

# SCIENTISTS IN THE FIELD *Where Science Meets Adventure*

DISCUSSION AND ACTIVITY GUIDE

## *Crow Smarts: Inside the Brain of the World's Brightest Bird*

BY PAMELA S. TURNER (PHOTOGRAPHS BY ANDY COMINS; ILLUSTRATIONS BY GUIDO DE FILIPPO)

### *About the Series*



*Crow Smarts: Inside the Brain of the World's Brightest Bird* is part of the award-winning Scientists in the Field series, which began in 1999. This distinguished and innovative series examines the work of real-life scientists doing actual research. Young readers discover what it is like to be a working scientist, investigate an intriguing research project in action, and gain a wealth of knowledge about fascinating scientific topics. Outstanding writing and stellar photography are features of every book in the series. Reading levels vary, but the books will interest a wide range of readers, both younger and older.



*Crow Smarts:*  
*Inside the Brain of the*  
*World's Brightest Bird*  
by Pamela S. Turner  
Photography by Andy Comins  
Illustrations by Guido de Filippo

### *About the Book*

Usually if someone calls you a birdbrain, you are deeply offended. The scientists who work with the New Caledonian crows will have us thinking twice before accepting this an insult! Dr. Hunt and his team have documented evidence of these crows not only using tools, but making them—AND even adapting them for new purposes! *Crow Smarts* is a fascinating account of the research on these amazing crows and how they have changed our perception of animal intelligence.

### *About the Author*

Pamela S. Turner has written about science and nature for many years, winning prizes and acclaim for her ability to present accurate information that is easy to understand and fun to read. This is her fifth book for this series. Frogs, gorillas, seahorses, dolphins, crows, and the scientists who study them are the subjects. Not surprisingly perhaps, her license plate reads RIBBIT. Turner has collected a Cybils Young Adult Nonfiction Award, a best science writing award from the American Association for the Advancement of Science, American Library Association Notable Book distinctions, honors from the National Green Earth, awards from the National Science Teachers Association, and Orbis Pictus non-fiction recognition.

### *About the Photographer*

Andy Comins is a California-based photographer dedicated to bringing the wide world of scientific knowledge to children of all ages. This is his third collaboration on a Scientists in the Field title.

Houghton Mifflin Harcourt Books for Young Readers

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### *Pre-Reading Activity*

Before even showing the title, have students make a top ten list of the smartest animals. Do another list of animals that are perceived as lacking in the brains department. Sort these animals into families. What trends, if any, are evident? Do birds show up in either list? Examine the underlying perceptions that form the basis for including animals on either list.

Have a group discussion about the ways in which we are perceived. Have students share instances in which they did something that others decided was less than brilliant. Make a list of words and phrases that people use to stereotype people or animals based on their supposed intelligence or lack of intelligence. Discuss how this happens. Are there any groups of people that students believe are more or less intelligent? Examine carefully and respectfully these assumptions, which often have a thread of racism or sexism, etc., woven into them.

Say you wanted to design a test to determine whether dogs or cats were smarter. What agreements would have to come from both cat lovers and dog lovers to ensure that the test was fair?

Bring in some tools or objects that students do not recognize, ideally enough to supply each student with his or her own tool. Have students spend about five minutes or so writing down predictions for the purpose of their tool. Then have the class form groups of about three or four students. Have each group decide together what the function is of all the tools. If possible, have students demonstrate how each tool is actually used. Compare the group definitions to the individual definitions. When all the groups are done, share the actual function of the tool. Discuss how humans develop new tools. Write a definition for the word *tool*.

### *Discussion Questions*

Is it possible to compare the intelligence of different species? Is it even possible to rank creatures by their intelligence when they are the same species, let alone comparing one species to another? Is it true that the bigger the brain is, the smarter the creature? Would this mean that males are smarter than females or that

elephants are smarter than people?

Is a crow smarter than a second-grader?

If we looked at any group of animals, could we determine whether some of those animals are better at being that animal than others? In other words, are some cats better at being a cat than other cats? Are some crows in the world smarter than others?

What tools do you typically use every single day? Pick a few of these tools to discuss and examine the process for inventing the tool. Are there tools that you or someone you know just can't seem to master? Explain. Why do some folks use tools and others do not?

What is the difference between, say, a drum and a hammer? We could use a steel drum to pound in a nail and we could use a hammer to tap out a tune. There are also many different kinds of hammers and many different kinds of drums. How do we decide which tool is best?

How do you suppose animals figure out how to make tools? Can you invent a new word or suggest an invention that needs to be created?

### *Applying and Extending Our Knowledge*

After the title page, there is a picture of a crow holding a stick. There is also a wooden hinged box with bars and sticks inside. Behind the crow is a Plexiglass contraption with some slits in it.

- Make predictions as to why this picture is included in the book.
- What is the crow doing with the stick? What experiment, if any, do you think is being conducted? Make sure to explain all elements of the picture.

### *Common Core Connections*

CCSS.ELA-Literacy.RH.6-8.7 Integrate visual information (e.g., in charts, graphs, photographs, videos, or maps) with other information in print and digital texts.  
CCSS.ELA-LITERACY.W.6.2 Write informative/explanatory texts

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CCSS.ELA-LITERACY.W.6.1(a-d) Write arguments to support claims with clear reasons and relevant evidence.

On page 2, we read *“Crows have another important quality, one that is rare and special. It’s the ability to reason, to remember, to keep a goal in mind. The ability to imagine and invent. The ability to create.”*

- While the ability to reason may seem obvious as an important quality for problem solving, go down the list of qualities including “reason” and show how they mesh together. What would happen if any of these qualities were missing? Explain how memory can both aid AND hinder our efforts at solving a problem. How would imagining, inventing, and creating suffer without having a goal? Or without memory or reason?
- Act out or write a quick scenario showing how goal setting can be the first step in completing a homework assignment, doing a report, applying for a job, meeting your friends’ parents, or any other daily activity.
- The quote above continues with, *“We call this quality ‘intelligence.’”* Does this definition match how you think of intelligence? Write your definition of intelligence and a justification for your definition.
- Think of gifted athletes or musicians or artists. Athletes, musicians, and artists also have intelligence. How does one of these gifted people use his or her intelligence to improve natural ability? We also hear gifted people talk about instinct. Plenty of stories are out there of, say, an athlete saying things like, *“I did not think. I just acted. You do not want to overthink your moves because your performance will suffer.”* What is the difference between natural ability and intelligence? Is intelligence ever a liability? Have this debate. Collect evidence depicting highly skilled people talking about skill versus intellect.

### Common Core Connections

CCSS.ELA-Literacy.SL.7.4 Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use appropriate eye

contact, adequate volume, and clear pronunciation.

CCSS.ELA-Literacy.W.7.7 Conduct short research projects to answer a question, drawing on several sources and generating additional related, focused questions for further research and investigation.

CCSS.ELA-Literacy.W.6.1(a-d) Write arguments to support claims with clear reasons and relevant evidence.

The previous activity has us thinking about intelligence and instinct. This activity builds on this work. On page 4 we see a picture of Little Feather and another crow. The caption states, *“Only about one-fifth of crow chicks survive their perilous first few months.”*

- Obviously intelligence is not the only important factor critical for these New Caledonia crows. What factors contribute to the very poor survival numbers of these crows? Make a poster showing all the causes of death for baby crows.
- While baby crows face many challenges and intelligence is not the only factor leading to crow survival, speculate on the degree to which crow survival DOES depend on their intelligence. Write a persuasive argument for why the survival rate of baby crows is not related to intelligence or why it is. If there are enough strongly held views on both sides of the question, have a debate and allow the class to determine the most persuasive arguments.
- Research the lifespans of these crows and the population numbers. What is the birthrate and the mortality rate? How many crows per year need to be born to maintain the existing population numbers? What is the status of these New Caledonia crows? Present your findings either in an online presentation or with posters and graphs.

### Common Core Connections

CCSS.ELA-Literacy.SL.7.5 Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points.

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Science writers use what they know to convey information. On page 6, we read, *“The young crow has perfected a technique known by children everywhere: just keep whining until Mom or Dad finally cracks.”*

- This quote is a gateway into the larger question of observation and interpretation. For example, without informing the class, have the students write about, say, what they did at lunchtime. Stand by and watch one student the entire time without explaining why you are watching. Do the same thing the next day and stand by and watch a different student. Repeat as time allows. Then explain to the class what you did and ask the students you observed to share any differences in their writing or behavior on the days they were observed and on the days they were not. Likewise, film a pet when the pet is active but does not know you are watching. Without calling the pet, make your presence known. What happens to the behavior? What steps must be taken to insure that our experiments and our conclusions provide useful information about other species?

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On page 8 we read, *“An ape making a tool! Jane immediately sent a telegram to Louis Leakey. He responded, ‘Now we must redefine “man,” redefine “tool,” or accept chimpanzees as humans.’”*

- What is the class consensus for the definition of both “human” and “tool?” Write this down.
- Make a class list of all the animals your students claim make tools, including the animals listed in the book.
- Search online for articles and videos of animals using tools. Add these to your class list.

- Later in this section, we learn about both programmed and flexible tool use. The author states that flexible tool use has been observed in capuchin monkeys, elephants, chimpanzees, bottlenose dolphins, and New Caledonia crows. Did you find any new animals to add to this list? Cite your source and explain why it needs to be added.
- On your school campus or in your neighborhood, collect natural materials (that are safe and that do not destroy habitats or property). Make a tool that can extract items from inside a jar or bottle. Make a tool that can lift and carry an item across a room. Make a tool for another purpose. Do this again and open it up to items from, say, a junkyard or from a dump or trash can (as always, be safe).
- Find sticks and twigs from your campus or your neighborhood. Collect a bunch of different-sized marbles, gravel, rocks, seeds, etc. Make several fairly equivalent collects. Create a game in which students take turns using the twigs to extract a set number of items from the collection, perhaps setting parameters for different attributes contained in the collection (say, three small pebbles, one of each sized marble, one of each sized rock, five different seeds, etc.). Allow students to go out and collect different twigs if their current selection proves to be unable to collect certain items.
- There are people who believe that intelligence as represented by tool building is a collective benefit, but that humans are actually much dumber now than in the past. They believe that fewer than one percent of humans are capable now of taking care of basic needs, such as raising food, building shelter, or collecting safe drinking water. Do we need classes in making tools, raising food, building houses? Are we becoming too dependent on our collective intelligence?
- Recruit volunteers to see how long they can go without using a single tool unless they build it themselves. For those not willing to volunteer, have them keep track of every single tool they use for a week (or other suitable time frame). Graph the complete collection of tools used and sort them by the frequency of their use.

### *Common Core Connections*

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New Caledonia is an island east of Australia, south of Hawaii, west of Fiji, and north of New Zealand.

- Using a variety of measures, such as climate, physical size, population, culture, biodiversity, economics, etc., prepare various comparisons with your area. Use Venn diagrams or other graphics to visually depict the similarities and differences.
- Prepare an online presentation on the crow habitat in New Caledonia. Perhaps using some of the information above, compare the New Caledonia crow habitat with the habitat of crows in your area. Speculate on possible theories for elements of the New Caledonia habitat that would lead to the sophisticated tool use in New Caledonia.
- Page 19 has an insert that gives an overview of New Caledonia. It states that the Kanak people have lived on this island for more than 2,800 years. If your school has a librarian, work with this person and do more research on the Kanak people. Prepare a brief summary to share with your class. Can you find information related to what the Kanak people think of the crows? The book speaks of Adolphe's experience with crow perception on page 59. Is Adolphe a member of the Kanak people?

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On page 21 we read, *“As it turns out, big brains usually aren't necessary. Jellyfish do their thing without any brain at all. Sharks are small-brained yet have survived for hundreds of millions of years. If it isn't broken, there's no need to fix it. It's not easy for a big brain to evolve, because big brains are quite costly. Brain tissue eats up more energy than other body tissues, just as a race car burns more fuel than a lawnmower.”*

- If big brains are the race car and smaller brains are the lawnmower, find examples of “race car” music and “lawnmower” music. Find examples of “race car” poetry and “lawnmower” poetry.
- Write a play or a skit depicting what our planet might be like if some other species (not human) had the faster “race car.” Be sure to factor in the information on convergent evolution discussed on page 22.
- Assuming that crows evolved the largest brains on the planet, draw a picture of what the crow would look like. Include measurements of head, body, wings, etc. Research the basics of flight and be prepared to justify why your crow prototype would still be able to fly. How big would the crow's egg need to be?

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The Corvidae family is a large family of birds that in-

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cludes magpies, bluejays, crows, and others. Crows belong to the *Corvus* genus, which includes ravens and rooks. The New Caledonia crow is *Corvus moneduloides*. The crow in the United States is *Corvus brachyrhynchos*.

- If you have crows on your campus, devote some time to going outside and observing and documenting crow behavior. Are you able to distinguish and remember individual crows? Create a field journal. Bring a digital camera and take pictures of the crows. Make sure to note the location and to write detailed notes of the very specific behavior observed.
- Create a guidebook that distinguishes the various birds in the family. Map the locations where these birds are found. Use a guidebook, such as a Peterson Field Guide, and pattern your student guidebooks after one of these.
- Since the intelligence described in this book is of the New Caledonia crow, make a very detailed comparison of the New Caledonia crows and the crows of North America. As described above, speculate on hypotheses for why the New Caledonia crow is smarter.
- Turner reports that New Caledonia crows are born with a tool-using ability. She states that they spend about a year with their parents. She also mentions that the preliminary research indicates that four human-raised crows did not develop the same tool-making skills as those raised by their parents—a combination of nature and nurture. Research whether American crows spend as much time with their parents as the New Caledonia crows.
- Much of the enjoyment in reading this book is in the depiction of the tests given to Betty and other crows. Page 49 has the results of one test and states, *“Alas! None of the crows could figure it out. When this same test was given to children, four- and five-year-olds were as stumped as the crows were. Six-year-olds breezed through. Score one for human children.”* Design tests for kindergarten and first grade students that have them solving puzzles similar to the tests given to Betty and the other crows. Design harder tests for your own classmates.

For as smart as crows may be, they do not have a very

good press agent. We read on page 59, *“Adolphe has been visiting the crows’ islet all his life. He explains that crows in New Caledonia don’t get much respect. ‘Crows are considered a bad omen. And they announce people’s coming, sort of like an alarm bird.’”*

- Find the clip of the crows gathering in Alfred Hitchcock’s *The Birds*. Google “crows and luck.” The collective noun or term of ventry, for crows is murder. A murder of crows! In the “ASK THE AUTHOR” section, Turner states that crows recognize specific people, which is supported by many scientists. Use this information and folklore to improve the reputation of crows.
- Design an ad campaign or make a commercial extolling the virtue of crows. Design an ad campaign that builds on your generic crow campaign specifically for New Caledonia crows.
- A “murder of crows” is just too juicy not to write a short story explaining how they got this nickname (use Kipling’s *Just So Stories* as a model—see especially “The Cat That Walked By Himself”). A good story will be one, like Kipling’s cat story, that respects the crows but uses their own behavior to justify the negative connotations. Use the crow behavior in this book as the starting point for your short stories.
- Go to an early elementary classroom and poll the class about their favorite wild animals. There probably will not be many who list crows. Find online videos, websites, articles, etc., that you could share with elementary students to improve the class perception of crows. Plan a program that has the goal of making crows the favorite animal of this class. Possible?

### *Other Websites to Explore*

**Pamela Turner’s website** has more information about the New Caledonian crows and the book: [www.pam-elasturner.com](http://www.pam-elasturner.com).

**The BBC** has an article talking about tool use of New Caledonia crows: [news.bbc.co.uk/2/hi/8631486.stm](http://news.bbc.co.uk/2/hi/8631486.stm)

**The University of Auckland** is mentioned by Turner

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in her Q&A section; it is worth repeating:  
[www.psych.auckland.ac.nz/en/about/our-research/research-groups/new-caledonian-crow-cognition-and-culture-research.html](http://www.psych.auckland.ac.nz/en/about/our-research/research-groups/new-caledonian-crow-cognition-and-culture-research.html)

**Oxford University:** Here is another look at crows from Oxford University: [users.ox.ac.uk/~kgroup/tools/crow\\_natural\\_history.shtml](http://users.ox.ac.uk/~kgroup/tools/crow_natural_history.shtml)

**National Geographic Society:** Here is the National Geographic's look at crows: [news.nationalgeographic.com/news/2002/08/0808\\_020808\\_crow.html](http://news.nationalgeographic.com/news/2002/08/0808_020808_crow.html)

**Communicative & Integrative Biology:** Here is an academic article discussing causal reasoning in crows: [www.ncbi.nlm.nih.gov/pmc/articles/PMC2734031/](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2734031/)

**Cornell Lab of Ornithology:** Here is information on rescuing (or not rescuing) baby crows and other baby birds: [www.birds.cornell.edu/crows/babycrow.htm](http://www.birds.cornell.edu/crows/babycrow.htm).

**Carolina Birds:** There are plenty of good websites about Corvidae. Here is one: [carolinabirds.org/HTML/WLD\\_Corvidae\\_Crow.htm](http://carolinabirds.org/HTML/WLD_Corvidae_Crow.htm)

**Central Intelligence Agency (CIA):** There are also many good websites with information about New Caledonia. Here is an interesting one from the CIA: [www.cia.gov/library/publications/the-world-fact-book/geos/nc.html](http://www.cia.gov/library/publications/the-world-fact-book/geos/nc.html)

### *Further Reading*

Please see Pamela Turner's book suggestions listed in the Q&A section in the back of the book. Her suggestions are our suggestions!

*Teacher Guide by Ed Spicer*