Radio (SWR) program Campus.
- 2005 NPR Elephant vocal learning.
- 2005 BBC News Scotland Vocal Learning in elephants.
- 2005 Elephant welfare ABC's Radio 702 with Rory McDonald.
- 2004 Elephant communication research featured in BBC's Beyond our Senses program Sounds of Life with Grant Sonnex.
- 2004 Elephant communication research featured in NPR program on elephant language.
- 1996 WETA-FM, News 820's Openline & WNYC.
- 1981 Musth in the African elephant, BBC Radio 4, The living World.

Television (a selection)

- 2019 *Women of Impact*, National Geographic.
- 2016 *Mind of a Giant*, award winning documentary, National Geographic and Vulcan Productions.
- 2015 *Rebirth of Paradise, Episodes 2 and 5* National Geographic and PBS.
- 2013 *An apology to elephants*, HBO.
- 2012 *War Elephants*, award winning documentary about the traumatised elephants in Gorongosa National Park, Mozambique, and their recovery. National Geographic Wild, worldwide.
- 2012 [Live conversation](#) on National Geographic's Facebook Page.
- 2008 Elephant communication research is featured in Elephant having tales to tell, NHK, Japan (Japanese and English versions).
- 2006 Interview on elephant communication and cognition for Smart Planet for REDES-TVE, Spain.
- 2005 Elephants and vocal learning, Daily Planet Discovery Channel Canada.
- 2005 Elephant cognition and conservation views featured on National Geographic Explorer *Elephant Rage*.
- 2004 Elephant recordings featured in Discovery Channel's Echo III.
- 2002 Elephant communication research, Elephant's Talk, featured in BBC documentary *Talking with Animals*.
- 1999 Research featured in *Inside the Animal Mind Part 3 Animal Consciousness*, WNET Nature.
- 1998 Featured on Episode 16, *Elephants*, in series, *Champions of the Wild*, Omni Film Productions, Vancouver, Canada.
- 1996 Life, elephant research and conservation work subject of National Geographic Special, *Coming of Age with Elephants*.
- 1996 *Wildlife Warriors*, National Geographic Special.
- 1996 *A Voice for Elephants* USIA AfricaPIX.

- 1996 Discovery Channel documentary "Ultimate Guide to Elephants".
- 1990 *Elephants like us*, Rossellini and Associates.
- 1990 *The language of the elephants*, Rossellini and Associates.
- 1989 Elephant research and conservation work featured in National Geographic Special *Ivory Wars*.
- 1988 Research highlighted in BBC production *Trials of Life* with David Attenborough.
- 1988 Work on elephant infrasound featured in *Supersense* BBC Natural History Unit series on animal senses.
- 1987 Featured in Sports and Adventure, *Women of the World*.

Work also featured on News and Talk shows such as CNN, 1993, ABC news Women and Science, The Today Show, 1996, West 57th Street CBS News, 1989, PM Magazine, 1987.

Exhibit B

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