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QUANTITATIVE HUMOUR THEORY

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ABSTRACT

The comprehensive humour theory that embraces all humorous expressions pertained to linguistic and non-linguistic demonstrations is proposed.

Many humour theories are developed and discussed up to date. Some teach that humour is mainly a social event. Another concentrate on the formal features of the humorous content often missing its social implication.

None of the proposed humour theories plausibly and exhaustively explains the most important question: what forces people to laugh. Where is the root of this phenomenon? Is it possible to explore humour from a scientific point of view? Can it be reduced to a mathematical expression, a formula, or an equation? Would it pass the criterium of falsifiability? Is it a true scientific theory, not just a description or classification of humorous manifestations?

The answer to those questions is: YES! The theory proposed here is based on the experimental facts and theoretical concepts established by numerous generations of researchers in the past. Most popular superiority and incongruity theories blend naturally in the proposed concept.

It elucidates humour as an important and inherent part of living matter.

The theory is crowned by the Formula of Laughter that allows making a quantitative assessment and prediction of the humorous effect based on the content and its implication to the audience.

Keywords: effect of humour, personal empathy, social status.

1. Introduction

The term "theory" is the first disputable definition I want to address. Sometimes a theory can be viewed as a body of knowledge or a conjecture, which may or may not be associated with particular explanatory models and experimental findings. The true scientific theory refers to a well-confirmed type of explanation of nature that can be reliably verified. It should use the scientific method and preferably be falsifiable. This is the goal of this article.

The second disputable issue is a mere notion to assess humour by quantitative quality. Is it even measurable, some may ask? It is highly subjective, indeed, but we are capable to rate every joke, or anecdote, or cartoon.

Existing humour theories may be divided into three groups: relief theory, superiority theory, and incongruity theory. Since the first category is based mostly on homeostatic mechanisms including tickling and a release of fear or pain, we will not examine it along with two others. Some researchers found a root of the

superiority theory in Plato and Aristotle writings. People in their view laugh when happen to be luckier or better than others. The feeling of superiority affirms the prime participants dominance and elevated their mood.

The incongruity theory asserts that humour is perceived as a result of the realization of incongruity, a riddle, which is an inseparable part of any humorous content.

The superiority theory emphasizes the social aspect of humour, while the incongruity theory concentrates solely on the joke's content.

There is a need to combine all the experimental data and theoretical ideas into a single concept that congruous with the contemporary "scientific theory" definition.

There is no generally accepted consent about the viability and explanation power of each theory. There is not even an agreement whether humour is a benign, or sinister phenomenon. Given the absence of a true scientific concept, such disagreement could not be resolved with any certainty. Here we attempted to resolve this situation.

To start with I put forward nine postulates (2.1 – 2.9) on which the proposed theory is built. These postulates are not new. Instead, they are rather obvious and undisputable for the majority of the researchers.

2.1. Humour is one of the most primitive manifestations of intellect.

Humour is a natural phenomenon for everybody, including children, uneducated persons, savages, primates, and some other animals and birds. It appeared to Charles Darwin (Darwin, 1971) and others (Coren, 2015) that not only monkeys but dogs have some sense of humour.

2.2. Humour is an innate phenomenon.

Pliny remarked that a smile appears on an infant's face within the first weeks of life. Indeed, can we find people who have never laughed? Humans come across something funny daily, several times a day, more often dozens of instances each day. That prompts us to consider humour as something inherent in our nature and may be vitally important to living matter.

2.3. Humour is a social phenomenon.

According to Henri Bergson, laugher loses all meaning outside of the social group. Giraldo Greg emphasized that "Nothing is laughable by itself: the laughable borrows its special quality from some persons or group of persons who happen to laugh at it, and unless you happen to know a good deal about this person or group of persons you cannot by any means guarantee the laugh beforehand." (Greig, 1923). Robert Provine found that his students laugh about 30 times more frequently in a social contest than being alone (Provine, 2001). He, along with Bergson, came to the conclusion that laughter in solitude and without an audience practically doesn't exist.

2.4. Humour takes roots in either aggression or competition.

Albert Rapp concluded that "laughter is the offspring of hatred and hostility. If hostility was not innate in mankind, laughter wouldn't exist. All contemporary forms of humour contain evidence of its aggressive origins. In some witticisms this comes through more clearly; in some, it's disguised. Ridicule, for example, bares our fangs and claws. The great majority of jokes and witticisms that reach us via radio contain elements of ridicule. Yes, they are subdued. But savagery is still concealed within." (Rapp, 1951).

He supposed that ridicule was the first, and for a long time, the only form of laughter. The caveman laughed at the physical misfortunes of others, as they foretold of a coming victory in battle. Subsequently, intentional mockery began to supplant the battle and probably became the way how the defeated could take revenge.

Martin Grotjahn wrote: "… wit begins with an intention to injure, which our culture causes us to repress." (Grotjahn, 1957).

The hostility concepts go back to Plato, in part to Aristotle and Cicero, and find support in the works of Schopenhauer, Hobbes, and Gruner. Thomas Hobbes supported Plato's and Aristotle's views that laughter has to bear on one's social status and superiority over one's peers. In "Leviathan", Hobbes wrote that the human race is in a constant power struggle and that it should not be surprising that victory goes to the one who laughs (Hobbes, 1651). Hobbes expressed a fruitful idea that laughter is the expression of sudden triumph, caused by a sudden feeling of superiority over others or one's past. His predecessor Gian Giorgio Trissino wrote in his theses "La Poetica": "this (humour) brings pleasure due to the fact that man is by nature envious and malevolent" (Trissino, 1530). William Fry drew a parallel between a verbal duel and a real battle engagement (Fry, 1963). Sigmund Freud noted that for humour three persons are needed: first, someone who causes laughter; second, a target for aggression; and third, someone who laughs - receives the extraction of pleasure (Freud, 1923). In modern times, physical entanglements have turned into duels of wit. We compete and sharpen our mastery not in physical, but in mental superiority, wherein jokes serve as weapons.

But even today the news informs us that mob violence, including mass-murders all around the world, is accompanied by… laughter. A. Cohn, a survivor of the 1999 Columbine school massacre, reported that both of the murderers "laughed. They were just hooting and hollering. They were having the time of their life." (Denver Rocky Mountain News, 1999).

2.5. Any joke is characterized by certain incongruity, illogicality, a "shining contradiction", or a riddle, separating it from the usual logical thought. Incongruity theories predicate that humorous pleasure appears as a result of understanding the incongruity between the expected, and the achieved result. Any joke contains a mental challenge waiting for resolution. These theories do not explain why not any mental task resolution results in laughter but only a certain kind.

2.6. Any verbal joke consists of a narration containing an incongruity and a short, abrupt hint for the incongruity resolution (punch line).

Arthur Schopenhauer expressed this idea in his book "The World as Will and Representation": "Laughter always signifies the sudden apprehension of an incongruity between a concept and the real object thought through it and represents a mere expression of this incongruity." (Schopenhauer, 1958). Alexander Luk came very close to understanding humour nature when he analyzed the role of the time factor in the reaction to the comic: "If the punchline becomes immediately apparent, or if on the other hand, it takes too long to figure it out, then the effect of the witticism decreases significantly, and sometimes vanishes entirely. Though the occasions in which the listeners "get" the joke several days hence and laugh aren't all that infrequent. Still, there exists a certain optimal time for processing." (Luk, 1977).

2.7. Humour reactions are expressed either in a positive mental pleasure (smile, laughing) or a negative reaction (shame, anger).

2.8. A positive reaction (pleasure) of humour is reached from gaining a social status by:

- superiority over other(s), or/and
- intellectual triumph from solving the riddle.

2.9. A negative reaction (shame or anger) causes by humour is a result of losing a social status from:

- humiliation or diminishing a person or a group, or
- the intellectual loss compared to others.

1. The theory of laughter

The above postulates contain a sufficient and necessary amount of information for the quantitative Humour Theory development and, as its natural outcome, a Formula of Laughter.

The simplest version of the formula looks like this:

$$EH = PSR + BM, \quad (1)$$

where EH = the Effect of Humour, expressed subjectively but quantitatively;

PSR = the intellectual Pleasure magnitude gained from Solving the Riddle (incongruity) of the joke, and

BM = the Background Mood value.

To keep the Formula in line with scientific tradition we need to introduce certain units on the Formula (1) components. EH unit (like physical dimension unit) will be called a Laugh (L). We designate the maximum possible pleasure received from the apprehension of a joke equal to 1.0 Laugh, or 1 L for short. The maximum value +1.0 L attributes to the crest of EH, which corresponds to a horse-laugh or "rolling on the floor laughing (ROFL)". The minimal value (- 1.0 L) represents the ultimate dissatisfaction, distress, or anger. The PSR and BM values must have the same dimension (L). Let us set an arbitrary maximum value for PSR equal to the maximum value of BM, that is, at +0.5 L each. BM = +0.5 L corresponds to a very joyous state of the soul, in which is very easy to force the person into laughing. The maximum value of PSR, also equal to +0.5 L, corresponds to a first-rate joke, such as a timely and well-told anecdote.

The minimal value of PSR = -0.5 L (a blasphemous, offensive, racial joke) corresponds to such deep depression that even a very high BM value (+ 0.5 L) won't raise the mood to a laughable level. Even the most successful joke with a value of PSR = +0.5L won't cause more than a slight movement of the lips. The total value of EH will be close to zero (0.0 L).

The maximal possible value of EH equals +1.0 L, and the minimal one can reach -1.0 L. Despite its obvious and inevitable subjectivity, formula (1) provides us with the opportunity for numerical analysis.

Let's proceed deeper into quantitative theory and the humour nature, using as an example a typical verbal joke and analyze its variations.

Variation 1 (original). *A burglar broke into a house one night. He shone his flashlight around, looking for valuables, and suddenly a strange low voice echoed from the dark saying, "Jesus is watching you". He nearly jumped out of his skin, clicked his flashlight off, and froze. When he heard nothing more after a bit, he shook his head, promised himself a vacation after the next big score, then clicked the light back on and began searching for more valuables.*

And clear as a bell, he heard the same low voice, "Jesus is near you." Rattled, he shone his light around frantically, looking for the source of the voice.

Finally, in the corner of the room, his flashlight beam came to rest on a parrot.

"Did you say that?" He hissed at the parrot.

"Yes, I'm just trying to warn you."

The burglar relaxed. "Warn me, huh? Who do you think you are anyway?"

"I am Moses".

"Moses? What kind of stupid people would name a parrot 'Moses'?

"The same kind of people that would name a Rottweiler 'Jesus'!"

Variation 2. Now we rephrase this anecdote. The story is the same but begins with words:

"A burglar broke into a house where was a Rottweiler named Jesus. He shone his flashlight around, looking for valuables, and … the story continues as it was".

Is this story still humorous for you? Obviously not, but why? It is the same textual narrative with just one sentence placed at the beginning instead of the end. But this switch of order deprives the anecdote of a riddle, of incongruity. The Rottweiler's name is revealed in the first sentence. The is no puzzle to resolve and no mental pleasure of cracking this incongruity. PSR value is equal to zero converting the good story to the flat and dull one. So far, our formula stands.

Variation 3. Let's change the first sentence again having the original riddle intact:

A small girl was visiting her uncle. One night she walked through the house looking for a restroom and entered a dark room instead. Suddenly a strange low voice echoed from the dark saying, "Jesus is near you"…

Does this "anecdote" still sound funny? No, it is a sad and disturbing story.

But, wait, what changes in this story compare with the original? In this variation, we still have a riddle, an incongruity, a puzzle that we have to resolve. It should involve a mental pleasure and laugh if we follow incongruity theories conclusions. Instead, we feel quite opposite: the sadness.

We have to modify the formula (1) with a new component. We call it Personal Empathy (PE) to the joke's subject. PE value may be positive if we feel that our Social Status is elevated by the joke. A burglar should be punished and we enjoy the justness. In the case of a small girl, albeit imaginary, we would be terrified of the story content. In this case PE, should turn to a negative value.

New formula member (PE) has to be multiplied by (not added to) PSR value. The formula of the funny then takes on the following form:

$$EH = PE * PSR + BM, \quad (2)$$

where * is the multiplication sign,

and PE is a dimensionless member.

Formula (2) has a powerful implication on our understanding of the humour nature and its role in society. There is a wide-spread notion among lay-persons that humour is a joyful and innocent art serving entertainment and amusement. If that would be so, Charlie Hebdo or Jyllands-Posten caricatures would not outrage Muslims and twelve French journalists would be still alive. We would laugh at racist jokes and promote them in public life. Instead, such kind of humour upsets people to the extent that it is considered a hate crime.

Therefore, we have to accept that humour is not just entertainment but it is a tool and a weapon. Yes, a bloodless weapon, but it leaves behind the winners and losers all the time. It may cause real scars in people's hearts. Plato considered Aristophanes' play "The Clouds" as a slander that contributed to the trial and subsequent condemnation to the death of Socrates.

Mark Twain once declared: "The human race has only one really effective weapon and that is laughter." Rephrasing Old West adage, one might reiterate that "God created men and Sam Clemence made them equal".

The modern world fully recognizes and uses humor’s power to the full extent. Mickey Mouse and Donald Duck became international symbols. Humorists have grown into a mighty popular and influential group. Many job seekers stress their sense of humour in resumes. Jokes became common in political debates.

From the biological point of view, competition is an inseparable part of the evolutionary process. That explains the evolutionary role of humour.

It is doing nothing but changing participants’ social status that may be elevated or diminished. How humour works? If you a good speaker and induce a good portion of laughter in your audience, then both you and the other participants experience joy.

But wait? Is this a win-win situation? Doesn't everybody rejoice because manage to understand a joke and crack its incongruity? But what if you did not get it and remain unexpressed while others laugh? What if the joke is aimed at you, or ridicules your beloved one, or your race, or your religious belief, while the rest of the audience horselaugh at it? The louder the audience laughs the more humiliated you feel. Your social status drops and you feel not a joy but a sadness. Remember the old days in high school when everybody laughs at your classmates? If you do, you not just understand but comprehend the power of Personal Empathy (PE) in the Formula (2). This Formula naturally combines hostility and incongruity concepts in a single compact shape.

It does not explain one main thing, however, which is a PSR value. If the PSR, which is the intellectual pleasure magnitude gained from solving the riddle, is so great that brings us an instant and powerful expression of happiness, why it manifests itself in rather simple incongruities which we find in common jokes? More sophisticated mental tasks should bring greater intellectual pleasure to those who manage to resolve them. We face sufficient mental challenges all the time. We need to find a good technical solution, or write a thesis, or resolve a chess endgame, or pass an exam. Each of these tasks is far more complex than a simple joke featuring cheating spouses or Rottweiler called Jesus. These complex tasks resolution also bring us joy but we seldom burst into laughter after resolving them. Why?

To understand that, we may recall a few examples from elementary physics.

Someone is stroking your hand or giving you a massage with a certain force that is equal, say, to F Newtons. You feel a pleasant sensation. But if someone applies the same force to a needle resting on your skin, the sensation becomes painful. The same force F is pressing on a much smaller area A. Pressure P is equal to:

$$P = F/A \tag{3}$$

The area of the needle's point is much smaller than the area of the palm and the pressure magnitude P is considerably larger. The smaller the area A, the larger the pressure P becomes, and the more unpleasant the sensation is.

Another physical analogy. A thunderbolt has colossal power. With voltage up to ten million volts, and current up to twenty thousand amperes, the power PL of lightning exceeds 200 thousand million watts. This is greater than an average power plant generates.

Lightning appears as a result of an accumulation of charges in the upper atmosphere. These elementary charges (ions) rise upwind from the lower atmosphere. The electric current which delivers the ions to the upper levels is small but flows without interruption. The Earth's entire area delivers to the sky only around 1000 amperes, that is, 20 times less than the amplitude of the current flowing down the narrow channel of a single lightning bolt. Yet there are about 16 million thunderstorms each year around the Globe. How did that happen? Such a great difference between the unimaginable power of single lightning and the modest value of the elevating charge is explained by a relationship reminiscent of Formula (3). Only now we are dealing with the time intervals T_A and T_L, spent respectively on a slow charge accumulation with power equal to P_A and a rapid discharge with power P_L; in other words, the interval of time between flashes of lightning and the duration of the lightning bolt:

$$P_L = P_A * T_A/T_L \tag{4}$$

The smaller T_L, the greater the impulse power P_L generated during this discharge.

In physiology, a sudden scare, as well as sudden joy, provides greater emotion magnitude than the same psychological stimulus that is spread out over time. For this reason, the maximal value of PSR is proportional not just to the complexity C contained in the riddle of the joke, but to the magnitude of the impulse, i.e., the splash of emotion. This maximal value may be defined as the ratio of complexity C of the riddle to the joke resolution time Tr:

$$PSR = C/Tr \tag{5}$$

Russian philosopher G. Golitsyn explains:

"Usually there exist various limitations which restrict immediate and full realization of this equilibrium so that the push to the minimum J, in reality, turns into the subject's push for receiving the maximal influx of information:

$$E = \Delta J/\Delta t = max, \tag{6}$$

where ΔJ = informativeness of the stimulus (comical), and

Δt = its duration". (Golitsyn, 1992).

We can logically induce now that a good joke must contain the maximal complexity, that is – a difficulty to resolve, which can be solved in a short time. Then the ratio of joke complexity C to duration Tr (i.e., the intellectual pleasure, PSR) should as high as possible. An impulsive, short-termed elevation of mood causes a strong positive (or negative) emotion. Externally this emotion is expressed through a laugh (positive) or anger (negative). This is the key to humour nature understanding.

The final Formula of Laughter takes the form:

$$EH = PE * C/Tr + BM, \quad (7)$$

where C = the complexity of the riddle, and

Tr = time spent on its solution.

Notice, that C has the dimension of L*t (L times second), and Tr is measured in seconds.

Let us continue the analogy between the processes of the joke apprehension and the impulse physical process, such as lightning.

The lightning consists of three phases:

- an accumulation of energy,
- a signal to discharge,
- the discharge of the stored energy.

In storm clouds, the accumulation of energy happens gradually, through a slow ions' migration into the upper atmosphere. This is the first phase.

When the critical amount of energy is accumulated, phase two begins. At the base of the storm cloud, a luminous discharge appears – a "leader". It travels to the surface with enormous speed and blazes the way (creates a channel) for the thunderbolt.

The third phase: The main body of the discharge – the lightning – travels down the channel and results in a thunderstorm.

The process of humour apprehension is quite analogous.

1st phase: The listeners are told that they are about to hear something funny. This announcement causes an expectation of the forthcoming riddle and the need for its solution. In the process of the narration, the information that contains the "riddle" is delivered and apprehended (accumulated).

2nd phase: A signal to start the riddle resolution process is sometimes a word or a phrase; sometimes a pause. Commonly it is known as a trigger or a punch line. As in a bolt of lightning, this phase must be short. In most cases, the punch line is placed at the end of the joke.

3rd phase: The third phase is a process of the "riddle" resolution by the listeners. If the joke is told to a group of people, a competition of a sort occurs in which the winners are those who laugh first, and the losers - those who get it a bit later. This competition plays a big part in the elevation or degradation of the social status of the listeners, expressed by the value EH. The biggest EH is gained by those with a good sense of humour, and the smallest or negative by those who didn't understand the anecdote at all.

A skilled narrator constructs his jokes in such a manner that punch line duration Tr is as short as possible. At the very best it is represented by just one final word.

An overly simple joke has a low C value (riddle complexity) and generates a small impulse of pleasure and a burst of PE. An exceedingly complex joke may cause a disproportional time duration Tr for the incongruity resolution. In this case, the level of PE may turn out to be low (spread over time).

The time spent on solving the joke's riddle is usually 1-2 seconds. Then the success of the joke depends on the correct choice of C value for the listeners or readers. A successful joke contains a maximally complex problem that can be solved in a matter of 1-2 seconds.

Formula (7) includes several numerical components and provides a ground for EH calculation based on the components' values. True, the components' values, as well as EH magnitude, are subjective. But as a saying goes: "I would be rather vaguely right than precisely wrong". This formula stands such scientific criteria as the falsifiability principle by Karl Popper and, therefore, brings the proposed theory of humour to the real scientific rank (Popper, 1959).

There is a hope that in the near future, an objective instrumental means for all components' measurements will become available and EH could be calculated and predicted with greater precision. These means may be based on phycological reaction assessment, or a questionaries' analysis, or direct neurons' activity measurements, or more advanced methods. So far, our approach allows getting as good prediction and generalization as Henry Cavendish did with electrical phenomena two centuries ago.

Formula (7) provides us with a practical tool for humour assessment and, which is more important, humour improvement.

In fact, stand-up comedians and skillful joke tellers subconsciously use formula (7) for a successful performance. Every experienced performer knows that the Background Mood (BM) of the audience should be of high value at the time of a joke introduction. They never tell funny stuff from the very beginning. First, they warm up the audience, that is so-called priming. They use a different technique to make the listeners more active, encouraging the participants' collectivism and awareness. Doing that they increase the listeners' BM value.

The next thing they do is a figuring out the audience PE. The joke should have an affinity to their taste and habits. Smart comedians pump out the listeners' disposition first and then adjust their jokes' content appealing to the audience's most sensitive points. If they take a stand in Seattle be sure that notorious rainy weather is the inseparable part of the comedian performance. Having a typical Californian audience, they mock the Republicans and, vice versa, pound democratic senators in Texas or Alabama. Remarkably, the jokes in all states may be virtually the same. The comedians' trick is to change the joke's target correspondingly. They do it subconsciously, but they just numerically elevate the PE value.

Jokes complexity C is the next important thing the comedians deal with. Most experienced speakers spend an initial part of their show, testing the audience's intelligence level. They bring some seemingly irrelevant questions, first asking the participants whether they read certain books, watch particular movies, what is their favorite sports and whether or not they are familiar with the non-common information, like popular scientific theories. After the audience collective IQ is figured out, the joke teller delivers to the audience more or less sophisticated pieces of his humorous assets. This way the comedian balances their jokes complexity C in order to maximize the ratio C/Tr.

When all the components of the formula (7) are near the maximum level you may be confident that your jokes will be met with enthusiasm and appreciable laughter.

2. Conclusion

In summary, the presented theory provides a scientific explanation of the humour nature in its historical and evolutionary contexts. It uses the existing theories and established observations and combines them into the harmonic and plausible concept. The theory is falsifiable and operates with mathematical apparatus. It explains humour as a double-edged art capable to increase or diminish people's mood and social status. These findings give an ability to predict and adjust the humorous content for achieving maximum efficiency. More detailed information may be found in my book “Humor Theory” (Krichtafovitch, 2006).

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