Title
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Journal
International Journal of Comparative Psychology, 29(1)

ISSN
0889-3675

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Publication Date
2016

DOI
10.46867/ijcp.2016.29.00.23

INTERNATIONAL JOURNAL OF COMPARATIVE PSYCHOLOGY

2016, 29
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Special Issue Editors
Peer-reviewed

A Legacy of Research Inspired by Dr. Stan Kuczaj (1950 – 2016)
A Special Issue – Part 1

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On 14 April 2016, the scientific community lost Dr. Stan Kuczaj, professor at the University of Southern Mississippi and Director of the Marine Mammal Behavior and Cognition Laboratory. He was a beloved teacher, researcher, friend, mentor, and colleague. By age 65, this well-liked, respected professor had achieved world-renowned status in multiple disciplines—comparative psychology, behavioral sciences, and developmental psychology. His tremendous success in these areas resulted in a legacy of more than 50 master's- and doctoral-level students working in a variety of fields; he also had hundreds of collaborators from around the world. Stan significantly contributed to and influenced the current direction of these fields and had many plans and research projects still to accomplish. Indeed, Stan was editor of this journal for 7 years. In Stan's honor, this special issue represents the first part of a compilation of research studies that were representative of, inspired, influenced, guided, or created by Stan.

Stan loved all things having to do with language and development, especially when he could interwine those loves with marine mammals. After founding the Marine Mammal Behavior and Cognition Laboratory in 1996 at the University of Southern Mississippi, Stan expanded his scientific investigations from human infants to marine mammals. Initially, research subjects ranged from the bottlenose dolphins and sea lions residing at Marine Life Oceanarium to wild dolphins in the Mississippi Sound, wild rough-toothed dolphins off of Utila, Honduras, and sperm whales in the Gulf of Mexico. Eventually other taxa were added, such as the Asian elephants at Busch Gardens in Tampa, Florida and the walruses at Six Flags Discovery Kingdom, Vallejo, California. Using his developmental background combined with his training in longitudinal, observational, and experimental research, Stan explored a number of comparative questions including the behavioral development of dolphin calves, the presence and influence of personality and emotion in animal behavior, the significance and application of environmental enrichment, the impact of anthropogenic noise on marine mammals, and the importance of maternal care, play, and physical contact in different social interactions among different-aged animals. His work in acoustics explored echolocation and whistle development in dolphin calves, sperm whale codas, and a two-way system for communication. These studies were possible due to his impressive ability to get along with almost anyone and his unquenchable thirst for knowledge inspiring him to attempt innovative experimental designs.

The articles contained in Part 1 of this special issue are representative of the myriad and fruitful collaborations formed by Stan with researchers from around the world. With contributers representing Australia, Canada, England, Japan, and the United States, these papers encompass a diversity of subjects encountered in the wild and under human care, ranging from a variety of marine mammals (i.e., bottlenose dolphins, killer whales, manatees, beluga whales, Australian humpback dolphins, and walruses) to terrestrial mammals (i.e.,

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otters, elephants, and mice) and birds (i.e., chickadees). Even more impressive is the variety of research designs utilized by these studies. Stan firmly believed that observational studies were as valuable as experimental ones, a belief that is embodied and perpetuated by the studies published in this special issue.

Part 1 of the special issue on Stan's legacy begins with field-based observations of bottlenose dolphins and Australian humpback dolphins. Ann Weaver explores the possible functions of bottlenose dolphins wearing grass, a topic that Stan was very excited about as indicated in Dr. Weaver's statement below:

> This paper showcases Stan's wide-ranging interests and capabilities. Stan was personally fascinated by grass-wearing behavior. His background in cognitive capabilities allowed that bottlenose dolphins *could* be capable of using objects to communicate a message. Stan and I had many stimulating discussions about grass-wearing and the implications of its most characteristic feature: Dolphins wear grass most often during a change in group composition – fusion. Given that, Stan proposed the idea that grass was a form of stimulus enhancement, and as such, grass-wearing may function in greeting and bids for attention in situations in which there is competition for social partners. He worked hard on this project. His input was invaluable. We collaborated closely on this writing. Among the many reasons that I deeply regret that Stan is not here, is that he cannot see this report come to fruition.

Tamzin Barber presents research on object carrying behavior in Australian humpback dolphins, a remarkably understudied species. As she indicates in her statement, Stan was a staunch supporter of her work with these provisioned animals:

> Dr. Kuczaj mentored my research from its inception and it would be an honor to be part of this issue commemorating his life and work. I cannot say enough positive words about Dr. Kuczaj, his support for my research and the advice he offered.

Gorden Bauer and his undergraduate coauthors examine the lateralized side preference of captive and wild manatees, a topic that Stan frequently studied in other contexts with different species. As Dr. Bauer states in his statement:

> There are several aspects of this paper that I think are consistent with Stan's approach to research: dedication to educating students and integration of laboratory and field research. The first three authors were all undergraduate or recently graduated students at the time they collected the data reported here. One now has her PhD and the others are in PhD programs.

Fay Clark also explores behavioral laterality in a more controlled paradigm using an underwater maze apparatus with bottlenose dolphins. With the support of Stan, Dr. Clark was able to test the usefulness of an enrichment apparatus and its influence on dolphin swim behavior.

Another graduate student in Stan's program, Jessica McCord, is investigating male walrus breeding behavior at Six Flags Discovery Kingdom. In conjunction with her coauthors, it is hoped that a better understanding of this species will assist conservation efforts as walrus habitat continues to be lost. As Jessica posits:

> This study is published in loving memory of the late Dr. Stan A. Kuczaj, II. I will forever be grateful for the teaching and guidance provided by Dr. Kuczaj. Without him, this study would not be possible, and I hope to continue on his legacy. Dr. Kuczaj was and continues to be, through living memory, an inspiration to so many.

The next series of studies presents acoustical work that Stan either guided or influenced in some manner. Beginning with a study on the development of echolocation by dolphin neonates that was conducted at the infancy of the USM Marine Mammal Behavior and Cognition Lab with the help of the SPAWAR Naval Marine Mammal Program and then graduate students, Heather Hill, Karissa Tranel Sanbria, and Jennifer Hendry Harder. Jennifer Harder and co-authors wish to dedicate this paper to Stan as it was in preparation at the time of his death. As he said, after 13 years, it was about time to get this paper out!

The next study in the acoustics section reflects the diversity of Stan's interests. Jenna Congdon and coauthors explore the responses of chickadees to playbacks of predator threats and conspecific calls in their paper. Stan greatly respected this experimental methodology, as it correlates sound with behavior and facilitates a better understanding of the possible functions of acoustical information. One of Stan's visions was to see marine mammal acoustical research parallel the accomplishments of investigations into avian bioacoustics.

In pursuit of pairing sound with behavior, Ann Bowles and her coauthors explore the relationship between various behaviors and vocals experessed by female killer whales. As indicated in their abstract, Stan would have appreciated both their approach and interpretation:

> Given these observations, synchronous behaviors in the presence of calves could function in one or more of the following ways: altering the signal value of calls, emphasizing an aspect of the social context, and facilitating learning. All are possibilities at the interface between cognition and communication that would have interested Stan Kuczaj.

Similarly, Stan would have also appreciated the efforts of Sam Ridgway and his colleagues to quantify the possible emotionality of an acoustical signal they coined as a *victory squeal*. This signal is emitted by bottlenose dolphins and other odontocetes after an emotionally exciting event, such as catching a fish or being correct on a task. As is stated in their contribution letter:

> We hope that our work with bottlenose dolphins and presentation of novel findings regarding dolphin vocalizations and emotions will aid in the effort to commemorate Dr. Stan Kuczaj's lifelong work and vision.

Our final section of this special issue – Part 1 summarizes some of the cognitive work that Stan initiated, inspired and conducted. A current graduate student of Stan, Erin Frick and her coauthors, explore the flexibility and use of a novel tool in Asian small-clawed otters. Stan consistently encouraged his students to expand their own behavioral repertoires by investigating similar topics across species. As Erin and her coauthors submit:

> To Dr. Stan Kuczaj, thank you for all your support and confidence, your legacy will continue on in the people you inspired throughout your life.

An example of diversifying one's repertoire, Lauren Highfill, a former student and associate editor of IJCP, and colleagues also investigate the understanding of a functional tool, but with Asian elephants. As indicated in their dedication, Stan played a significant role in developing this idea:

> The authors would like to note the influence of Dr. Stan Kuczaj on this project. While most of Stan's research involved marine mammals, elephants had a special place in his heart. He would visit the elephants at Busch Gardens any chance he could. In fact, as fate would have it, he was visiting the day we held our initial brainstorming session for this project. And in true Stan form, he provided his support throughout the project. We dedicate this paper to him.

When possible, Stan encouraged students to investigate basic research questions particularly those involving fundamental learning questions. Mary Katherine Lawrence and her colleagues at Dolphins Plus examined the learning patterns and potential mechanisms of three dolphins as they exhibited a *create* behavior while under stimulus control. As expressed in their contribution:

> Our research drew inspiration from Dr. Kuczaj's achievements in marine mammal cognition; in particular, his work with the "create" behavior documented with bottlenose dolphins. . . . and wished to publish in tribute to Dr. Kuczaj's mission and in celebration of his legacy.

Shigeru Watanabe, a long-time collaborator and colleague of Stan, presents research on the using mirrors as a way to reduce stress in caged mice. This study reflects Stan's interest in research on mirror processing and the importance of appropriate enrichment for animals under human care.

The final study conducted by two former students of Stan, Heather Hill and Deirdre Yeater, rounds out this first part of the special issue. This study is a replication and extension of a study that Stan collaborated on in 2011. Using a comparative approach in which the same methodology was used, the authors of the current study tested the ability of three different odontocetes to discriminate between familiar and unfamiliar humans in different conditions.

As can be seen from the summaries above, Stan's scientific legacy to the developmental and comparative communities continues on with a dedicated corps of past students and collaborators. We are eager to collaborate, share resources and insights, and pursue challenging topics in human and animal cognition with rigor, candor, and the spirit of intellectual adventure passed on to us by our mentor. Because Stan impacted so many people around the world, we will be publishing a second part to this commerative special issue in April 2017.

If interested in celebrating Stan's life and legacy, his family has requested that any contributions be made to the "Kuczaj Memorial Fund" located at http://www.nmmf.org/kuczaj-memorial-fund.html.

Figure 1. The diversity of Dr. Stan Kuczaj's legacy.

Figure 2. Current and past students of Dr. Stan Kuczaj.

Figure 3. Family and friends, near and far, celebrating the life Dr. Stan Kuczaj with a toast of his favorite “shot”.