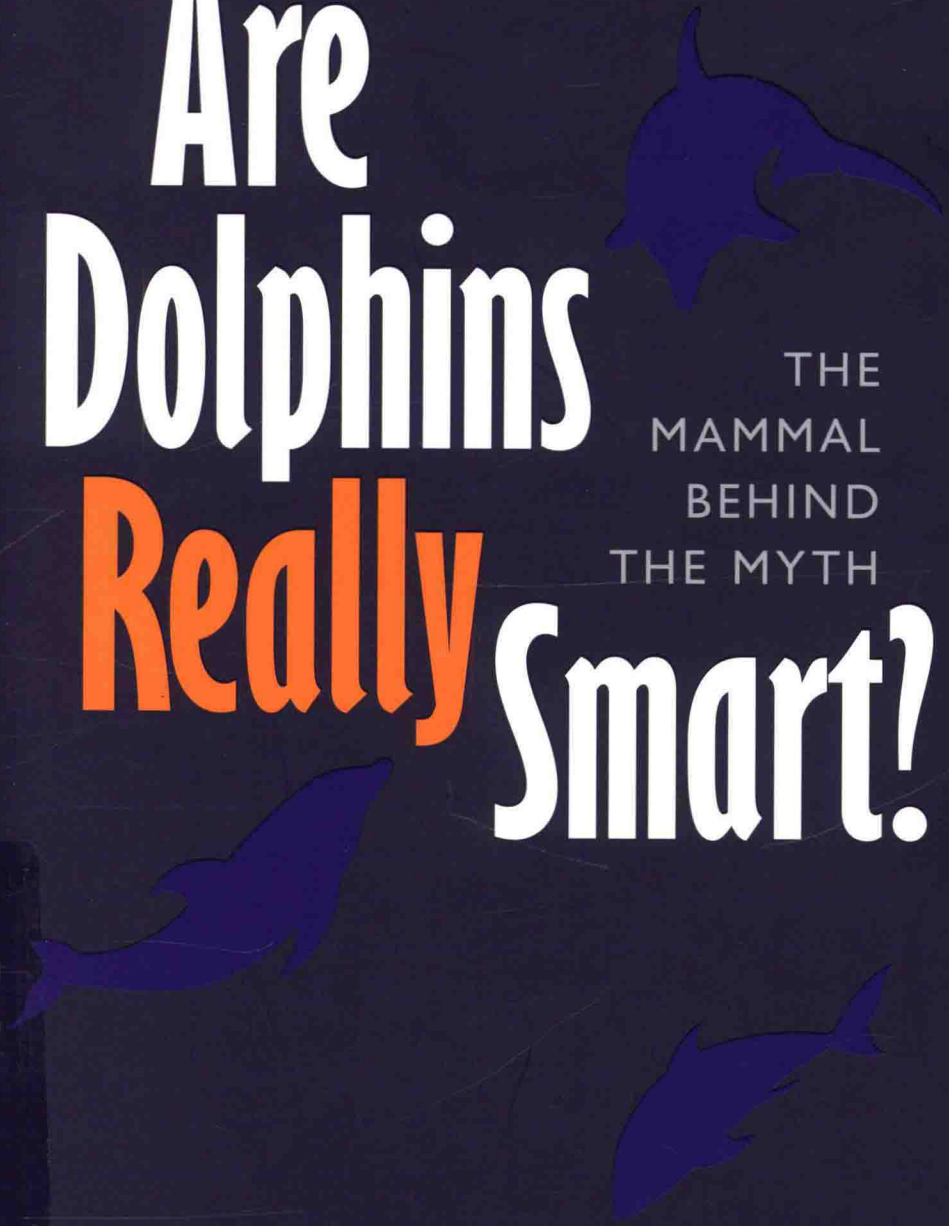
Are Dolphins Really Smart?

THE MAMMAL BEHIND THE MYTH



JUSTIN GREGG

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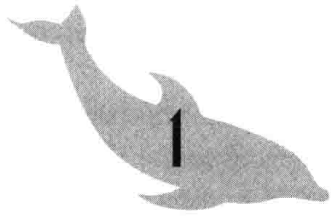

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The Second Most Intelligent Creature on Earth

The fact that an opinion has been widely held is no evidence whatever that it is not utterly absurd; indeed in view of the silliness of the majority of mankind, a widespread belief is more likely to be foolish than sensible.[1] *Bertrand Russell*

This is the story of a truly remarkable animal. Its bond with humankind goes back many centuries, if not millennia, and it appears in our earliest myths and legends. Recent scientific research has revealed its sophisticated social behavior and remarkable cognitive abilities. With these discoveries, many who once spoke of the undeniable superiority of the human intellect have been humbled into silence. What's more, this extraordinary creature is only distantly related to humans and other primates, which makes the following discoveries of its intellectual prowess all the more startling:

- They can live in groups numbering in the hundreds and are able to recognize and remember individuals within the group, as well as their place in a complex social hierarchy.[2]
- Certain behaviors appear to be learned from other members in the group: a form of social transmission of behavior traditionally

seen only in primates, and the first steps toward what scientists now refer to as animal culture.[3]

- They have been shown to display signs of empathy—registering increased heart rate and anxious behaviors when watching their friends or family in distress.[4]
- When food is found, they will alert members of the group by producing a complex series of vocalizations that vary depending on the kind of food. What's more, these vocalizations appear to refer to food in a one-to-one correlation—almost like human words.[5]
- They produce unique vocalizations that appear to refer to different threats in the environment—these vocalizations are meant to warn the group of approaching danger. Individuals will take evasive action that differs depending on the kind of vocalization they hear.[6]
- In experimental conditions, they have been shown to have the ability to anticipate future events, and to exercise self-control—delaying an immediate food reward when they realize that by waiting they may get an even larger food reward. Thus, like humans, they may be able to plan for the future.[7]

This inventory of astonishingly complex cognitive talents belongs not to the dolphin (as one might have expected based on the title of this book), but to the humble domestic chicken. Surprised? If so, you can take some comfort in the fact that some (although not all) of these complex behaviors have also been observed in dolphins. The lesson here, however, is that chickens are not as dim-witted as popular opinion would have us believe. Long-held ideas of animal intelligence are increasingly out of step with the rapid pace with which the vanguard of science penetrates the mysteries of the animal mind. If Bertrand Russell's tongue-in-cheek maxim as to the silliness of mankind is as insightful as it is funny, there's good reason to subject these popular ideas to careful scrutiny.

Popular opinion considers dolphins to be fairly intelligent animals. As we shall see, there is ample scientific evidence to lend support to this idea. But if we're going to think critically about what it means to be "a fairly intelligent animal," we'll need to do three things: 1) produce a working definition of *intelligence*; 2) get to grips with what the scientific literature on dolphin intelligence is (or is not) telling us; and 3) put these findings in proper context by examining what is known about the intelligence of other species. We'll need to ponder the implications of this list of ostensibly complex chicken behavior, and decide what it means that the veined octopus, with a brain smaller than a dolphin's eyeball, is known to use tools with a sophistication rivaling that of dolphins.[8] The past few decades have produced many startling discoveries of complex animal behavior scattered throughout the taxa, including in animals previously considered unintelligent. Science continues to challenge our traditional ideas about where individual species should be placed on the continuum of animal intelligence, and whether a continuum of animal intelligence is a useful model to begin with. Dolphins might well be smart, but the idea that they sit atop a pedestal as "the second most intelligent species on the planet"[9] is now passé. Under Ben Goldacre's banner of "I think you'll find it's a bit more complicated than that,"[10] I can safely state that the notion that *dolphins are smart and chickens are stupid* is at best a gross oversimplification, and at worst completely wrong and thoroughly unhelpful.

The Myth of the Intelligent Dolphin

The myth of the intelligent dolphin has been percolating in popular culture for more than half a century, and comprises a number of beliefs about dolphins, ranging from the innocuous (e.g., dolphin societies are unusually complex) to the bizarre (e.g., dolphins can teleport people to Mars).[11] I have distilled the myth into five core themes that will be carefully dissected in this book:

1. The idea that the dolphin brain is unusually large and sophisticated.
2. The idea that the dolphin mind is unusually complex when it comes to self-awareness, consciousness, and emotions.
3. The idea that dolphins display unusually sophisticated behavior in the wild and in experimental situations.
4. The idea that dolphins speak dolphinese, a vocal communication system as complex as human language, which scientists will one day decipher.
5. The idea that dolphins lead usually complex social lives, and live in peaceful harmony with each other and their environment.

My aim in writing this book is to deconstruct the dolphin myth, and to determine to what extent the ideas underpinning these five themes are based on scientific fact as opposed to science fiction. By remaining impartial, skeptical, and critical of the results of scientific experiments and observations of dolphin behavior, it is possible to create a realistic picture of these much-loved animals. I won't be able to tackle every claim about dolphins that can be found in popular culture, as there simply isn't enough space in this book (or any book that is expected to be bound in a single volume). There are probably more weird ideas about dolphins swimming in cyberspace than there are dolphins swimming in the ocean. Assuming that you, kind reader, are sympathetic to the concepts of critical thinking, skepticism, and the value of science at explaining the natural world, there is no need for me to go into detail as to why dolphins most likely cannot teleport you to Mars.

The Legend of Lilly

As I began doing research for this book and tracing the history of the development of the many ideas about dolphins we see in popular culture today, I was surprised to learn that nearly all of the principal

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concepts underpinning the five major themes can be traced to a single man: John Cunningham Lilly. As a dolphin researcher I was of course aware of Lilly's monumental influence on the field of dolphin science—he is, as I am sure most dolphin scientists will agree, the father of the study of dolphin intelligence. His ideas and writings almost single-handedly propelled the dolphin to the forefront of the emerging field of animal cognition in the 1960s. But I was still astonished that so many of the concepts I was certain were attributable to later scientists (and non-scientists), like the idea that dolphins communicate by transmitting holographic sound images, were in fact first proposed by Lilly.

I want to make clear that this book is not a critique of John Lilly's ideas per se. The dolphin intelligence myth that Lilly originated has been evolving for decades as new scientific discoveries and fanciful speculation continue to churn up a heady soup of dolphin-inspired lore. And please be clear that when I use the term *myth*, I do not mean that this assembly of popular beliefs about dolphins is collectively false. Like all modern myths, and much like Lilly's own writings, when we look under the hood we find a complex web of truths and falsehoods, with uncertainties and speculation binding it all together like glue. Some of the concepts dealt with in this book are ones that Lilly himself might never have encountered. But Lilly's catalytic influence on dolphin science cannot be overlooked, which is why it's necessary to briefly recount just how he managed to transform what was initially regarded as an odd air-breathing fish at the turn of the 20th century into an animal whose intelligence is so sophisticated that it deserves the same constitutional protection as you or me.[12]

Lilly was a medical doctor and neurophysiologist with the National Institute of Mental Health. In his early research career he specialized in invasive cortical vivisection, which involved implanting electrodes into primate brains in order to monitor or stimulate the central nervous system.[13] Lilly's first encounter with a cetacean brain was in 1949, when he joined WHOI physiologist Pete Scholander on an excursion

to examine the brain of a stranded pilot whale. Although the pilot whale's brain was too badly decomposed to conduct an investigation, Lilly's interest was piqued. On Scholander's advice, Lilly contacted Forrest G. Wood at Marine Studios in Florida, which he visited with a team of scientists in 1955 with the intent to map the dolphin cortex using the same techniques he had applied to primates. But his attempts at anesthetizing the dolphins failed—dolphins are conscious breathers, meaning that a fully anesthetized dolphin will rapidly succumb to asphyxiation as its brain loses communication with its diaphragm. Consequently, Lilly inadvertently euthanized five dolphins on this initial research excursion. But Lilly returned to Marine Studios in 1957 and again in 1958, having devised a method of inserting electrodes into the brain of a fully awake/conscious dolphin without killing it, and thus allowing his cortical mapping work to go forward.[14] He could then stimulate either the pleasure or the pain centers of the dolphin's brain as required by the experiment. This might sound barbaric to the modern reader—especially considering that these types of invasive procedure on marine mammals are no longer performed in the United States and a number of other countries. But keep in mind that at present, vivisection is routinely performed on many other animal species in US laboratories—from fruit flies to primates—so Lilly's techniques are not quite as outdated as they initially appear.

It was during one of these vivisection experiments that Lilly had his Eureka moment, which would result in a fundamental shift to how he—and the rest of the world—would relate to dolphin-kind. After reviewing slowed-down recordings of vocalizations produced by one of his dolphin subjects that had been making an awful lot of noise while having its brain stimulated just before it died, Lilly became convinced that the animal was attempting to communicate with the human experimenters by imitating the sounds of their speech. He also noted that when an injured dolphin was reunited with its tank mates, it "called" to them, and promptly received help/care—something Lilly argued was evidence of an intraspecies language. Lilly also observed

that dolphins, unlike primates, did not become violent when having electrodes inserted into their brains—something he attributed to a sophisticated ability to control their emotions. The conclusion Lilly drew from these observations was that lurking inside the misleadingly piscine dolphin body was an undiscovered intelligence and capacity for language that could rival humankind.

Lilly presented his ideas on these subjects in short order at two scientific conferences in San Francisco in 1958, which drew the interest of Earl Ubell, the Science Editor at the *New York Herald Tribune*. Ubell organized a news conference for Lilly, which resulted in the dissemination of Lilly's novel ideas (which were eventually published in the *American Journal of Psychiatry)*[15] across the globe, and forever changed the nature of the relationship humanity had with the aquatic environment. The US Marine Mammal Protection Act of 1972—a landmark piece of legislation that banned "the act of hunting, killing, capture, and/or harassment of any marine mammal"—was due in no small part to Lilly's writings on the dolphin mind, and the effect his ideas had on public opinion. Here is an excerpt from Ubell's original article published soon after the news conferences of 1958, which likely constitutes the very first popular report of dolphin über-intelligence and the existence of dolphin language:

> Dr. Lilly believes they [dolphins] may be the only other creature besides man to be able to transmit complicated ideas by a kind of speech. And indeed they may be the only creature capable of learning true human speech. Next to man, it has the most complicated nervous system in the entire animal kingdom.[16]

After the flurry of media attention following his presentations, Lilly received grants to study dolphin behavior from the National Science Foundation, the Office of Naval Research, and NASA. The potential implications of Lilly's work as it pertained to controlling dolphin (and human) behavior via implanted electrodes caught the attention of the FBI, the CIA, the Defense Department, and J. Edgar Hoover, with Lilly

being involved in classified security meetings to learn how, at the height of the Manchurian Candidate scare in the late 1950s, his research could apply to brainwashing and mind control. Although many scientists had initially criticized Lilly for going too far with his speculations concerning dolphin language and intelligence, the simple fact that the US government was interested in his work, which would eventually lead (as Lilly had correctly predicted) to the use of dolphins for mine hunting and other war-time applications under the US Navy's Marine Mammal Program, lent him considerable legitimacy in the eyes of the public. Lilly's scientific prominence was confirmed three years later when he attended a conference together with Carl Sagan, Frank Drake, and a dozen other leading scientists and deep thinkers at the National Radio Astronomy Observatory in Green Bank, West Virginia. This history-making conference established the field of SETI (Search for ExtraTerrestrial Intelligence) and the Drake Equation. The attendees became known as the Order of the Dolphin—presumably in deference to Lilly's influential ideas of communicating with other species—be it dolphins or aliens.[17]

By 1960, Lilly had set up a dolphin research facility (the Communication Research Institute) on St. Thomas, in the US Virgin Islands, and promised the world (and his financial backers) that he was on the verge of an interspecies communication breakthrough. But this breakthrough never happened, and Lilly's subsequent peer-reviewed publications were both sparse and underwhelming. By 1967, his funders had lost faith in both his ideas and his methods, and his financial support dried up. Lilly's critics from the scientific community—who had once described his highly influential 1961 publication *Man and Dolphin*[18] as an example on "how not to do scientific research,"[19] and suggested that the book did not present "a 'single observation or interpretation' that could withstand scrutiny"[20]—were somewhat vindicated by the ultimate fate of Lilly's research trajectory.

In his attempts to understand the dolphin mind at the Communication Research Institute, Lilly's experimental techniques became

increasingly unconventional. He spent hours floating in an isolation tank under the influence of LSD, and even injected his dolphin subjects with LSD to see what would happen—a ludicrous notion to the modern reader, but perhaps only slightly unconventional in the zeitgeist of 1965. In his infamous experiments teaching Peter the dolphin to speak English, Peter was manually brought to sexual climax in order to satisfy his "sexual needs" and make him more cooperative[21]—something that is considered well outside the norm in animal behavior research, even for the 1960s. Lilly's exit from mainstream science saw him releasing three of his dolphins back into the open ocean (the other five having purportedly died of neglect), closing his laboratory on St. Thomas, and retreating to the West Coast, where he became one of the spiritual leaders (together with Timothy Leary) of the 1960s and 1970s counter-culture. Lilly was still involved in research projects involving dolphin–human communication (notably project JANUS in the late 1970s and early 1980s), but these projects did not resonate with the scientific community, nor result in any noteworthy scientific discoveries. He continued to publish hugely popular books weaving together his New Age ideology with dolphin science, providing the public with tantalizing yet wholly unsubstantiated statements like "these Cetacea with huge brains are more intelligent than any man or woman" and "the Cetacea are sensitive, compassionate, ethical, philosophical, and have ancient vocal histories that their young must learn."[22] Lilly is regarded by many as an unparalleled mythmaker (i.e., the man who planted "the 'mindbomb' of whale-dolphin intelligence"),[23] and is uniquely responsible for the emergence and intractability of many (if not most) of the ideas that will be scrutinized in this book.

Lilly's Lasting Legacy

It has been over half a century since dolphins were first declared language-using animal-savants by John Lilly. He once characterized

himself as a maverick willing to stick his neck out[24] in defense of a position that the dolphin mind was superior to that of human beings. To those scientists uncomfortable with his habit of making grandiose and often unsubstantiated claims about dolphin intelligence, he once replied "only narrow-minded people criticize me."[25] Regardless of whether this attitude raises your hackles or fills your heart with admiration for Lilly's stand against orthodoxy, no one can deny that Lilly was an agitator par excellence; the man who pulled dolphins from their hidden aquatic realm and thrust them under the glaring lights of the world stage.

Famed cetologists Kenneth Norris and Karen Pryor, active during the heyday of Lilly-mania (the 1970s) and critical of his writings, cheekily referred to dolphins as floating hobbits.[26] Tolkien's mythical hobbits—much like Lilly's characterization of dolphins—are almost indistinguishable from human beings with regards to their complex behavior and intellectual prowess. Both hobbits and dolphins have become pop-culture icons, and stars of the silver screen. Fifty years after Lilly published *Man and Dolphin*, the super-intelligent-dolphin archetype that this book helped spawn is seemingly omnipresent in popular culture. Keanu Reeves starred alongside Jones, a cybernetic ex-Navy dolphin with cryptanalysis abilities surpassing that of humankind in the film *Johnny Mnemonic*. Darwin the dolphin from the television series *seaQuest: DSV* had his vocalizations translated into speech by the ship's computers, allowing him to conduct quick-witted conversations with his human shipmates. In a scientific review of how dolphins are portrayed in popular literature and media, two of the four most common dolphin themes aptly describe the fictional characters of Jones and Darwin, and seem to be derived directly from Lilly's own writings: 1) "Dolphin as peer to humans, of equal intelligence or at least capable of communicating with humans or helping humans," and 2) "Dolphin as superior to humans, associated with a higher power or intelligence."[27] It should come as no surprise that another major theme found by this study was "dolphin as representative of peace,

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