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Book Review

Inside "Inside Jokes": The Hidden Side of Humor

A review of Matthew M. Hurley, Daniel C. Dennett, and Reginald B. Adams Jr., *Inside Jokes: Using Humor to Reverse-Engineer the Mind*. MIT Press, 2011, 376 pp., US$29.95, ISBN-13: 978-0262015820 (hardcover).

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Studying humor is a very difficult task. For starters, the concept of humor, what exactly humor is or how it is defined, is highly contentious. While most people have an intuitive sense of what humor might be, researchers struggle to come up with one definition that will encompass the myriad of ways in which people use and consume humor in their daily lives. For example, if you hear a joke and you do not find it funny, but can still "see" the humor in it, does this still count as humor? Or is it still considered humor if we laugh at something that others don't find amusing, like slipping on a banana peel?

The difficulty in studying humor is intensified by its wide use. Humor is one of the most common human activities, surrounding us everywhere. Since we use the word "humor" to describe so many seemingly different activities - laughing at a joke, in relief when something untoward does not transpire, in embarrassment, or in conversational interactions devoid of any apparently funny comments - there is the assumption that there must be some essential underlying quality shared by these activities, and that once discovered will provide the necessary and sufficient conditions to elicit the phenomenon. At least that has been a guiding principal of philosophers going back millennia and researchers for decades. The researchers took from philosophy their theoretical notions concerning incongruity, superiority and relief to construct what they hoped were more sophisticated and empirically based versions of these concepts.

Unfortunately, most research tended to focus on a limited subset of the phenomenon; the evaluation of jokes and cartoons, or observed people's emotional or physical responses after watching a comedy skit. Relatively little effort was devoted to studying humor outside of the lab, within the social realm, where people interact with each other, share a joke or try to impress a potential mate with a witty remark, and where laughter is more likely to predominate. These research limitations notwithstanding, many

flavors of the basic aforementioned theories have been put forth, but a comprehensive scientific theory of humor with testable and measurable parameters has proved elusive.

There is little doubt that humor and laughter (though not entirely overlapping) have evolutionary roots. Humor and laughter are part of every society and can be dated back phylogenetically to other apes and even as far as laughing rats, albeit crudely (See: Panksepp, 2007). Various evolutionary theories, such as sexual selection (Miller, 2000), group selection (Gervais & Wilson, 2005), humor as a disabling mechanism (Chafe, 1987) and others, have been offered over the years as an ultimate explanation for why humor evolved. Even more non-evolutionary explanations were introduced, most of them focusing on the mechanism that elicits mirth, the emotions associated with the enjoyment of humor, or with the conditions under which humor is likely to prevail. One of the most popular humor theories is the incongruity-resolution theory. This theory suggests that humor arises from resolving some incongruity in the situation. This is best exemplified by the following joke (p. 46):

> O'Reilly was on trial for armed robbery. The jury came out and announced, "Not guilty". "Wonderful", said O'Reilly, "Does that mean I can keep the money?"

The incongruity of the verdict with O'Reilly's reaction seems at first puzzling, but it is resolved once the reader realizes that the jury's verdict can differ from the real event. While this theory explains an important aspect of humor, it does not account for all types of humor, not even all jokes such as philosophical humor and slapstick comedy, for example. Moreover, incongruity-resolution theory does not tell us why incongruity or resolution are essential for a joke to be funny, or why many resolved incongruities are not funny all. For example, if you come home to find your house burned down to ashes, this is incongruent with what you normally expect when you come back home, but you are not likely to find it very amusing.

There are different kinds of incongruity-resolution theories, and one of the main problems associated with all of them is that there is no agreed definition for the term "incongruity", and most definitions are hard to operationalize. The original formulation of the theory by James Beattie defines incongruity as:

> "Laughter seems to arise from the view of things incongruous united in the same assemblage." The object of laughter is "two or more inconsistent, unsuitable, or incongruous parts or circumstances, considered as united in one complex object or assemblage" (Beattie, 1778)

Unfortunately, this definition is so broad a term as to be unfalsifiable as a necessary condition for humor if not a sufficient one. Moreover, all classical theories seem to have similar limitations. While they all capture some important essence of humor, none seem to truly account for the astonishing manifestation of humor and laughter in every day encounters, and none gives an ultimate evolutionary explanation as to why we should use humor at all.

Hurley, Dennett, and Adams believe they have found the answer, cracking the riddle of humor once and for all. In a highly original and thorough presentation, the authors offer an ultimate explanation as to why humor has evolved and is used in many different

contexts. While there are many other books that present comprehensive theories of humor, this is the first book devoted completely to the evolutionary understanding of humor, and for that alone the authors should to be commended. The theory introduced in the book grew from Hurley's dissertation at Tuffs University with the two other co-authors serving as his advisors. This book is not just about humor. According to the authors, "It is a book about the epistemic predicament of agents in the world and a class of models of cognition that can successfully deal with that predicament. It argues that emotions govern all our cognitive abilities, large and small, and that humor is thus a rich source of insight into the delicate machinery of our minds" (p. xii). The two main foundations of their theory are evolution and the computational theory of the mind, where the latter is taken in a broader sense of a cognitive theory of humor.

Inside Jokes starts by presenting a series of questions which the authors believe a complete theory of humor should be able to address (p. 57). The scope of the questions, alluding to the broad uses of humor, show how daunting a task it is to come up with such a comprehensive theory of humor, but also reflect how ambitious the theory proposed in the book is. The book focuses on the following key questions (pp. 58-60):

> Why do we enjoy humor so much?
> Why does humor elicit the emotion of mirth and how is it different from other pleasurable emotions?
> Why do most humorous situations involve an element of surprise or incongruity?
> Why does humor often point to failures?
> How is play related to humor (as both are non-serious and evoke pleasure), and how are they are related to tickling?
> Why do we actively seek humor, even willingly paying to consume it (in the form of comedy movies and stand-up comedy)?
> Why is humor such a social phenomenon, mostly enjoyed in groups?
> Why are there sex differences in humor production and humor appreciation?

These questions are, no doubt, very important, and every complete humor theory should be able to answer them, but it is also imperative to note that other questions that are essential to understanding humor are missing. For example, what is the exact relationship between humor and laughter? Why do people sometimes seem to laugh when there is nothing funny in the situation, or by contrast, why do we think that something is funny but we do not laugh? Why does our appreciation of humor and enjoyment change depending on our mood or other situational conditions? Why, despite its universality, are there systematic differences in what individuals and cultures perceive as funny? It seems that the specific set of questions presented by the authors serve the purpose of setting the stage for their own cognitive and evolutionary theory of humor, which will be discussed next. At the end of the book, the authors return to those questions and show how their theory answers them.

The debugging theory of humor

The first step in building the foundation of the cognitive-evolutionary theory is equating jokes with problem solving. When someone "gets" a joke, the feeling it elicits is similar in some sense to the feeling of solving a riddle. In both cases there is some sort of puzzle or incongruity that needs to be resolved, but the emotions that follow differ. We feel satisfied solving a riddle, but we laugh in reaction to a joke. Nonetheless, in both cases the tension in the situation is relieved. Many languages acknowledge these similarities, and the word for "funny" embodies a meaning that alludes to the need for solving or explaining something strange. The authors make the important observation that there is a difference

between the word funny as in funny "ha-ha", and funny as in "huh", indicating that something unusual or strange happened. Can these two meanings actually intertwine and tell us something deeper about humor? According to the authors the answer is yes, so they move on to developing their debugging theory of humor.

Chapters 7 and 8 are the core of the book in detailing the architecture of the mind that sustains humor. The evolutionary explanation the authors offer is quite simple in essence, but the details are crucial. The proposed theory is that humor serves as an "error correction" mechanism, and people use it to debug certain mistakes that enter our conscious mind when they should not. The evolutionary justification for such a mechanism is quite obvious. Our brain needs a self-correcting mechanism that filters-out information that hinders its function and/or leads the individual to commit potentially costly errors from erroneous conclusions. Since our brain has limited resources, evolution should favor an efficient mechanism that will help in removing this unnecessary and mistaken information and direct our resources to more fruitful endeavors.

Most of this misleading information that enters our mental space does not usually surface and come to our conscious attention, but on occasion, some of it does. In these cases, with the brain must use some mechanism to redirect the devotion of time and resources to the more essential activities of the brain. This "debugging" process transpires in what the authors call "mental spaces", which is a "region of working memory where activated concepts and percepts are semantically connected into a holistic situational comprehension model….They are built incrementally and revised constantly" (p. 97). The debugging process must be consciously working since the mind needs to perform "reality checks" against competing ideas, test and examine the new information that comes into mental space, and evaluate its accuracy and usefulness. According to the theory, humor occurs when some covert idea enters that mental space by mistake and does not fit whatever scheme we had in mind. Now, the brain has to find a way to get rid of this idea, and that is where humor comes into play. Humor's role is to eliminate this deceptive idea as fast as possible before it can cause any damage, or further squander the brain's resources. In other words, we must find an efficient way to determine that some idea is false, and we do so by comparing it to other competing ideas. The theory can be summarized more formally as (1) an active element in mental space that has (2) covertly entered the space (for one reason or another) and is (3) taken to be true (i.e. epistemically committed) within that space; (4) Is diagnosed to be false in that space–simply in the sense that it is the loser in an epistemic reconciliation process; and (5) (trivially) the discovery is not accompanied by any (strong) negative emotional valence.

The reward system that motivates us to conduct debugging is manifested by the emotion of mirth, which is the good feeling that we get after a laugh. Thus, humor will only work for ideas that do not pose an immediate threat and are innocuous enough, as more direct dangerous mistakes will have a much stronger and negative emotional impact that requires other actions and a more suitable mechanism to cope with them.

To illustrate how the theory works, consider the following one-liner by Steven Wright (p. 136): *"Some people are afraid of heights. Not me, I'm afraid of widths"*. The set-up of this pun relies on the putative perception of heights as something scary that most people try to avoid. In terms of the theory, the audience listening to the joke assumes that we are talking about fear of heights, hence making a commitment in their active mental

space. As it turns out, this commitment is a false belief because Wright is using the word height in a different context. Height is just one of the three possible dimensions in space. When he says that he is afraid of widths, he presents the listeners with this new interpretation. This catches the audience by surprise, and they realize that the premise of the joke is different to what they had expected. They are now forced to acknowledge the new interpretation of the word "height". Hence, by "debugging" the wrong belief attributed to the word "height", they can fully understand the joke and laugh. Here is another example:

> "Is the doctor at home?" the patient asked in his bronchial whisper. "No" the doctor's young and pretty wife whispered in reply. "Come right in." (p. 50).

We assume covertly that this is about an actual visit to a doctor rather than an assignation, but then realize it was a false belief and re-interpret the joke in order for it to make sense.

The theory applies to both primitive and crude humor, and more sophisticated jokes and other forms of humor are built onto this basic structure. They are descendants of the original composition of simple puns, and are magnified by other cognitive mechanisms and culture. The funniness of a joke is also magnified by sex, violence, racial stereotypes and other topics that, perhaps not surprisingly, occupy a large part of human evolutionary research. Still, all jokes and humorous incidents contain the core of the debugging mechanism. Comedians and joke tellers exploit this mechanism, in what the authors call "supernormal stimuli". Other mechanisms can also contribute to stronger feelings of mirth. For example, arousal for reasons unrelated to humor can increase the intensity of a humorous situation even if the arousal is negative (e.g. fear).

The authors give countless examples and show how many humorous situations and jokes are funny based on their theory. This works well for most jokes, the simplest and most popular form of humor, but when applied to more nuanced types of humor, the theory becomes complicated. For instance, the authors seem to not fully acknowledge that humor is sometimes very subjective, and their theory cannot always be easily applied to such situations. For example, consider our own summary of the following vignette described on page 190. A woman plans to stop at an ATM before going to the store but forgets to do so. In the checkout, she realizes she does not have enough money to pay for her purchases. Recounting this story verbatim does not constitute humor, and most people would not consider it funny. However, consider two variations of the story described by the authors. In the first variant, the woman meets a friend who asks her where the closest ATM is. This reminds her that she forgot to stop at an ATM. The second variant is that she looks at an expensive item in the store and wonders if she has enough money to buy it. She searches for the ATM receipt to find her account balance, and upon not finding it, realizes she did not go to the ATM. According to the authors, the second variation is funny because the search activated a commitment for a false belief, but the first variant is not funny at all. It is not clear why the first scenario would not activate a false belief similar to the second scenario, resulting in humor, and whether indeed the second story is funny at all. Upon hearing these two stories, different people might find them funny or not, but it is almost impossible to deduce the humor of either story strictly by analyzing them, and it is not clear how the authors distinguish between the two. While many of the other jokes/stories

mentioned in the book are more straightforward in their ability to elicit laughter or not, many can still be interpreted subjectively.

As a cognitive theory, the debugging theory does posit that the essential part of humor is in the perceiver's mind and not in the stimulus per se. For humor to exist there must be some covert false belief that enters a person's mind and needs to be removed. But as the example above shows, there is at least some subjectivity in the interpretation of a covert idea. Some people might remove it with laughter, while others just acknowledge the mistake and move on. This subjectivity is most pronounced in many daily uses of humor and requires further discussion.

Subjective vs. objective humor

Humor researchers sometimes classify humor theories by the degree of subjectivity involved in the interpretation of the humorous stimulus, or in the subjective mind that perceives it. Objective definitions of humor rely on a set of rules, that if met, leads to humor and the joke or situation is considered funny. The theory put forward in the book is a good example of such a theory. According to the theory, we can recognize any instance of humor by identifying the covertly committed false belief, and the inconsistency it raises in one's mind. Solving this inconsistency by debugging the error that sneaks into our mind enables us to "get" the joke.

There are several problems with this approach. For one, the authors are the ultimate judges and will interpret any jocular case through the lens of their theory, showing how it is a good fit. This problem is not unique for the debugging theory and is shared with most other humor theories. Incongruity theorists, for example, find incongruity in every humorous stimulus, similarly to the authors' ability to find a covert belief that needs to be debugged in every joke they analyze. The main challenge is to formulate rules that any independent judge can follow and reach high inter-rater reliability. This is a daunting task since there is no easy way to define what constitutes a covert idea, or to find a way of distinguishing between committed and uncommitted belief. Future researchers are sure to find ways to address these questions in order to give the theory a more objective test.

But even without an objective measure of the theory, there seems to be some obvious examples that challenge the validity of the theoretical conditions. For example, many people laugh at jokes that they already know. If they know what is coming, no inconsistency arises, there is no false belief and therefore nothing to solve. Yet, many people can watch a Seinfeld episode over and over again, and experience mirthful laughter, as if they were watching it for the very first time. Moreover, from observations that look at what people actually laugh at during regular conversations, laughing occurs more often than not, in response to mundane comments. Robert Provine documented what students laugh at during spontaneous conversation on a college campus (Provine, 2000). He discovered that most pre-laugh comments are very banal. Examples include, "I'll see you guys later", "I hope we all do well", and "It was nice meeting you too". Onlookers do not laugh at these comments, while the people present find them funny. Not only are these comments subjective in nature, but they also seem to not fit any crucial elements of the debugging theory. There are no obvious covert elements entering a mental space that people are actively committed to that need to be removed.

It is possible, of course, that various people might have different knowledge about

the situation, which results in the existence or absence of a covert mistaken belief entering their mental space. This is part of shared knowledge that one must possess in order to understand a joke. Not getting a joke due to cultural differences or not being familiar with something in the joke can explain why some people do not understand certain jokes, and the authors give several examples when that happens. This does not mean that there is no humor in the joke, but that not everyone can see it. You can still explain a joke to someone, and even if you "killed" it on the way, at least it is clear why the joke might be considered funny. However, this does not apply to all situations where people laugh. It is very difficult to explain why the examples of the trivial statements mentioned above are funny. Those utterances that produce laughter are not what most people often refer to as private jokes, something that some private knowledge may help to illuminate the humor in it. The laughter in these situations largely acts as social bonding, common among friends who know each other well. The question is, if we are to dismiss these examples of inconsequential statements as non-humor, one has to wonder how much humor is really out there, as they seem to comprise a large portion of our day to day laughs.

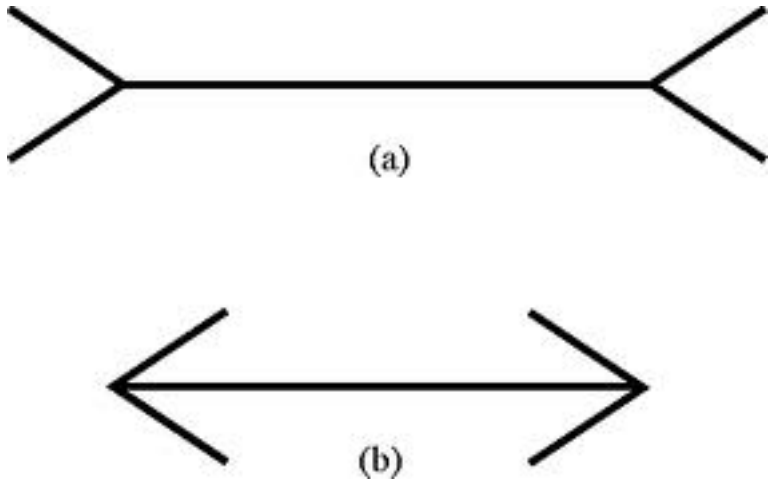
Visual humor, puzzles and riddles

Consider the following picture. What is in it that makes most people find it funny? Is there any covert belief violated in this humorous image?

Visual humor also challenges their theory, as conveyed by this illustration:

Having all corkscrews is certainly incongruous, but it sets up no covert belief that is then falsified. Seeing all the corkscrews we are puzzled and do not know what to think until the title tells us and then we resolve the incongruity by linking it with associations to French culture and history. Incidentally, this cartoon is well explained by an incongruity resolution model.

A further problem for the theory is that not only do there seem to be instances where no covert beliefs are falsified, as in the above examples, but there are also instances where covert beliefs are falsified where no humor results. Visual illusions would seem to be good examples. In the famous Müller-Lyer illusion we perceive line (a) as being longer than line (b). When we are informed that they are equal length we do not find it funny.



Similarly, many crosswords puzzles have misleading clues. For example, the answer of the clue "Pop Star" is "Nova". When we are searching for the answer our covert belief is that the clue refers to an entertainment celebrity, but when we suddenly realize it is

an astronomical reference we have an "aha" experience rather than a "ha-ha" one. Many trick questions on exams are also like this. Here is an example:

> "A bat and ball cost a dollar and ten cents. The bat costs a dollar more than the ball. How much does the ball cost?"

Most people respond quickly insisting the ball costs ten cents. This answer is both obvious and wrong - The correct answer is five cents for the ball and a dollar and five cents for the bat. When they find out they're wrong they do not consider it to be funny. These above counter examples suggest that a falsified covert belief is neither a necessary or sufficient condition to induce a humorous response.

Laughter and play

Good humor usually produces a healthy dose of laughter, or at least results in a genuine smile (or "Duchenne smile", named after Duchenne de Boulogne, the French neurologist who studied it in the 19th century). The physiological and emotional response that humor elicits is usually referred to as mirth. An important part of the debugging theory is that the "prize" for good debugging is laughing, and it also explains why we seek more and more of it by means of going to a comedy club, watching a comedy movie and so on. If some jokes do not produce laughter, can we still consider them humor, if they meet all the other criteria of the theory? This is important, because different people react differently to various types of humor. One can read the dozens of jokes mentioned in the book and might laugh or smile at some of them, but not at others. If they did not, it does not necessarily mean that they did not find them funny, because reading jokes alone does not inevitably make one laugh. People may also laugh out loud at the same jokes that did not elicit laugher while reading them, if someone else told them, or they heard them in a comedy club full of people. Thus, the mirthful reaction to jokes relies heavily on social cues, not merely the cognitive processing of the joke. If laughter indicates the discovery of a false belief, then we should expect it to occur independent of social cues, and that is obviously not the case. Clearly, laughter is more than just acknowledging covert mistaken conviction.

The authors justifiably point out that laughter is a communicative signal, but what does laughing signal? According to the debugging theory, laughing should signal to others that the individual made a mistake and that he or she is well aware of it. But as the authors themselves point out, admission to one's own mistakes is unlikely to be favored by evolution, since it is a sign of weakness that creates opportunities for others to exploit.

The answer to the laughter riddle might lie in social play. Social play was shown to reduce levels of aggressiveness in both humans and other primates. Primatologists have long noted that rates of affinity among chimpanzees and other primates increase following relaxed open mouth display (the equivalent to human laughter; Preuschoft & Van-Hooff, 1997). Relaxed open mouth display is observed primarily during play, especially chasing and wrestling games, which leads researchers to hypothesize that humor evolved from social play. Children all over the world laugh the most during play, and similar to other primates, it largely arises during chase and fleeing games or wrestling with each other. Play serves as a safe environment to rehearse and develop the physical and social skills children will need as adults, such as social bonding and cooperation, which will later contribute to

their survival. The laughter that accompanies such play signals to the participants that the activity is playful, without serious ramifications, and thus allows them to acquire important skills in a safe environment. Children and primates practice play wrestling among themselves, and the tickling and laughter involved indicate that it is "just for fun". Laughter, therefore, indicates that the aggression is not real.

The authors suggest taking it a step further, combining play with another evolutionary theory, the false alarm theory (Ramachandran, 1998). The distraction that laughter evokes not only saves people from trouble and from taking things too seriously, but it also sends this message to onlookers. It alerts the surrounding people that what is happening has only trivial consequences, and there is no real threat to anyone in the current situation that requires outside intervention. Laughter acts as a false alarm and signals that nobody needs to take the situation seriously, nor allocate valuable resources and energy to it, preventing the situation from escalating.

Of course, laughter occurs not only in play situations among children, but the basic idea remains. Humor might be built on this early vestige of neutralizing a potentially dangerous situation, and reducing aggression among people. This has clear fitness benefits, but the problem is that many instances of humor do not seem to fit this description. People not only use humor solely for the purpose of defusing a tense situation, but also for many other reasons. In fact, most people actively seek humorous stimuli, and this seems to contradict the notion that laughter signals safety, where the safe environment is already in place. It is possible though, that this active seeking of humor is just an exaptation meaning to provoke the good feeling of laughter. Similarly, people enjoy the exploitation of other emotions that evolved for other purposed. Screaming, for example, has obvious evolutionary advantages such as to warn others and call for help, but we also use it beyond its original purpose such as going on a roller coaster and screaming for the fun of it.

Exaptation, interpersonal humor and sexual selection

The authors view most forms of interpersonal humor as exaptation, a derivative of one's own cognitive ability, a way to manipulate others' opinions. This is an arms race, a co-evolution between the joke teller and the appreciator, in which each side is trying to get as much information as possible about the other while exaggerating his or her own ability. Humor is hard to fake, so it is not easy to exaggerate your own ability to be funny, but people can fake laughter. If you want to make a good impression on someone, or would like to show your appreciation, you might laugh at their jokes, even if you do not find them funny, or worse, even if you do not understand them. Many people laugh at jokes they do not get because they do not want to look stupid. As the authors put it: "… [laughter] may have been exapted from its ancestral version to help a laugher enhance their reputation of intellectual capacity in the minds of potential mates and competition." (p. 269).

The problem with seeing humor in interpersonal relationships as some kind of exaptation or spandrel is that it does not seem to fit the growing evidence suggesting that humor and laughter co-evolved as sex specific, sexually selected traits that contribute to individuals' mate value. Recent research shows that humor is a reliable indicator of intelligence rather than merely functioning to enhance perceived intelligence, and that men use humor to signal their mate quality while women are good evaluators of humor (Bressler, Martin, & Balshine, 2006; Wilbur & Campbell, 2011). Men purposely try to

impress women with their high quality humor, and women who find this humor funny respond by laughing, and are more attracted to these men. Moreover, there is evidence that men's humor ability is slightly higher than women's, and a good sense of humor translates into mating success (e.g., no. of sex partners, early age of first intercourse; Greengross & Miller, 2011). These sex differences in ability, signaling and reception of humor and laughter are not likely to be just an evolutionary by-product, and probably underwent strong selection.

The authors argue that for humor to be a sexually selected trait it needs a strongly supported reward system. This reward system must be built on the error debugging mechanism (p. 274, note). While we agree that a reward system must be in place, its nature could be different. If humor is indeed an honest fitness indicator underlying genetic quality, then women (who are choosier when selecting a mate) should pay special attention to men who exhibit a good sense of humor. The reward mechanism is in the enhancement of one's fitness, and this can be done by choosing mates who exhibit high genetic quality, not just the satisfaction of reducing cognitive errors.

The ultimate question is whether the cognitive mechanism described by the authors explains the adaptive function of humor and laughter. As they explain: "Humor is one part of the emotional mechanism that encourages the process that keeps data integrity in our knowledge representation. This process ensures that we reduce the likelihood of making faulty inferences and fatal mistakes. Without a trait like that, a cognitive agent as complex as we are would be practically guaranteed a quick death" (p. 290). But do we really need humor to do that? As the authors themselves note, and as anyone can observe themselves, humor usually involves minor error corrections. To deal with more serious mistakes, we use other cognitive mechanisms, and we do not find them funny. Humor involves incongruities that are mostly trivial, or even fictional (e.g. fables), so it is not clear how important this debugging mechanism was to our evolved cognition. Moreover, the authors claim that humor evolved first with first-person jokes, which is the most basic kind of humor. For example; "Recall a moment when you have been looking frantically for the sunglasses that are on top of your head or the keys that are in your pocket. The eventual breakthrough in these episodes can be circumstances for mirth" (p. 131). We agree that finding the glasses on top of your head can be funny, but it strikes us as completely counterintuitive. First person humor (the "oh isn't that silly of me to not realize my glasses were on my head" humor) is very weak in terms of mirth and usually does not coincide with Duchenne laughter, the reward system that drove the evolution of humor by the theory proposed. It not only is weak but it often does not occur at all. How many time do people laugh even slightly when they find out the keys that they thought were lost were in their pocket?

Inside Jokes uses jokes primarily as examples to verify their theory, and the theory is indeed an excellent one for explaining jokes. Jokes are very good fodder for the theory because they work, for the most part, by creating a belief that we accept unconsciously because we then have to reconsider when the punch line does not fit the narrative of the set up. However, once the theory moves outside of the realm of set-up and punch line jokes, the covert belief necessity becomes strained. For example, a simple ironic statement such as saying "nice weather" when it is raining (which most people perceive as humorous comment) is not dependent on a covert belief which is then falsified to be perceived as humorous. Interestingly, nowhere in the book is such ironic humor discussed. Nonetheless,

this book details one of the most comprehensive theories of humor. Whether humor and laughter evolved as a debugging mechanism will, however, need to wait for further studies that directly test this theory. The theory offers some clear hypotheses that could be corroborated with future studies, especially with the advances of research in neuroscience. Only time and new evidence will reveal the extent to which their theory explains the ultimate mechanism that makes humor so valuable to all humans.

This is the first book devoted in its entirety to the evolution of humor, with one of the most complex and sophisticated humor theories ever presented. The authors excel at explaining why we find some things funny but not others, and raise the bar for future theories that attempt to explain humor from evolutionary perspectives. This book should not only be read by people interested in the evolutionary origins of humor, but also by anyone who is interested in learning more about humor and how complex a phenomena it is. This is an important contribution to both the humor and evolutionary literature that no doubt will spark discussions on the evolutionary origin of humor and its uses. The authors should be lauded for their thought-provoking and original work. The writing is clear and eloquent with an abundant number of footnotes that are very informative and interesting, though sometimes too tangential or esoteric and distract the flow of reading. Although most of the book is a fun and interesting read, some parts of the book are highly technical and the non-expert reader could have some difficulties with them. This is particularly true for chapter 7, where the authors detail the construction and activation of mental spaces as part of the theory of the mind that explains the architecture of humor.

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