# Laughter and Humour as Conversational Mind-Reading Displays

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**Abstract.** Laughter and humor are pervasive phenomena in conversational interactions. This paper argues that they function as displays of mind-reading abilities in social interactions–as suggested by the Analogical Peacock Hypothesis (APH). In this view, they are both social bonding signals and can elevate one's social status. The relational combination of concepts in humor is addressed. However, it is in the inclusion of context and receiver knowledge, required by the APH view, that it contributes the most to existing theories. Taboo and offensive humor are addressed in terms of costly signaling, and implications for human computer interaction and some possible routes to solutions are suggested.

**Keywords:** Laughter · Humor · Social bonding · Evolution · Context

## 1 Introduction

Laughter and humour are interlinked phenomena, but obviously quite different in nature; this should–but typically does not–raise questions about why such different phenomena came to be so closely associated with one another. Laughter is often assumed to be a simple response to a humorous stimulus presented in the environment; clearly it has this role but it also appears to have many other functions as well. A variety of research domains have shown that there is much more to laughter than its role as a simple response to humorous stimuli. In particular, laughter seems to have a range of regulatory functions within our social interactions and conversations; it seems to act as a kind of non-verbal punctuation mechanism, it eases our social interactions and regulates the flow of conversations in ways that usually pass unnoticed by the interlocutors [1].

Probably the first discipline to realise the importance of laughter in conversational interaction was conversation analysis [1,2] with important contributions from psychology [3–7], ethology and comparative psychology [8–10], and human ethology and anthropology [11–13].

Laughter is a reflex-like non-verbal social signal that is pervasive in human social interactions, especially amongst friends and close associates [5,15]. It commonly occurs at differing levels of intensity, and it seems that the intensity of a laugh most strongly distinguishes the function to which laughter is oriented [14]. At low levels of intensity laughter seems to serve conversational goals ensuring


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fluid social interactions with a social bonding function [1]. At higher levels of intensity it is more strongly related to humour [14], while probably still retaining its function as a social bonding signal. Far from being a reflex-like phenomena humor occupies a very different place in the human behavioural repertoire. Humor typically involves high level cognitive processing and perspective-taking and is often linguistic in nature. Humor, like laughter, is a pervasive feature of conversational and social interactions [16]. Yet, it is unclear why this would be the case if a simple utilitarian approach to human communication is adopted, that is, one that assumes the goal of human communication is to convey information efficiently. Accounts that place a higher value on social bonding aspects of human communication are required. This paper will briefly address the evolution of laughter as a social bonding display; the social nature of cognition, mind-reading, and the Analogical Peacock Hypothesis (APH). It will then focus on humor more directly, before exploring the implications of laughter and humour as conversational mind-reading displays for human computer interaction.

## 2 Laughter as a Social Bonding Display

Laughter has been suggested to have ancient origins in the mammalian lineage. Laughter-like phenomena are observed in many primates and its origins probably extend back at least as far as our last common ancestor with those species. Even older origins have been suggested as rats emit laughter-like ultrasonic vocalization patterns in response to play and tickling [17]. Amongst the great apes tickle-induced vocalizations are found in orangutans, gorillas, chimpanzees, and bonobos with similar acoustic patterns to human laughter [8].

Differing intensity levels in laughter may have their origins in two different primate social signals–one related to smiling and the other to laughter. Smiling may originate in the silent-bared teeth display, or teeth-chattering and lip-smacking displays that are often seen in higher primates–these are usually submissive, appeasement gestures or signal affiliation, reassurance, and attachment. Laughter probably has its origins in the relaxed open mouthed display or "play face" which often has a vocalized breathing component–this display is typical in rough social play and mock fighting, and may be a signal to interpret behaviour as non-serious [9]. Wild chimpanzee research has shown that receivers of mock-aggression emit these displays more often–they may therefore signal it is safe to continue the play [18]. Such tickling and "roughhousing" play is commonly found in humans between children, and between adults and children where it aids social bonding. Gervais and Wilson [19] stress the social affiliation function of laughter in human communicative interactions, and how laughter works with humor to enhance group cohesion and cooperation and maybe to signal to other group members it is safe to engage in group play.

Laughter's origins seem to be as a social bonding signal and it seems to retain this function in modern conversation [1,16]. Holt [20], a conversational analyst, suggests it is this social bonding function that allows laughter to do much of the work that is required in regulating and repairing conversational

interactions. Laughter creates a signal that is only very loosely attached to the propositional content of the current conversation and therefore it can help to create safe moments where topics can be terminated or changed, miscommunication and broken down conversations can be repaired, and potential misinterpretation of taboo conversational areas can be safely navigated.

Many of laughter's functions can use low intensity laughter, where the goal is to ensure that cultural and social norms of conversational interactions are adhered to. However, its inclusion is crucial, as social norms mean it will be expected in appropriate situations. It should not be thought of as false or weak laughter as it is required for efficient conversational interaction; a strong reason for this is that the absence of a social signal where one is expected can itself be a strong social signal. This is particularly important with respect to laughter. Good social interactions require laughter in culturally appropriate places, without it, it is easy to appear awkward; a worse scenario is silence where laughter is expected–easily interpreted as an insult. Alternatively, high intensity laughter most likely signals that it is safe to continue in playful social interaction, while retaining social bonding functions. High intensity laughter is harder-to-fake, signaling a more authentic connection with a felt emotion and a strong desire to bond. Higher intensity laughter has been shown to be more closely related to humor and humorous interactions [14]. This raises the question as to why we might want to place greater authenticity in our desire to socially bond with individuals who are able to produce quality humor. An answer to this has been provided by the Analogical Peacock Hypothesis [21]. However, before we address the APH, we need to introduce mind-reading and why it might be evolutionarily useful.

## 3 The Social Brain Hypothesis

The social brain hypothesis [22–24], places human sociality, and the human social milieu, as the core evolutionary driver and ecological environment for human cognitive evolution. It is in the need to rise up through a social hierarchy and to keep track of rivals, allies, and potential mates–and their relationships with one another–that has led to the special kinds of cognition that are seen in primate evolution and especially in humans [25]. This kind of social cognition places a strong emphasis on being able to take the perspective of others within the social hierarchy. Perspective-taking–sometimes known as mentalizing but more commonly referred to scientifically as mind-reading–has become particularly pronounced in humans. This has led to the evolution of strong mind-reading capabilities; the development of Theory of Mind, with strong recursive intentionality [26]; and important co-evolutionary aspects with human culture [27].

## 4 Mental Fitness Indicators, Mind-Reading and the Analogical Peacock Hypothesis

The argument that the need to be socio-politically astute has been the key driver in human evolution has been extended in a further argument known as

the Analogical Peacock Hypothesis (APH) [21]; this view combines the social brain line of reasoning with ideas that argue that sexual selection rather than survival selection has been more influential in recent homonin and human evolution. Miller [28] has argued that certain socio-communicative elements of human behaviour function as *mental fitness indicators*, these are mental abilities that indicate evolutionary fitness to potential mates. Miller [29] suggests some candidate mental fitness indicators, these include creativity, morality, language in conversation and storytelling, and humor (both verbal and nonverbal). The APH [21] argument posits that in the course of human evolution female homonins began to select males as reproductive partners on the basis of their socio-political prowess–how well they could gain status and rise up through the ranks of a social hierarchy. A key target for this selection was their perspective-taking and mind-reading abilities. According to the APH, the reason that the abilities highlighted by Miller are mental fitness indicators is that they allow us to display our mind-reading abilities to one another. This *display* of mind-reading abilities becomes the principal goal of human communication rather than the traditionally assumed function of conveying useful information to one another. Displays of mind-reading abilities serve as proxy measures for how socio-politically astute we are–how likely we are to climb our way through a social hierarchy and gain status, with the access to resources and reproductive advantages that high status brings.

However, mind-reading displays are only part of a complementary pair of communicative functions–we also engage in *alignment* communications. To be capable of displaying mind-reading ability we must become aware of and tune our minds to those of potential mates. In addition, as mating is a competitive selection process, multiple potential mates will be aligning their minds with each other which will lead to a broad cultural alignment. To become socially successful creative mind-readers, we must be aware of what is in other people's minds; we must spend a large amount of time listening to and observing other humans within the cultures and social groups whose social hierarchy we wish to ascend. We must learn and align ourselves with others within our social group and assimilate our group's cultural norms. A long process of alignment allows us to fine tune ourselves to the cultural knowledge, behaviours, and expectations that exist within the minds of other members of our social groups, and amongst those we would most like to have as potential mates, friends, and allies.

The analogical part of the APH comes from one of the key proposed methods of displaying mind reading abilities; we can create hard-to-fake displays of mind-reading abilities by showing others that we are so aware of the concepts that exist inside their heads that we can creatively link them together in ways that they had not yet thought of themselves. Finding previously unforeseen and relevant relational links between concepts creatively highlights a communicator's knowledge of what is in other people's minds and shows that they know what is likely to interest them. This core creative process is shared across mental fitness indicators. The APH highlights five key features that unify mental fitness indicators and make them serve as hard-to-fake signals of mind-reading ability.

These are: the relational combination of concepts, large conceptual knowledge networks, processing speed, contextualization, and receiver knowledge.

## 5 Relational Combination of Concepts in Humor

Humor makes a particularly good example in which to examine the creative display of mind-reading ability. The original APH paper [21] highlights Gentner's structure mapping theory [30], ideas around dynamic relational binding [31], and conceptual blending and integration [32] as mechanisms that may be used to explain how concepts may be relationally combined. Some of these mechanisms have previously been implicated in humor [33], but many similar mechanisms–proposed as models of humor–work well within the broader framework of the relational combination of concepts. An interesting older candidate is Koestler's bisociation theory [34], it makes a similar claim to the APH that the combination of concepts is central to creativity in general and that emotional context determines whether a creative act is found to be humorous or some other form of creative act. However, it differs extensively in the motivation for producing creative acts–Koestler relies on a "releasing tension" explanation as opposed to the socio-evolutionary motivation of the APH.

Most of the cognitive theories of humor highlight mechanisms that are suitable in one form or another for the idea that the relational combination of concepts is a key feature of creativity and humor. Humor represents a particularly useful example of how this might unfold; the various cognitive theories of more formal "canned" joke scenarios provide particularly explicit explanations. These theories tend to have a well explained mechanism for finding potential relational combinations. These concepts can then be held apart with sufficient confidence to challenge a joke receiver to exert considerable cognitive effort in finding the link–with a failure to meet the challenge, it can be revealed at a moment of the joke-teller's choosing by telling the punchline. Most of the theories of incongruity resolution involve some mechanism of this sort and perhaps the most detailed and explicit in terms of the mechanism are those suggested by Raskin [35].

These theories of humour typically highlight the nature of two of the APH's unifying features of mental fitness indicators: the possession of large conceptual networks and the relational combination of concepts. The APH requires, rather than contests, mechanisms of this sort. However, it is in the other aspects the communicative nature of humor that the APH can make a more valuable contribution. The APH highlights the importance of processing speed–an area where computers have a distinct advantage–as speed helps to make signals harder-to-fake. Processing speed makes a fitness indicator a more honest and reliable signal. It is usually the case that those who are able to make quick and relevant witticisms garner greater social status in social interactions than those who deliver a barrage of pre-prepared jokes. Even within the more formally defined situations of stand-up comedy there is greater kudos to be gained by performers who show themselves able to possess a fast wit and improvisational skills. However, it is in the incorporation of context and the acknowledgement of the importance of

receiver knowledge that the APH highlights important aspects of humor and laughter that need to be addressed for human computer interaction situations.

## 6 Contextualisation and Receiver Knowledge

Within most computational communication research–both linguistic and non-verbal–the problem of context is usually acknowledged as a difficult issue. This results in context being ignored in favour of "toy problems" and constrained scenarios until research has advanced sufficiently. With receiver knowledge the situation is even worse, the idea that communications have to be tailored to a given receiver or audience is usually not considered, or simply subsumed within broader conceptualisations of context. Typically, assumptions are made that we all operate using the same set of linguistic rules and use sufficiently similar semantic networks. These assumptions allow us to evade the issue that different people have different subsets of vocabulary with nuanced differences in the weighted relationships between concepts. Much of the computational research on humor, depends on abstracted sets of cultural knowledge, such as predefined static semantic networks or ontologies that capture constrained subsets of meaning in a language at a given point in a language's history–typically as modern as possible. These are valid and useful approaches, yet inherently limited–Raskin explicitly acknowledges the limitations of looking at just the "artifact text in isolation" [35]. Yet, these limitations raise important issues for certain kinds of human-computer interaction. Research in dialog modelling; Embodied Conversational Agents [36]; and digital assistants such as Apple's Siri, Microsoft's Cortana, Amazon's Alexa, and "OK Google", are all technologies and research areas that are currently at a stage where the infusion of humor and the appropriate placement of laughter would considerably enhance their user engagement.

During the evolution of the human communicative system, every human communication that influenced the evolutionary process took place within a context, and was targeted towards a specific receiver–whether that was an individual or a broader social audience. Consequently, when humans socially interact and communicate with one another, many adjustments and accommodations are made by communicators as they tailor their utterances, paralanguage, facial expressions, and other non-verbal components towards the targets of their communicative acts. These adjustments are made on the basis of a communicator's assessments of the contextual knowledge available to a receiver, their level of cultural understanding, their linguistic style, level of verbal fluency, and degree of intimacy with the communicator. Accurate assessments are evidence of receiver knowledge and require strong mind-reading abilities. Typically a joke or humorous comment made to a well-known friend will be different from a joke or humorous comment made to a stranger who has recently been introduced. Indeed, the "known" in well-known friend entails receiver knowledge. The tailoring of a communication to a given individual or audience becomes especially important if we accept the basic tenet of the APH that conversational interactions are primarily displays of mind-reading abilities. At a basic level, a well-tailored communication

serves as a direct display of the communicator's receiver knowledge. At a deeper level, incorporating as much context as possible makes a display hard-to-fake as it shows an awareness of what is most likely to be salient in the mind of the receiver at the current moment in time.

The degree of intimacy with a conversational partner is likely to be an important determinant of both the use of laughter and humor in conversational interactions. There is evidence that the use of metaphor in conversation depends on the degree of intimacy between interlocutors [37,38], and from conversation analysis that figurative language has functions that are similar to laughter [39]. Where there is a high degree of intimacy–between good friends, and between potential romantic partners–humor can and should be tailored to the interlocutors's particular tastes, displaying high levels of receiver knowledge. Successful displays would in turn be responded to with high intensity laughter, indicating a genuine desire to socially bond with someone who clearly knows the receiver well; someone who is reinforcing that they possess strong receiver knowledge through humorous conversational displays. In cases where levels of acquaintance and intimacy are lower, the use of humor becomes a much riskier endeavour. Where receiver knowledge is low, any targeting of humor is more likely to fail, in which case, broader, and more bland humor is a safer strategy, but it is unlikely to be viewed as a particularly accomplished display. Similarly, high intensity laughter as a response to bland and contextually weak displays of humor is likely to be interpreted as over-eager or fawning–perhaps at a level that is sufficiently inappropriate to induce different mentalizing strategies [40]. Therefore, low-intensity laughter is a safer option as it has greater ambiguity in how it can be interpreted. Having no laughter at all, however, is not an option, as the absence of a signal is often a signal; failure to laugh in a socially appropriate context displays a lack of knowledge of cultural norms or could be interpreted as an insult or snub. The correct knowledge of when laughter and humor are appropriate is essential to fluid conversational interactions. Without socially appropriate laughter interactions will quickly appear awkward and cumbersome, without sufficiently tailored humour they will lack engagement and charm.

According to the APH, conversational interaction is part of a competitive evaluation and selection process, and producing eloquent and accomplished conversation is amongst the most difficult behaviours we engage in. Language is well suited to these evaluative needs as it is represents a "Red Queen" situation. Languages are ever-evolving dynamic cultural entities where context plays an important part in the interpretation of meaning when humans are confronted with utterances [41]; and novelty, news, creative trends, and predicitons of what a receiver will find interesting are core features of conversational content. Therefore, "it takes all the running you can do, to keep in the same place" [42]. Consequently, static semantic network approaches are probably limited to bland and mediocre humor, and are likely to age very quickly in their applicability to human conversational interaction. The use of context and finely tuned receiver knowledge offers opportunities to ensure that humorous displays are seen as intentional and hard-to-fake. Incorporating topical and situation-

ally relevant material in humor displays cultural awareness. Successful humor production means that a correct assessment of the audience's awareness of the cultural set of knowledge on which the humor depends has been made; the producer has judged that a sufficiently aligned semantic network exists before attempting the humor. Assessments of receiver knowledge should be made and attempts at humor production should be inhibited or vetoed by a socially aware producer–whether computational or human. Vetoing should become more likely or humor should be made more bland in cases where the cultural differences–lack of alignment–with a receiver or audience are too great. For example, due to age or social group differences, insufficient degrees of intimacy, or weak levels of linguistic ability–perhaps in the case of an obvious second language speaker.

Acknowledging the importance of receiver knowledge and context means that the success of humour and laughter in a conversation is relative to how well it is tailored to an interlocutor's mind. To be convincing as a mind-reader of quality requires humor displays that: are tuned to a particular conversational partner or audience, show knowledge of the appropriate cultural norms, and awareness of the current context."The audience is a genius" is a phrase used in stand-up comedy circles and often attributed to Lenny Bruce. It captures this relative nature of humour. Professional stand-up comedians often have preparatory shows testing and vetoing their material against a live audience; in effect, they tune their material to reflect receiver knowledge using a representative sample of a larger audience population. They test their receiver knowledge to minimise the likelihood of failure.

Addressing the issues of context and receiver knowledge defines the humor problem in a broader way than the relational combination of concepts. It makes the problem of humour more obviously one of mind-reading; it places emphasis on the importance of understanding what is currently relevant, and subverting expectations in interesting and engaging ways–no small challenge for both computers and humans.

## 7 Humour, Taboo, and Offense

Culturally taboo topics are often sources of humorous material; factor analytic studies of cartoons and jokes often generate three factors–one instance generated incongruity-resolution, nonsense, and sexual factors [43]. In addition, taboo humor is common in romantic flirtation, where it can be used to explore social boundaries while remaining retractable; male-male insulting humor, where it can used to establish social rank while remaining socially bonded [44]; and to emphasize ingroup bonding, while denigrating an outgroup–often engaging stereotypical cultural formulations of an outgroup as part of a joke [16]. Clearly where humor strays into culturally and socially taboo areas there is a heightened risk of being offensive when the intention is to be humorous, almost the opposite outcome of that which is usually sought. Why would such a risk be taken? Costly signals are harder-to-fake and one way of making a humor signal more potentially costly is to increase the risk associated with a signal. Taboo topics can

make humorous displays more costly. Deft use of humor that is on the border of social acceptability shows that the humorist is finely tuned to the prevalent cultural norms and can push the limits of social acceptability just as far as they think the receiver will find acceptable. It displays finely tuned receiver knowledge. The risk is high as any failure to judge the boundary appropriately will create an offensive situation with the subsequent damage to social reputation that this would cause; managing to be humorous, to know just what is appropriate, and playing with the boundaries of social acceptability provides a strong display of receiver knowledge where the risks of getting it wrong are high.

Often in stand-up comedy there is greater kudos to be earned for conducting "edgier" routines, pushing the boundaries of acceptability and running the risk of offending people. Reputations can be enhanced by adding shocking attributes to a comedy routine, performances that come close to, but do not quite overstep the social limit. For a performer this can constrain the size of a potential audience to those that are willing to tolerate their boundaries being pushed in a particular way–perhaps a tolerable outcome if it also enhances critical appraisal. Larger audiences will contain a greater proportion of shockable people, those easily pushed beyond their boundary of acceptability and offended. Often a comedian retains some control over an audience–an audience has self-selected to watch a performance, or paid to see a show of a known outrageous performer–then there are expectations that social norms and acceptable boundaries will be challenged.

Audience control is often limited, however, and from the APH point of view, there should be no surprise that so much offense occurs in social media situations–especially in micro-blogging networks such as Twitter. Often in these situations a communication is pared down to its minimal textual component, minimising the amount of context, and supportive signalling, that can be used to mitigate any erroneous attribution of intention towards insult. Laughter and smiling are not easy to convey in this medium, so there can be no signals to announce that this is a play frame or that it is safe to continue playful conversation. The audience too, is broad and diffuse, and often beyond the control of the communicator. Micro-blogs get shared amongst broader social networks than those that have self-selected to follow the original communicator. Therefore, any judgements of receiver knowledge can be nullified by the dispersive nature of social networks. A written piece of text that has attempted to tread into the finely tuned areas at the boundaries of social acceptability is almost certain in these circumstances to be met by someone with indignation and to cause offense. As morality is also a mental fitness indicator, attempts at humor can be converted by other communicators into displays of decrying sanctity. These displays engage a different emotional context and agenda, and an assessment of receiver knowledge that perceives an orientation towards outrage. The humorous attempt will probably also get clarified in ways that remove ambiguity and to ensure moral unacceptability before being further shared. Micro-blogging sites offer a communicative environment in which the checks and balances offered by the interaction of laughter and humor within conversational interactions have been

stripped away; as a result they often generate controversy that was unsought and cause offense that was unintended.

## 8 Implications for Computational Humour and Human Computer Interaction

The problems associated with mind-reading, context, and cultural understanding are amongst the most difficult tasks to incorporate into computational models of social interactions. However, it is necessary to overcome these obstacles in the development of computational humour generation and accompanying socially appropriate laughter. A goal of this paper has been to suggest a way to more clearly define this problem. Embodied conversational agents and digital assistants are ready to move beyond narrow and constrained scenarios, and dialog models that incorporate laughter and humour are needed to create genuinely engaging conversations.

Although social media has been highlighted as a dangerous place in which to produce humor, it may also offer opportunities to solve some of these problems as it presents a rich source of current and topical receiver knowledge. It can be used to keep semantic networks up to date with socially relevant concepts. Incorporating novel and trending concepts into existing semantic networks can allow them to keep pace with the dynamic unfolding of language and highlights the concepts that are most likely to be salient at any given moment. In addition, some social networks can provide access to receiver knowledge; people leave strong indications of the their tastes within social networks, their friends and followers send humorous messages to them that are often evaluated with "likes" and similar endorsements. People also sign up to recommender engines and provide them with strong indications of their interests. Recommender engines use this offered receiver knowledge to predict future interest and refine receiver knowledge with patterns of use. These techniques gather evidence of receiver knowledge and context that can be incorporated into current models to create more tailored attempts at humor. There are obvious ethical and privacy issues with these technologies. Care is required to ensure informed consent, as the goal is to create automated and targeted mind-reading technologies that tailor communications to a given individual. Technologies like these could be used to generate more engaging interactions, but also material and techniques that could most certainly be abused.

## 9 Conclusion

This paper has argued that laughter and humor both work within social and conversational interactions as displays of mind-reading abilities for evolutionarily important reasons. These mind-reading displays reinforce social bonds and elevate the social status of humor producers. Computational models of humor need to address these aspects if they are to move out of the laboratory and into current technologies that require laughter and humor if they are going to function as genuine human-like interfaces.

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