



Stumpers: an annotated compendium*

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To cite this article: Maya Bar-Hillel (2021) Stumpers: an annotated compendium*, Thinking & Reasoning, 27:4, 536-566, DOI: [10.1080/13546783.2020.1870247](https://doi.org/10.1080/13546783.2020.1870247)

To link to this article: <https://doi.org/10.1080/13546783.2020.1870247>



Published online: 03 Feb 2021.



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REVIEW



Stumpers: an annotated compendium*

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ABSTRACT

A stumper is a riddle whose solution is typically so elusive that it does not come to mind, at least initially – leaving the responder stumped. Stumpers work by eliciting a (typically visual) representation of the narrative, in which the solution is not to be found. In order to solve the stumper, the blocking representation must be changed, which does not happen to most respondents. I have collected all the riddles I know at this time that qualify, in my opinion, as stumpers. I have composed a few, and tested many. Whenever rates of correct solutions were available, they are included, giving a rough proxy for difficulty.

ARTICLE HISTORY Received 19 August 2020; Accepted 26 December 2020

KEYWORDS representation; insight; problem solving; conversational maxims; availability; cognitive economy

1. Introduction

Stumpers, as defined here, are riddles so simple that kids can solve and appreciate them – yet so elusive that even intelligent adults can be completely stumped by them. Example: *Alex is Bobbie's blood relative, and Bobbie is Charlie's blood relative, but Alex is not a blood relative of Charlie. How come?* Stumpers are distinct from other types of riddles, such as the wildly popular CRT (Frederick, 2005; presently over 4400 hits on Google Scholar, and counting). CRT items are (typically mathematical – although this may be changing recently) riddles to which an intuitive answer immediately springs to mind – but is nonetheless wrong. The most famous example is: *A bat and a ball together cost \$110. The bat costs \$100 more than the ball. How much does the ball cost?*

Stumpers are also distinct from other riddles that elicit no immediate answer, but the solver's sense is that the elusive answer is simply hard, and

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*The following people deserve special thanks for help in various stages of this project: Yigal Attali, Shane Frederick, Phillip Johnson-Laird, Tom Noah, Gordon Pennycook.

This article was originally published with errors, which have now been corrected in the online version. Please see Correction (<http://dx.doi.org/10.1080/13546783.2021.1891366>)

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requires time and possibly paper and pencil. Example: *If my mother is your mother's mother-in-law, who am I?* Stumpers also differ from riddles which either stump, or bring to mind a false answer, but do so by “tricking” the solver, in some suitable sense. Example: *How many pangolins did Moses take into the ark?* (for a discussion of the cognition underlying this type of riddle see, e.g., Reder & Kusbit, 1991)

Based on informal perusal of hundreds of riddles in academic papers, riddle books, and Internet collections, stumpers are a relatively rare form of riddle. I am not aware that anybody ever defined the category as such before Bar-Hillel et al. (2018; BNF, for short), although on the Internet the term is sometimes used casually as more or less synonymous with brain teasers. Murray and Byrne (2013; M&B, for short) introduced what they call *1-step insight problems*.¹ In a 1-step insight problem, the insight *is* the solution. For other insight problems, the insight *allows* solution, but is not yet itself the solution, requiring more steps. Stumpers are the simplest form of 1-step insight problems, and require less creativity than solving the classical oft used insight problems.

Analyses of insight problems often evoke the need of the respondent to break away from an initial *interpretation* in order to solve the problems, a mental step which typically requires insight. In stumpers, it is preferable rather to speak of an initial *representation*. For example, one can envision a *chair* as made of wood or made of plastic. These are not two interpretations of *chair* – nothing changes in the word's meaning – but two representations. On the other hand, one can understand a *chair* to mean a piece of furniture to sit on, or a person conducting a meeting. These are two interpretations. This dichotomy somewhat resembles the meaning-reference dichotomy in semantics: a word can have multiple meanings, and within a given meaning, can have multiple references.

In most of the stumpers collected here, solution depends on abandoning the dominant representation in favour of another. Nothing changes in the interpretation. Words don't change their meaning.

The purpose of this article is to gather all the stumpers of which I am presently aware. Until recently, I knew barely half a dozen, and as recently as the proofreading stage, a reader alerted me to more.² I have tried to cite published sources for the stumpers. But, as is the fate of other kinds of riddles or jokes, many remain without attribution. Several are referenced to Dominowski (1994), a conference paper I have been unable to obtain. Since these also appear in Ansburg and Dominowski (2000; A&D, for short), I will

¹There are 4 1-step insight problems in their paper, but I only included three here. The fourth suffers a flaw that in my opinion disqualifies it: It fails to distinguish between X and “X”, a distinction which cannot be overlooked in a written version.

²Thank you, Ariel Rubinstein.

be citing that source instead. Other stumpers have appeared over the years in Martin Gardner's famous column in *Scientific American*, and then assembled in his book *Aha! Aha! Insight* (1978), but without citing their origins. No doubt, many of the stumpers existed even earlier than my citations, some perhaps for centuries. It may be forever impossible to know exactly who invented each one. Stumpers taken from accessible published sources are reproduced closely or verbatim (unless noted otherwise). I have also translated some stumpers from my mother tongue, Hebrew. I use MBH to designate Stumpers I invented, or adapted.³ By request, my personal favourites are starred.

Whenever a stumper is accompanied by data, the data are reproduced verbatim, and the rate of correct solutions is given in parentheses. In A&D, N for each stumper was apparently 20+.⁴ Among the stumpers, a group of 26 were given by me together, in randomised order, to the same 56 MTurkers. These data have not been previously published. Readers interested in details of the studies wherein data were collected can refer to the original source.

The compendium is meant to help researchers who wish to study stumpers or to utilise them in their research. I will suggest some lines of possible research throughout the paper and at its end. Often, research stimuli that appear first in professional journals dominate later research, even if they are not optimal. That need not be the fate of stumpers. Since I have composed some stumpers myself, I offer some tips on how to develop stumpers, and share some insights I gained in my years of dealing with stumpers. Some tips apply to more than the stumpers next to which I give them, while others are more specific. I encourage stumper users to polish the ones I used, some of which I would polish myself were I to use them again. Solutions can be found in, or gleaned from, the comments following the stumpers.

Since there are dozens of stumpers in this compendium, here is a roadmap for what follows. [Section 2](#) groups the original BNF stumpers and variations thereof. [Section 3](#) outlines a theory of the cognitive underpinnings of dominant representations. [Section 4](#) groups stumpers whose dominant representations follow Rosch's idea of cognitive economy. [Section 5](#) groups stumpers whose dominant representations result from Grice's maxims of cooperative conversation. [Section 6](#) gives just two riddles, which are borderline stumpers, if at all. [Section 7](#) hints at a promising avenue of stumper research.

I recommend that you pause after every stumper and attempt to solve it. If you fail, you will find the solution in the subsequent text.

³I welcome any and all additions and corrections to this compendium.

⁴Personal communication, Pamela Ansborg, 2020, who did not provide exact numbers

2. The BNF stumpers

BNF offers a cognitive account of stumpers. In a nutshell, the main idea is that the stumper narrative, or even a particular target noun phrase therein, brings a (typically visual) representation to mind spontaneously. The riddle is deliberately rigged so that the solution cannot be reached from that representation, and one needs to break from it to solve the stumper.

Besides asking respondents to solve stumpers, BNF also gave them another task, in which a verbal target was presented (e.g., “a person reading”), and the respondents were asked to imagine it visually, thus accessing their representation directly, not via a stumper narrative.

I begin with the BNF stumpers, which are grouped alongside other stumpers that rely on the same psychological principles.

2.1. Stumpers due to gender bias

Arguably, the most famous stumper is the **Surgeon** problem.

2.1.1. Surgeon. (no data)

*A father and son were involved in a traffic accident.
The father was killed, and the son was rushed to hospital.
The surgeon walked into the operating room,
and upon seeing the severely wounded boy cried out:
“OMG, it is my son!”
How could this be true?*

This riddle is so famous, that BNF did not use it. If you are not already familiar with it, you may feel stumped, unless you realise that *The surgeon was boy’s mother*. People often feel slightly abashed when given the answer, and berate themselves for not having solved it on their own (note that whether one visualises the surgeon as male or female is not a matter of interpretation, but of representation). A common excuse is: *Well, most surgeons are male*. That may or may not (still) be true, but other gender-based stumpers do not depend on occupational stereotypes, or on base rates (examples follow). They just reflect the inherent male primacy common to language itself (at least the two I am fluent in).

2.1.2. Accountant 1. BNF, study 1 (solved by 35% of 99 respondents)

*“That attorney is my brother”, stated the accountant.
Later that attorney stated that he has no brothers.
Both were telling the truth.
How is that possible?*

2.1.3. Accountant 2.⁵ BNF, study 2 (solved by 48% of 99 respondents)

*An accountant says: “That attorney is my brother”,
and that is true – they really do have the same parents.
Yet the attorney denies having any brothers – and that is also true!
How is that possible?*

⁵Here and throughout, stumpers with the same name resemble each other a lot.

Some comments: (i) At the time of the study, most accountants in the United States (from where most of our respondents hailed) were actually female, so the base rate excuse would not do. (ii) The words: *Both were telling the truth* are meant to block solution answers such as *They were lying*; the words *They really do have the same parents* are meant to block alternative interpretations of *brothers*; both are answer types that we actually encountered. It is important to block defensible answers that differ from the canonical solution. Unfortunately, these blocks often require adding words, and in riddles, sparseness is a virtue. (iii) Using *attorney* and *accountant* was unfortunate, since the words are too similar, and some respondents confused them (I therefore recommend replacing *attorney* by *lawyer*). We took as a correct answer any awareness that one sibling is *female*, even if applied to the wrong sibling. (iv) Stumpers typically end with the responders' task: *Explain. Or: How come? Or: How is that possible?* I prefer *Explain in brief*, hinting that the correct solution requires very few words, as it almost always does (1–5). (v) With time, I am increasingly inclined to drop the words *Yet* and *But*, which appear in so many stumpers. These words suggest an inconsistency in the narrative, which indeed almost always seems to be there. It calls attention to the very tension that requires explanation. But good stumpers can stump even without that linguistic nudge.

A simpler variation utilises no occupations, only unisex names: *Alex is Bobbie's brother, but Bobbie is not Alex's brother*. Or even no names: *A is B's brother, but B is not A's brother*. These riddles can certainly be told with other relationships, such as father-son (*A is B's father, but B is not A's son*), uncle-nephew, etc., and not only with siblings. There is a certain elegance to reducing the riddle to just a few words, while excluding all extraneous information (e.g., occupation, or even name). However, few stumpers can afford to be this spare.

I have no data for what happens in a female version, such as *A is B's sister, but B is not A's sister*. I shall guess that fewer respondents will be stumped, because a female narrative already chips away at the solid male primacy that causes the stumping in the standard form. Study it yourself! I also have no idea what would happen in a gender-neutral language, if one exists.

Additional variations follow:

2.1.4 * *Siblings 1. MBH (14% of 56)*

Two Italians are sharing a pizza.

The older Italian is the brother of the younger Italian.

But the younger Italian is not the brother of the older Italian.

Explain briefly.

2.1.5. *Siblings 2. MBH (33% of 366)*

Two Russians were standing in line.

The taller one was the brother of the shorter one,

but the shorter one was not the brother of the taller one.

Explain in a few words how that is possible.

Why is **Siblings 2** so much easier than **Siblings 1**? Are Russians less masculine than Italians? Or is it easier to recall the two sexes when the protagonists differ by height, a variable associated with sex, than by age, which is not? Check it out!

2.1.6. Basketball. Gardner (1978) (no data)

*Our basketball team won 72–49,
and yet not one man on the team scored as much as a single point.
How is that possible?*

I do not like the subtle implication that there are men on the team, when the solution is that it is a women's team (but I do like Martin Gardner ...).

2.2. Stumpers due to representation of quantities

2.2.1. Bus ticket 1. BNF, study 1 (1% of 102)

*Bus tickets cost one dollar each, unless you buy a card,
which is good for six rides. The card costs five dollars.
A passenger boards the bus, and hands the driver five dollars
without saying a word.
The bus driver takes her money, and hands her a card,
with one of the six holes punched out.
The passenger thanks the driver and takes a seat.
How did the driver know that this was what the passenger wanted?*

2.2.2 * Bus ticket 2. BNF, study 2 (12% of 101)

*Individual bus rides cost one dollar each.
A card good for five rides costs five dollars.
A first-time passenger boards the bus alone,
and hands the driver five dollars, without saying a word.
Yet the bus driver immediately realizes, for sure,
that the passenger wants the card, rather than a single ride and change.
How come?*

Tips: The changes in the second version were meant to block some of the answers elicited by the first version, answers such as: *The passenger was accompanied by her four kids; the bus carries no change; cards are more economical than single rides.*

About two years ago I finally came upon a similar version in print: a Hebrew collection of riddles for children, written by Shlomo Abbas (who doesn't cite sources for his riddles).

2.2.3. Bus ticket 3. Based on Shlomo Abbas (10% of 366)

*A one-way ticket costs \$10, and a roundtrip costs \$20.
A customer hands the cashier \$20, and gives no further indications.
The cashier realizes at once that the customer wants a round trip ticket.
Explain in a few words how that is possible.*

Tips: Abbas' version actually did not include the phrase *and gives no further indications*. But experience taught me to block answers such as:

The customer handed the driver a note saying what she wanted, or: she gestured her desire, etc. **Frozen yoghurt** was written with a similar motivation.

2.2.4. Frozen yoghurt. MBH (2% of 56)

At the frozen yogurt stand, a small bar costs \$3, and a large bar costs \$5.

All flavors cost the same, and are available in just these two sizes.

Little Andy walked up to the stand, handed over \$5, and only said: "Strawberry, please".

The smart new guy behind the counter knew right away that Andy wanted a large strawberry bar, rather than a small one and change.

Explain briefly how the guy knew exactly what size Andy wanted.

In the stumpers above, respondents are stumped by their tendency to represent \$5 by a fiver, rather than by five singles (or any other combination of coins and bills that adds up to five dollars). That explanation is ad hoc. BNF sought a more general psychological principle that causes this tendency. Psychologists seem not to have researched the question how numerically stated quantities are typically represented. BNF hypothesised that "it is mentally easier to conjure a representation of a single item (e.g., a fiver) than of multiple items (e.g., 5 singles)" (p. 113). We generalised, and showed, that this holds not for money only, or for the number 5 only, but also for solids (gold), liquids (water), large quantities (pounds), small quantities (ounces), units that combine to form other units (5 singles versus a fiver, or a 5-ounce piece of cheese versus cheese bites totalling 5 ounces), units that do not (five keys), etc. But our investigation of this tendency was by no means exhaustive, in number or in variables, and readers are encouraged to continue it.

Consequently, I composed the following stumpers.

2.2.5. Coins. MBH (no data)

There is one euro on the left pan of a perfectly well calibrated and symmetrical pan balance. There are two euros on the right pan.

There is nothing else on the pans.

Explain briefly how come the left pan outweighed the right pan.

2.2.6. Lead. MBH (4% of 56)

Two pounds of lead accidentally dropped down from a workshop table onto the toes of a barefoot worker in a lead pipe factory.

The worker was barely hurt.

Explain briefly how that is possible.

If you represented 2lbs. of lead by a single chunk of lead, you would probably be stumped. If you represented it by a bag containing two pounds worth of lead shavings, you would probably not be.

2.3. Stumpers due to lighting conditions

2.3.1. Black road. BNF, study 1 (34% of 108)

*A black man, all dressed in black,
was walking alone down the middle of a black asphalt road.
The man had no flashlight, and no streetlights were on.
A car was travelling towards him at full speed, its headlights off,
yet managed to see him in time to brake and avoid running him over.
How was the driver able to see the man?*

Tips: This, too, is a famous riddle. Unfortunately, we had shaved off the words *The moon was not out*, which appear in most of its versions, and so some respondents answered *By the light of the moon*. Beware of shaving off too much!

Some colleagues thought the stumper worked because of the multiplicity of *black* in it. We tested. It is not (see BNF).

2.3.2. Brown cow. BNF, study 2 (39% of 99)

*A big brown cow is lying down in the middle of a country road.
The streetlights are not on, the moon and stars are not out,
and the skies are heavily clouded.
A truck is driving towards the cow at full speed, its headlights off.
Yet the driver sees the cow from afar easily, and stops in time.
How is that possible?*

2.3.3. Black clutch. MBH (26% of 56)

*While walking on the newly paved black asphalt road to her home,
Jen accidentally dropped her small black leather clutch.
The lights on the new road had not been turned on yet,
the moon was not out, and Jen did not have on her a flashlight,
matches, mobile phone, or any other means of lighting.
Explain briefly how Jen nonetheless saw her clutch immediately.*

2.3.4. Light switch. A&D. (35%)

*A young boy turned off the light in his bedroom
and managed to get into bed before the room was dark.
If the bed is ten feet from the light switch and he used no wires,
strings or other contraptions to turn off the light,
how did he do it?*

Tip: I suggest changing the words before *the room was dark* to *before the room went dark*.

Once you realise that the answer to these stumpers is *It was broad daylight*, it is easy enough to see that stumping results from representing the scenes above as occurring at night. But it is harder to understand just what it is that causes them to be represented as dark scenes. BNF suggested, and showed, that when people mentally imagine a scene – any non-specific scene (e.g., *Imagine a parked car*) – light is actually the default, not dark. The mind's eye, we suggested, needs light to see by no less than the

physical eye. This novel insight had not before been stated as such, and was derived from analysing a stumper.

However, the default can be overridden by “turning off all the lights”, so to speak, as is done in our stumpers. This verbal mental manipulation is possible due to the maxims of cooperative conversation laid down by Grice (1975). According to Grice, in broad daylight, it is not necessary to say that street lights and car lights are off – why would they be on? If the narrator bothers to say that they are off, the implicature – a Gricean word – is that it is dark (more on Grice in sections **3.2** and **4.1** below).

One need not override the default of light in order to stump; instead, one can exploit it by *not* turning off the lights, leaving the default intact. This insight led me to compose the following stumper, where the default itself causes the stumping.

2.3.5. * *Invisible*. MBH (6% of 56)

*Jorge, whose vision is 20/20, stood, with eyes wide open, looking directly at a large modern painting, hanging at eye level on a wall just two yards away, with nothing occluding it.
Jorge looked and looked, but could not see the painting.
Explain briefly how that is possible.*

Warning; The next two stumpers are a little more different from **2.3.1-2.3.5** than they appear superficially to be.

2.3.6. *Reading in the dark 1*.

After Gilhooly and Murphy (2005; G&M for short) (4% of 164)

*Stephanie was reading a book in her bedroom when suddenly all the lights went off.
The house was now pitch dark.
Explain in a few words how come Stephanie calmly went on reading as before.*

Minor changes give a slight improvement (e.g., by blocking out e-readers):

2.3.7. *Reading in the dark 2*. MBH (no data)

*Stephanie was reading a book in her bedroom late at night, when suddenly all the lights went off in the entire street.
Everything was now pitch dark.
Explain in a few words how Stephanie calmly continued reading in the dark.*

Here, the solution does not involve replacing the default of light with dark, but rather replacing a default of reading by sight with reading by touch. These two stumpers are included here for thematic reasons, not because they share the section’s psychological principle.

2.4. *Stumpers involving containers*

2.4.1. *Bags 1, BNF, study 1 (13% of 94)*

*Tom broke his arm badly, and it was in a cast for weeks.
When the cast was removed, he trained as follows:*

*He extended his arm to the side, straight, and while holding a small potato bag, maintained this position for as long as he could.
Once he could keep it that way for a whole minute,
the small bag was replaced by a medium bag, and the exercise repeated.
Once he could hold the medium bag for a full minute,
it was replaced by a large bag.
As soon as Tom could hold a large potato bag that way for an entire minute,
one potato was added to the bag.
Tom's arm collapsed almost immediately.
How come?*

Tip: This version is way too wordy, and the situation is completely contrived. Nobody trains with empty bags (which is the solution). So I composed the following variation:

2.4.2. Bags 2. BNF, study 2 (38% of 95)

*In a Bangladesh market, a small potato bag costs 5 taka,
a medium potato bag costs 7 taka, and a large potato bag costs 9 taka.
Yet, a single potato in that market costs 10 taka.
How is that possible?*

Tip: Respondents who don't know the value of a taka, cannot use it to see whether 5 taka is like 5 cents – only enough to pay for an empty bag, or like 5 quarters – enough to pay for a bagful of potatoes.

Stumpers **2.4.3–2.4.10** replace the bag with all kinds of containers, but rely on the same psychology. But **2.4.11** and **2.4.12** are different. Beware.

2.4.3. Box 1. MBH (20% of 56)

*In a faraway land the national sweet is called a Lali.
All Lalis are the same – size, flavor, and all.
The currency of the land is called a Loli.
Lalis can be bought individually, or packed into pretty colorful paper boxes.
A small Lali box costs 5 Lolis; A medium Lali box costs 7 Lolis;
A large Lali box costs 9 Lolis. Yet, one single unpacked Lali sweet costs 10 Lolis.
Explain this pricing briefly.*

2.4.4. Box 2. MBH (no data)

*Dan and Daphne had a fight just before Valentine's Day,
and Daphne was hoping that Dan would try to make up.
On Valentine's Day, Dan sent Daphne a big Valentine's Day Special chocolate box from her favorite chocolatier ("La Maison du Chocolat").
Explain briefly why the brokenhearted Daphne
furiously tossed it into the garbage.*

2.4.5. Decanter. MBH (68% of 56)

*A very tall man was holding up a wine decanter way above his head.
He let go of it, and it dropped to the carpet he was standing on.
Explain briefly how not a single drop of wine was spilled.*

2.4.6. Coke. MBH (78% of 56)

*Clive got so mad at Pete that he hurled a Coke can at him.
The can struck Pete smack on his bare head.
Explain briefly how this inflicted no pain or injury.*

2.4.7. Balloons. MBH (70% of 56)

Jack and Jill attended a birthday party.

One of the party games involved stuffing as many balloons as one could into a box, without popping them.

With great skill, Jack managed to stuff eight balloons into the box.

Jill, using exactly the same kind of balloons,

easily stuffed more than twice as many into the same box.

Explain Jill's success briefly.

2.4.8. Pillow cases. A&D (60%)

Barney Dribble is carrying a pillow case full of feathers.

Hardy Pyle is carrying three pillow cases the same size as Barney's, yet Hardy's load is lighter.

How can this be?

2.4.9. Coffee mug. A&D (50%)

A woman said to her husband:

"This morning, one of my earrings fell into my coffee.

Even though my cup was full, the earring did not get wet."

How could this be true?

Tip: I suggest changing *fell into my coffee ... though my **cup** was full to ... fell into my **coffee mug** ... though **it** was full.*

2.4.10. Pool. MBH (32% of 28⁶)

Long after the screen of Kim's smart phone had cracked.

it was still functioning just fine.

Before he could replace it, the phone accidentally fell into the family's swimming pool.

It was retrieved almost at once, but – alas – the phone was dead.

Yet no water had penetrated the cracked screen,

so all the critical components remained completely dry.

Explain briefly why the phone was dead.

2.4.11. Box 3.⁷ MBH (no data)

Roger is moving his book store.

He saw the movers arrive with 3 huge cardboard boxes – a cubic yard (approximately a cubic meter) each.

Roger worried, because the volume of his stock totaled several times that much.

But the movers fit all the books nicely into the boxes they brought.

Explain briefly.

2.4.12. Bag 3. MBH (no data)

Cindy recycles everything: paper, glass, metal, plastic, etc.

She also brings her still useable stuff (books, housewares, etc.) to the donation bins at the recycle center.

Recently, she brought a bag full of large (2 liter) bottles to the recycling center.

The volunteer on duty could barely lift it.

Explain briefly.

If you solved the last two stumpers, you will understand why **Box 3** and **Bag 3** appear here, and not earlier, after **Box 2** and **Bags 2**, respectively. All

⁶The small N resulted from a technical glitch.

⁷I thank Tom Noah for the idea.

the **Container** stumpers rely on the containers to be represented by most respondents as full, when a solution requires them to be empty – or, as in **3**, vice versa. But if this account is not to be ad hoc, we need a simple criterion that would account for all the data we had regarding which containers were represented as full, and which as empty. After rejecting an initial idea that did not pan out (see BNF), our present hypothesis is that once the container's content is mentioned, content is seen – whether in *wine* decanter or in *cereal* box. Yet *shopping* bags are mostly visualised empty, while *swimming* pools are mostly visualised full (then again, *swimming* isn't the name of a content), so the story is still incomplete. Moreover, several of our Container stumpers didn't "work" properly, inasmuch as most respondents solved them. Why did they fail? Do complete the story!

2.4.13. Theft 1. A&D (58%)

Sid Shady was working for a large construction company that was very concerned about employee theft. Someone tipped the company security that Shady was the man to watch. Each night, he passed through security with a wheelbarrow full of scrap lumber, discarded electrical wires and chunks of concrete. The security guards checked the contents daily, but could find nothing of value. Explain briefly what Shady was stealing?

2.4.14. Theft 2. MBH (no data)

When Josh leaves the factory where he works, all he has ever taken with him is a toolbox containing only his very own tools. No lunch box, no backpack, no bags, nothing in his pockets, etc. Yet, after a month he is arrested for grand theft from the site. Explain briefly what Josh was stealing.

To solve the last two stumpers, attention must be redirected from what is inside the containers, which is the core of the narrative, to the containers themselves. Whether they should appear in this section can therefore be challenged.⁸

2.4.15. Perforated. MBH (no data)

Ariel has only two items. One is a glass full of warm water, and the other is perforated all over. He manages to transfer the water from the glass directly to the other item without losing a drop. Explain briefly how this is possible.

2.5. Stumpers involving category prototypes

2.5.1. Farmer Joe, BNF, study 1 (54% of 99)

Farmer Joe eats two fresh eggs from his own farm for breakfast every day. Yet there are no chickens on his farm. Where does Farmer Joe get his eggs?

⁸I thank Phillip Johnson-Laird for this stumper.

Tip: An attempted variation (changing *Farmer Joe eats* to *Farmer Joe's diner serves*; and *Where does Farmer Joe get his eggs?* to *Where are the eggs from?*) made little difference (57% of 366 respondents).

2.5.2. Xmas. MBH (78% of 56)

*On Christmas Day, at the stroke of midnight,
David walked out to his own back yard, on a dare.
He was stark naked: no shoes, no socks, no sweater,
no coat, no hat, no scarf - nothing.
He stood out there with arms outstretched, singing Christmas carols,
for 5 whole minutes.
When he came back indoors, he wasn't the least bit cold.
Explain briefly.*

2.5.3. Test. MBH (68% of 56)

*Laura took a multiple-choice test.
She barely speaks, reads, or understands English,
and had nobody who could translate for her.
Explain briefly how Laura scored nearly 100% on the test,
completely legitimately.*

Riddles 2.5.1–2.5.3 rely, respectively, on chicken eggs being the prototypical breakfast eggs, on the prototype of a White Christmas, and on the belief that English is the prototypical language for English speakers.

In the next stumper, the representation is not so much derived from a prototype as it is literally given in the narrative.

2.5.4. * Hospital. After Shlomo Abbas. (10% of 99)

*Cecil is a criminal lawyer.
Many years ago, he spent a couple of days in hospital.
When he was discharged, he was in perfect health.
Indeed, there was nothing at all wrong with him.
Nonetheless, he was incapable of leaving his hospital bed on his own,
and had to be carried off of it.
Explain how come.*

Tip: Enough failed respondents guessed something like *Cecil was taken forcibly from bed in chains, to jail*, that I recommend replacing *criminal lawyer* with *divorce lawyer*. Best yet, consider having no mention at all of Cecil's profession, which is merely a device for planting a representation of Cecil as an adult in the reader's mind. Since the generic *person* is anyhow represented by default as a normal adult male (Martyna, 1978), this phrase may well be unnecessary. It would be more elegant to dispose of it, and begin the stumper with the second sentence.

3. The emergence of representations

We have seen what representations are evoked by the stumpers above, and how they need to be changed to afford a solution. The psychologist's task is,

first, to account for what causes the initial representation. A second task is to account for who are the respondents who manage to break out of it, and how they do so. There has not even been an attempt to tackle the second (“How are representations replaced?”), let alone answer it. But BNF made some headway on the first (“How are representations formed from narratives?”), and I am now prepared to suggest a general answer, based on combining three powerful psychological principles: Rosch’s theory of human categorisation (see section 3.1), Grice’s theory of cooperative conversation (see section 3.2), and Tversky and Kahneman’s (1973) availability heuristic (also in 3.1). This tentative theory is not yet substantiated by new empirical evidence.

3.1. Representation according to Rosch

The psychological principles arising out of stumpers research are a natural extension of Rosch’s work on categorisation (e.g., Rosch, 1978). The visual imagining of a verbal narrative involved in solving stumpers is the reverse mental task to one of Rosch’s. Rosch presented respondents with an object, or its picture, and asked them what it is. She found that respondents overwhelmingly named it at what she called the basic-level, (e.g., *chair*), namely, the level in hierarchically nested categories that provides “maximum information with the least cognitive effort” (p. 28). In stumpers, the narrative mentions certain target objects, typically basic-level ones, and the respondents’ representation necessarily imagines more detail in them than their name in the narrative provides.

In another task, Rosch found that when asked to list instances of a superordinate category (e.g., *bird*), prototypical instances (e.g., *robin*) come to mind faster and with greater ease than instances which are not such good representatives of the category (e.g., *penguin*). Visualising a narrative, e.g., that of a stumper, is a similar mental task, but one which Rosch did not use, since it involves instantiating basic-level-or-lower objects, such as *accountant*, *\$5*, *potato bag*, *egg*, etc. BNF found, when asking their respondents to choose which of two images better matched what they had in mind when imagining those words, that *an accountant* is mostly visualised as male, *\$5* as a fiver, *potato bags* as full of potatoes, and *an egg* as a chicken egg.

To use Rosch’s theory and terminology, we conclude that a male accountant is more prototypical than a female, imagining a single bill is more cognitively economical than imagining other forms of money that sum to \$5, being full is the canonical state for a potato bag, and a chicken egg is the default breakfast egg. Minsky (1985) described a prototype as a set of default properties. I use the term *properties* to also include states (e.g., light versus dark), actions (e.g., tell the truth versus lie), positions (e.g., hanging versus leaning), conditions (e.g., healthy versus sick), functions (e.g., to feed, to heat), and even parts, colours, size, orientation, etc.

Rosch's powerful psychological principle ("almost common sense", she modestly called it; 1978, p. 28), according to which human categorisation maximises cognitive bang-for-the-buck, accounts both for what category members people find more or less prototypical, and for what their respective default properties are.

Can a single principle also explain people's default representations of (words in) narratives? A tempting candidate for such a principle is that defaults are based on the possibility which has the greatest statistical frequency – but there are too many counterexamples to it: e.g., more female than male accountants; over five times as many singles in circulation than fivers; etc. Availability, Tversky and Kahneman's (1973) subjective mental counterpart, is a better candidate. Availability is the mental analogue of relative frequencies in the real world – it is relative frequencies in the mental world. Availability is increased by ease of retrieving instances from memory, when they are in it, and ease of construction of instances, when they are not in memory. Happily, the notion of mental ease is essentially the same as cognitive economy.

Thus, the Roschian quest continues, and stumblers offer a veritable spring of insights into enriching it.

3.2. Representation according to Grice

Grice's (1975) maxims of conversation also adhere to Rosch's idea of cognitive economy (not that he ever uses this term), derived from the stipulation that standard conversation is a cooperative social endeavour. According to Grice, a cooperative speaker intuitively strives in standard conversation to convey maximum information ("don't say less than is needed") with the least cognitive effort ("don't say more than is needed"), and, justifiably, expects the listener to hear it with the same stipulation.

For present purposes, Grice's maxims can be reduced to two, pertaining to quantity and to quality. Quantity: Don't say more, or less, than is needed for effective communication, and forgo irrelevancies. Quality: Don't be deceitful, devious, ambiguous, obscure, etc. The maxims are not exclusive. When Grice's Quantity maxims are applied to determining the level of object names, they sound quite like a descriptive prediction, or normative recommendation, to choose the basic level. But Rosch also explicitly acknowledges that "there will be context effects for both the level of abstraction at which an object is considered and for which items are named, learned, listed, or expected in a category" (1978, p. 42). Narratives create such context effects by laying out contexts that go beyond single words. What they say nudges listeners towards, or away from, this representation or that. In that sense, narratives are their own guide to imagining and constructing their visual representation. Under normal circumstances, a

narrative's words would be represented normally, namely, instantiated through the defaults. But if the narrative gives cues that override the defaults, then imagination might be directed away from the defaults.

For example, as noted above in section **2.3, Lighting conditions**, a scene would normally be visualised by default in the light (since, in compliance with cognitive economy, it is mentally easier to imagine seeing in the light, just as it is physically easier to actually see in the light). But if it contains cues to the contrary, such as denying various night-time lighting devices, only imagining a dark scene would comply with Grice's maxim of quantity.

A critical caveat, which should be obvious, is nonetheless often ignored or forgotten: a riddle is hardly a normal speech form; it is not standard communication, and it certainly is not a cooperative context but rather a competitive one, like a game of hide-and-seek. It is a stylised genre, often resorting deliberately to trickiness, deviousness, and opacity, all of which are legitimised by the acknowledgement that it is a riddle. Therefore responders who spontaneously, automatically, intuitively treat it as they would standard cooperative speech do so at their peril – as stumpers so eloquently demonstrate. This caveat notwithstanding, some riddles work just fine without Gricean violations. Among the BNF stumpers, only those concerning **Lighting conditions** rely on inducing Gricean implicatures. [Section 5](#) is dedicated to an entire slew of stumpers that work thanks to Gricean violations and implicatures.

3.3. Where do dominant representations come from?

In summary of this section: Whether a Roschian representation or a Gricean one dominates, Kahneman and Tversky's concept of availability will determine which of the set of representation possibilities will dominate; it is the one which first comes to mind; and the first representation to come to mind is the one easiest for the mind to conjure; and the easiest representation to conjure is the most cognitively economical one.

A caveat is in order: The most available representation at the end of a narrative may have replaced earlier representations that came to mind as the narrative was being read and processed.

In the rest of this compendium, I will attempt to analyse the listed stumpers using the insights of Rosch and of Grice, to show wherever possible just how the critical default representation maximises cognitive economy.

4. Roschian stumpers

The rest of the stumpers in this collection are mostly taken from articles published in the academic literature, with which I was not familiar when

conducting BNF. I will accompany those in this section by a tentative discussion of the defaults underlying them (and those in the next section by discussion of their Gricean properties). This discussion should be taken with a grain of salt, as it is still preliminary. To substantiate it, empirical evidence should be garnered. I am optimistic that Roschian methods (e.g., Imagine tasks) have the potential to provide the evidence.

4.1. Stumpers involving height assumptions

4.1.1. Ladder 1. A&D (32%)

Hardy Pyle was washing windows on a high-rise office building when he fell off his 60-foot ladder onto the concrete sidewalk below. Incredibly, he did not injure himself in any way. How was this possible?

4.1.2. Ladder 2. MBH (53% of 170)

Pedro was washing windows outside a tall office building when he fell off his 60-foot ladder onto the ground below. Incredibly, he did not injure himself in any way. He was not wearing any safety equipment, and nothing broke his fall. Explain in a few words how he was not injured.

Tip: The phrase added to the second version is, yet again, meant to block unwanted answers. I recommend adding the adjective *hard* to *ground below*.

4.1.3. Plane. MBH (76% of 56)

A Mafia boss recently pushed an undercover police officer forcibly out of his private aeroplane. The officer fell at free fall speed to the solid ground beneath the plane. Explain briefly how he survived with no more than a few bruises.

4.1.4. Roof. MBH (32% of 56)

Sonny the stunt man jumped off the roof of a 33-story building, untethered. He was without a parachute, without a safety net, and indeed without anything to slow down his free fall. Explain briefly how he landed safely on his own two feet.

Words such as *ladder*, *plane*, and *roof* call to mind heights. The default position on a ladder is not on its lower rungs; the default state of a plane is up in the air; and the default jump-off-a-roof is to the ground. This can be tested, besides by the Imagine task, by asking respondents to draw a plane in a given scene, or to draw a person on a ladder, etc. To solve these stumpers, these default representations must be changed.

4.2. Stumpers involving ball tossing

4.2.1. Ball 1. A&D. (36%)

Dee Septor, the famous magician, claimed to be able to throw a ping-pong ball so that it would go a short distance, come to a dead stop, and then reverse itself.

*He also added that he would not bounce the ball against any object or tie anything to it.
How could he perform this feat?*

4.2.2. Ball 2. MBH (18% of 366)

*A ping pong ball was hit. It flew in the air, stopped, reversed direction, and returned to where it originated.
The ball was not attached to anything, nor bounced off anything.
Explain in a few words how that is possible.*

4.2.3. Ball 3. MBH (43% of 100)

*Denise is a pretty good tennis player.
She made a bet that she could hit a regular tennis ball,
send it flying off in the air, and after a bit,
it would turn around 180 degrees and fly right back to her –
without contacting any other object on its way.
She won the bet.
Explain how in a few sensible words.*

Because ball games are interactive, the default trajectory of a tossed ball in a ball game always includes a forward component vector, whether the other vector points up or down. It is unusual for a ball to be tossed straight up in the air, as solution of these stumpers requires.

4.3. Stumpers involving bodies of water

4.3.1. Water 1. After G&M. (56% of 171)

*Maxine walked for 200 meters directly on the surface of a lake,
without sinking, without any devices, and without getting any clothing wet.
Explain in a few words how she managed this.*

4.3.2. Water 2. MBH (30% of 56)

*Tom and Jerry live in the Canadian countryside.
Recently, they competed who can get across a deep large pond faster.
They did not go around the pond, nor above the pond –
they went in a straight line across the pond, from shore to opposite shore.
They used no equipment – only their own bodies.
Tom is a fabulous swimmer, whereas Jerry cannot swim at all.
Explain briefly how come Jerry won.*

Water 1 is stylistically sleeker than **Water 2** – but didn't work as well. I'm not sure why. **Water 3** has not been tested yet.

4.3.3. Water 3. MBH (no data)

*Marcy went from one bank of a river to the one 20 meters across.
There are no bridges on the river.
Marcy had no equipment, no devices, no special clothing,
and she can't even swim. She relied on her own body only -
and none of it got wet!
Explain briefly how she managed this.*

The default state of a water body is to be full, and full of liquid, not of ice or of debris. This default is probably set by normalcy. A body of water without water is abnormal. The **Pool** stumper, **2.4.10**, albeit a manmade water body, could conceivably be included here, rather than under **Containers**.

4.4. Stumpers involving “common fate”

4.4.1. Woods walk. After (23% of 166)

Two tourists got lost while hiking in the woods.

One started walking due north, while the other walked due south.

About 10 minutes later, they bumped into each other.

Explain in a few words.

4.4.2. Volvo. MBH (32% of 56)

A red Volvo and a yellow Volvo both travel from point A towards point B.

They travel at the exact same speed,

using parallel lanes of the very same highway.

There is no other traffic on the road, nor any other obstacles.

Yet the red Volvo gets to the destination 7.5 minutes before the yellow Volvo.

Explain this outcome briefly.

4.4.3. Checkers. Sternberg and Davidson (1995). (no data)

Two men play five checker games.

Each wins an even number of games, with no ties.

How is this possible?

To solve these stumpers, one must realise that in **Woods Walk**, the two hikers do not start from the same point; in **Volvo**, the two cars do not start at the same time; and in **Checkers** the players do not play the same games. These, apparently, are the respective default assumptions. I am not sure what causes such a “common fate” default assumption when two agents are spoken of together (it is not the word *both*, which **Volvo** would probably have worked even without, and which does not appear in the other two). Is it enough to simply apply a single verb to the multiple nouns? Is it because “same” is cognitively easier to imagine than “different”? After all, there is only one way for two things to be the same, and innumerable ways for them to be different. This is an exciting open question for research.

4.5. Stumpers involving blood relationships

Goodwin and Johnson-Laird (2008) is not about problem solving, but about representing transitive and pseudo-transitive relationships. Respondents were told: *Fred is a blood relative of Bob’s. Bob is a blood relative of Anne’s.* Sixty eight percent of them drew a transitive diagram to represent this

information, showing transitivity to be the default representation of blood relationship. The following stumpers were inspired by this finding.

4.5.1. Blood relations 1. MBH (44% of 126)

Alex is a blood relative of Bobbie, and Bobbie is a blood relative of Casey. Yet Alex and Casey are not blood relatives at all. How is this possible?

4.5.2. Blood relations 2. MBH (31% of 127)

Alex is a blood relative of Bobbie, and Casey is a blood relative of Bobbie. Yet Alex and Casey are not blood relatives at all. How is this possible?

Possibly, transitivity is the default of blood relationships because it does not require changing the instantiation from the first to the second statement. Full brotherhood (but not necessarily half-brotherhood), and ancestry, are indeed transitive. To instantiate without transitivity, one needs to reverse the relationship (e.g., *parent of* versus *child of*), or add detail to it, both of which are more cognitively effortful.

4.6. Stumpers that rely on wholeness

4.6.1. X-ray vision. A&D (65%)

There is an ancient invention still used in some parts of the world today that allows people to see through walls. What is it?

Tolstoy's *Anna Karenina* famously opens with the words: "Happy families are all alike; every unhappy family is unhappy in its own way". Being intact for objects is the analogue of being happy for families: there is only one way to be intact, and multiple ways to be flawed. Being intact is therefore also more cognitively economical. Hence, like any other object, even walls are seen by default as intact; and even when they are *seen through* they are still imagined intact. Therein lies the puzzle. Tear a hole in it (window), and the puzzle is solved.

4.6.2. Stool. MBH (10% of 56)

At the flea market, Carl bought a standard 3-legged wooden stool. It was a bargain. For some reason, he sawed off one of the legs. Explain briefly how the stool maintained its stable position.

Being upright, like being intact, is the default position, the normal position, and the most available position. But to solve this stumper, it is necessary to realise that the stool must have been upside down when its leg was sawed off.

4.6.3. Parrot. MBH (no data)

*Polly bought a beautiful parrot.
The seller guaranteed that the bird repeats everything it hears.
However, try as Polly might to teach it,
her squawking parrot never repeated a single word.
The seller did not lie.
Explain briefly.*

Being healthy for a biological creature is analogous to being intact for an artefact. That is what's normal. Thus, a parrot is assumed by default to be a hearing parrot – unless, alas, it isn't.

One might nonetheless ask how is it that the narrative states that the seller was not lying? Remember: the narrative can't lie. But it can violate Grice's maxims. The guarantee is irrelevant and misleading regarding a deaf parrot. But technically, it is not a lie.

4.7. Stumpers involving deceit

4.7.1. Seller 1. MBH (0% of 56)

*Farmer Joe bought Daisy, a strong, young, beautiful, healthy cow.
The former owner said that Daisy's daily yield of milk is 40 liters
(average milk yield is about 25 L a day).
In spite of giving Daisy the best possible living conditions,
she never gave more than about 10 L a day.
The seller still insists that he was telling the truth.
Explain briefly.*

4.7.2. Seller 2. MBH (42% of 366)

*Fred bought a used car from his neighbor next door.
The neighbor claimed that the car got 35 miles per gallon.
Fred, an excellent driver, could only get about half that much,
in spite of driving on the same roads as his neighbor.
Explain in a few words.*

4.7.3. Seller 3. MBH (42% of 56)

*Polly bought a beautiful parrot.
The seller guaranteed that the bird repeats everything it hears.
However, try as Polly might to teach it,
her squawking parrot never repeated a single word.
The seller vows that he did not lie.
Explain briefly.*

Not a single respondent solved **Seller 1**, which requires calling the seller a liar. Possibly, **Seller 2** is so much easier because *used car salesman* is stereotypically nearly synonymous with conman. Note that **Seller 3, 4.7.3**, differs from **Parrot, 4.6.3**, only in who is asserting that the seller did not lie: The narrator (in **Parrot**), or the seller (in **Seller 3**).

4.7.4. *President (MBH, based on an allegedly true story)*

A major convention was held in a large convention hotel.

At the President's request, a certain female employee was brought to his room.

Nobody else was there.

The woman resented his inappropriate sexual advances,

and later sued him for sexual harassment.

The President claimed that he was never alone with her in a hotel.

Explain briefly how this could possibly be true.

This stumper is offered tongue-in-cheek. It rules out a solution of doubting the President's veracity by stating that his claim was true. Indeed, there were thousands of other people in the hotel at the time! But only two people in the President's hotel room. *Hotel* is a basic-level structure, whereas *hotel room* is a subordinate level. By the maxim of Quantity and scalar implicature, use of the basic-level is appropriately cooperative only when the listener may safely infer that it applies to the subordinate level as well, which is not the case here. But of course, a President defending himself can hardly be expected to comply with Grice's maxims, even while he must normatively abstain from outright lies. So this stumper could rightfully also belong in section 5.1.

4.8. *Miscellaneous other default-based stumpers*

4.8.1. *Accident. MBH. (adapted from a joke) (42% of 171)*

A car hit a woman, injuring her badly.

The woman was slightly drunk, hopping about

and swaying to the music in her headphones, with eyed half closed,

holding a beer in one hand, and her mobile phone in the other.

Explain in a few words how it is possible that the judge found

that her share of the blame for the accident was 0%.

A car accident occurs, by default, in a moving car; moreover, it is, by default, on a road, just as we previously noted that a plane is, by default, in the air. The accident in this riddle, however, occurred on the woman's front porch.

4.8.2. *Rope. A&D (40%)*

A prisoner was attempting to escape from a tower.

He found in his cell a rope that was half long enough

to permit him to reach the ground safely.

He divided the rope in half, tied the two parts together, and escaped.

How could he have done this?

Tip: I recommend adding *thick* before *rope*, and *just over* before *half long enough*. This could help avoid quibbling with the solution.

Here the default, which needs to be changed, pertains to the cutting action. A rope cut in two is, by default, understood to have been cut by

length. I conjecture that in general, the default way of (virtually) cutting a 3-dimensional object in two is on the dimension where the cut is shortest – another form of cognitive economy. I have no evidence as yet.

4.8.3. *Holidays. A&D (75%)*

In what year did Christmas and New Year's fall in the same year?

Tip: I prefer asking: Explain how it is possible for Christmas and New Year's to fall in the same year?

Events in time are assumed, by default, to have occurred in the order in which they are related, that being the cognitively easier way to imagine them. The logical operator *and* is commutative. But in regular speech, order might carry meaning. *Dana got married and had twins* sounds quite different from *Dana had twins and got married*.

4.8.4. *Finger MBH (adapted from a joke) (12% of 166)*

Geraldo's little daughter Annie posed him a riddle.

She raised her left hand, and, pointing to the ring finger, asked:

"Dad, why do the Chinese never use this finger?"

Geraldo was stumped.

Can you answer Annie?

Tip: I recommend changing *ring finger* to *fourth finger*, because there were quite a number of answers involving a ring – which is beside the point.

Apparently, even pointing to a specific finger does not overcome what appears to be a default interpretation of the finger as a type, not a token. Clearly, had Annie used the words *my finger* rather than *this finger*, there would have been no riddle. But why *this finger* was taken to be *their* (the Chinese's) *finger*, I cannot at this time say. Noveck and Reboul (2008), discussing the concept of Definite Reference, give the following example: "... when an interlocutor says 'I used to work for that paper' (while pointing to the latest edition of a newspaper), the addressee's interpretation relies heavily on identifying the speaker's intention" (p. 427). But though similar, it does not help us here.

5. Gricean stumpers

Whereas the stumpers in the previous section rely on default representations, the ones in this section rely on representations shaped by Grice's maxims. Violation of these maxims (mis)leads respondents into adopting an alternative representation to the default one, driven by the unnecessary, or missing, information in the narrative – whereas the solution actually lies in the default. We already saw examples in section 2.3, on

Lighting conditions, where the violated maxim was *Don't say more than is necessary*.

It is important to maintain the distinction between violation of Grice's maxims by the riddle narrative, versus by the riddle protagonists. The narrative is allowed to use any means except lying. The protagonists can use any means, including lying. As a matter of personal taste, stumpers that violate defaults are overall less elegant than those that exploit them, because they involve "setting up" the respondent, by having a narrative that is misleading or unnatural, even if not false. But they are quite legitimate.

Studying Gricean implicatures through stumpers is an expansion of so-called experimental pragmatics (e.g., Noveck & Reboul, 2008).

5.1. Grice's maxims of quantity

5.1.1. Horse. MBH (18% of 56)

A hungry horse is tied by its neck to a 10-meter-long chain.

A bale of hay is 13.8 meters away from it.

Explain briefly how the horse reaches the hay with the chain intact.

Alas, I discovered too late that this riddle is not necessarily a stumper, since it has a perfectly fine solution which requires no change of representation (though none of the respondents gave it). But if 13.8 were replaced by 23.8 (or 10 were replaced by 6), it would be a proper stumper. If you are stumped, it is because you probably imagine the rope tied on both ends. A horse tied to a chain, is, apparently, and by default, tied – and therefore not free to roam loose.⁹ Moreover, unless the chain is used to tie the horse, why even mention it? It is irrelevant.

5.1.2. Painting. MBH (48% of 56)

Dame Dora owns an Old Masters painting in a heavy gilded frame.

The cord for hanging the painting, as old as the painting itself, is made of thick 3-ply hemp, and is somewhat frayed.

Dame Dora was thinking of replacing it.

But before she could, a couple of hungry little mice invaded her mansion.

Sneaking behind the painting, they chewed right through the cord.

For a while nobody noticed, because the painting didn't budge.

Explain the painting's stability briefly.

A painting supplied with a hanging cord is naturally expected to be hanging, by default. Moreover, unless it is hanging by the cord, the mice story is irrelevant.

5.1.3. License 1. Gardner (1978). (no data)

A woman did not have her driver's license with her.

She failed to stop at a railroad crossing, then ignored a one-way traffic sign

⁹Thank you, Sergiu Hart, for catching the typo.

*and travelled three blocks in the wrong direction down the one-way street.
All this was observed by a policeman,
yet he made no effort to arrest the woman.
Why?*

5.1.4. License 2. MBH (68% of 56)

*Bob's driver's license was recently revoked,
following a string of severe traffic violations.
Just a few days later, a cop spotted the unlicensed Bob yet again,
entering a one-way street against the direction of the traffic.
This was the same cop who had cited Bob before.
Explain briefly how come the cop did not stop him, and just gave him a smile.*

Why, the astute conversationalist might (unconsciously) ask, am I being told about the protagonists' *driver's licence*? Must be relevant. But it wouldn't be if they were pedestrians. Think about that when solving the next stumper, even though no licence is mentioned.

5.1.5. License 3. A&D (30%)

*Professor Bumble, who is getting on in years, is growing absent minded.
On the way to a lecture one day, he went through a red light
and turned down a one-way street in the wrong direction.
A policeman observed the entire scene but did nothing about it.
How could Professor Bumble get away with such behavior?*

5.1.6. Rain 1. MBH (36% of 56)

*It is raining cats and dogs (i.e., it is pouring).
Four people try to squeeze underneath one small umbrella.
Explain briefly how nobody gets wet.*

The mention of the umbrella is irrelevant if the four were, say, standing under an awning.

5.1.7. Church. MBH (42% of 56)

*There is a certain prayer during which it is customary to kneel.
At a recent church gathering, all present were kneeling.
Explain briefly why Maria was not.*

If Maria isn't in the church, it behoves the speaker to say so. Otherwise, juxtaposition of the question with the description violates the maxim by omitting something critical.

Tip: Change Maria's name to Cindy, to block answers like *Maria is a statue*,¹⁰ which was given by one respondent.

5.1.8. * Hilltop. MBH (44% of 56)

*Two old friends are standing together on a hilltop, in complete silence.
Nora is facing north, and Sara is facing south.
Suddenly Nora asks: "Why are you smiling, Sara?"
Explain briefly how Nora saw Sara's smile.*

¹⁰Thank you, Sergiu Hart.

I found this stumper exceptionally hard to account for. Clearly, most respondents see Sara and Jen standing back to back, rather than face to face. But why-oh-why would two friends on a hilltop *not* be seen facing each other? Would not that be the default position (unless they are both looking at the same panorama, in which case they'd be side-by-side)? Odd. What in the narrative directs respondents away from what I would have guessed is the default representation of friends standing together – namely, imagining them facing each other?

I believe it is the words: *Nora is facing north, and Sara is facing south*. If they were facing each other, the natural, and economical, way to say so would have been: *Nora is facing north, and Sara is facing her*, from which it follows that Sara is facing south – but not vice versa. The implicature of not saying so is that it cannot be said; otherwise, Grice's maxim "*Don't say less than is necessary*" is violated.

I am not sure of this conjecture, and have no evidence to back it up. Maybe some reader will do the job.

5.2. Grice's maxims of quality and manner

5.2.1. Family 1. A&D (30%)

Two mothers and two daughters were fishing.

They managed to catch one big fish, one small fish, and one fat fish.

Since only three fish were caught,

how is it possible that they each took home a fish?

5.2.2. Family 2. MBH (50% of 170)

Two strolling mothers and their two daughters walk up to the ice-cream truck.

The youngest daughter requests an ice-cream cone for each of them.

The vendor hands them 3 ice cream cones, and they leave satisfied.

Explain in a few words how each got a whole cone.

Two moms and two daughters is a strange way, and post-hoc also obviously misleading way, of talking about three generations.

5.2.3. Rain 2. A&D (65%)

Captain Frank was out for a walk when it started to rain.

He did not have an umbrella and he wasn't wearing a hat.

His clothes were soaked yet not a hair on his head got wet.

How could this happen?

If the Captain has no hair, mentioning his hair violates the maxim. This is the same objection I had to **Basketball, 2.1.6**.

5.2.4. Ceremony. MBH (18% of 56)

Sir Archibald, the famous tennis champ,

has great respect for the Queen.

At a recent royal event, the Queen ceremoniously entered a large hall,

full of people, including Sir Archibald.

All rose when she entered – with the exception of Sir Archibald.

Explain the Sir's behavior briefly.

5.2.5. Cockroach. MBH (22% of 56)

Ben hates cockroaches and eliminates them whenever possible.

Once he deliberately stomped on a really big nasty looking one until its guts spilled out.

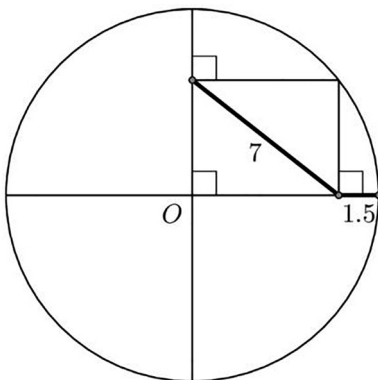
Explain briefly how this didn't kill it.

Why, the astute conversationalist might (unconsciously) ask, does the narrative of the last two stumpers use verbs that refer to (albeit while denying) a change of state (*rise*; *kill*)? There must have been an option for such a change. This Gricean implicature easily leads to the erroneous inference from *did not rise* to *is still seated*; from *this didn't kill it* to *it was still alive*. Not to mention that *alive* for biological organisms is like *intact* for artefacts, so that this stumper could also be in section 4.6.

6. Borderline stumpers

The next two riddles are not quite stumpers, but I like them enough to include them nonetheless. While in **Circle** no answer comes to mind at once, as is the case for stumpers - neither does one feel stumped. The feeling is that one needs to engage high school geometry – perhaps Pythagoras's Theorem? In **Bookworm** an answer does come to mind, but it is erroneous. This is a feature of CRT items. But in this case, it is a wrong representation, not wrong math, that causes the error, and, as in stumpers, it is a representation that needs to be changed for successful solving, rather than more careful calculation, which is what CRTs call for.

6.0.1. Circle MBH (18% of 98)



In the figure above O is the center of the circle.
What is the radius of the circle?

In this riddle, the default representation is not constructed. It is directly given by the illustration. And the given illustration dominates, as constructed representations dominate in standard stumpers. To solve it, the drawing needs to be altered by adding an auxiliary line: the second diagonal of the rectangle.

6.0.2. Bookworm. MBH (7% of 196)

Ryan has a box set of books, arranged in order from Vol. 1 on the left to Vol. 5 on the right. Each book is 150 pages long. A bookworm had eaten its way in a straight line from the first page of Vol. 1 to the last page of Vol. 2. How many pages did it damage?

Tip: I now recommend adding the word *inclusive* after Vol. 5.

To solve, consider that taking books off the shelf to open them reverses right-left. The worm's damage is only seen when the books are open, but it is caused while they are shelved.

7. Can stumpers do what CRT can do?

I have sprinkled research ideas throughout this paper. Stumpers are fun vehicles for extending Rosch's theory of human categorisation – from her account of how specific instances are categorised, to a new account of how words and narratives are instantiated in representation. They are also intriguing test cases for Grice's theory, pitting the robustness of default representations versus the power of implicatures to change them.

I have also noted that stumpers raise a big question to which there is, at present, no answer: What cognitive processes enable people to break out of dominant representations – which is akin to the age-old question of how insight comes about; and what characterises those who succeed in doing so. The latter individual differences question points to a potentially exciting possibility: that the amazing scope of predictions possible with CRT items may perhaps be matched by performance on stumpers.

The CRT owes its immense success primarily to the fact that already at the time of its initial introduction, besides consisting of intrinsically tantalising items, it had powerful predictive powers. Tantalising, because of the ease with which respondents who could have and should have known better erred in solving them; powerful, because of the high correlations with which performance on just three items predicts performance on many a cognitive task.

Stumpers, I believe, are no less tantalising, again because of the difficulty which even smart sophisticated people encounter in solving them; and no less powerful, again because of the almost equally high correlations with which performance on just one stumper predicts performance on some of the same cognitive tasks.

I have been involved in an as yet unpublished study (with Yigal Attali, Shane Frederick and Daniel Kahneman), and I shall divulge some of its pilot results. About 160–170 different MTurk workers (for a total of over 600 respondents) answered two stumpers each (from those numbered **2.3.6, 4.1.2, 4.3.1, 4.4.1, 4.8.1, 4.8.4, 5.2.2**¹¹). Performance on a single stumper was correlated with their performance on the following variables:

One dozen CRT items – positive correlations from .25 to .51.

One dozen Maths items – positive correlations from .32 to .45.

One Belief in God item – negative correlations from –.31 to –.08.

Three pseudo-profound, BS items – negative correlations from –.41 to –.25.

Three Belief in the Paranormal items – negative correlations from –.33 to –.16.

All correlations are in the right direction, and all those larger than .14 in absolute value are significant at .05.

These promising results are somewhat weaker than, but not out of line with, results reported for CRT items, raising the intriguing question: Can stumpers match CRT items?

Disclosure statement

No potential conflict of interest was reported by the authors.

References

- Ansburg, P. I., & Dominowski, R. I. (2000). Promoting insightful problem solving. *The Journal of Creative Behavior*, 34(1), 30–60. <https://doi.org/10.1002/j.2162-6057.2000.tb01201.x>
- Bar-Hillel, M., Noah, T., & Frederick, S. (2018). Learning psychology from riddles: The case of stumpers. *Judgement & Decision Making*, 13(1), 112–122.
- Dominowski, R. (1994). Insight and instructions. Paper presented at the Cognitive section of the 11th annual meeting of the British Psychological Society, Cambridge, England.
- Frederick, S. (2005). Cognitive reflection and decision making. *Journal of Economic Perspectives*, 19(4), 25–42. <https://doi.org/10.1257/089533005775196732>
- Gardner, M. (1978). Aha! Aha! Insight. (Vol. 1) *Scientific American*.
- Gilhooly, K. J., & Murphy, P. (2005). Differentiating insight from non-insight problems. *Thinking & Reasoning*, 11(3), 279–302.
- Goodwin, G. P., & Johnson-Laird, P. N. (2008). Transitive and pseudo-transitive inferences. *Cognition*, 108(2), 320–352. <https://doi.org/10.1016/j.cognition.2008.02.010>
- Grice, P. (1975). Logic and conversation. In P. Cole & J. Morgan (Eds.), *Syntax and semantics* (Vol. 3, pp. 41–58). Academic Press.

¹¹The 8th riddle, **6.0.6, Bookworm**, was removed from this analysis – but is not really a stumper.

- Martyna, W. (1978). What does 'he' mean? *Journal of Communication*, 28(1), 131–138. <https://doi.org/10.1111/j.1460-2466.1978.tb01576.x>
- Minsky, M. (1985). *The society of mind*. Simon and Schuster.
- Murray, M. A., & Byrne, R. M. (2013). Cognitive change in insight problem solving: Initial model errors and counterexamples. *Journal of Cognitive Psychology*, 25(2), 210–219. <https://doi.org/10.1080/20445911.2012.743986>
- Noveck, I. A., & Reboul, A. (2008). Experimental pragmatics: A Gricean turn in the study of language. *Trends in Cognitive Sciences*, 12(11), 425–431. <https://doi.org/10.1016/j.tics.2008.07.009>
- Reder, L. M., & Kusbit, G. W. (1991). Locus of the Moses illusion: Imperfect encoding, retrieval, or match? *Journal of Memory and Language*, 30(4), 385–406. [https://doi.org/10.1016/0749-596X\(91\)90013-A](https://doi.org/10.1016/0749-596X(91)90013-A)
- Rosch, E. (1978). Principles of categorisation. In E. Rosch & B. B. Floyd (Eds.), *Cognition and categorisation* (pp. 27–48). Lawrence Erlbaum Associates.
- Sternberg, R. J., & Davidson, J. E. (Eds.) (1995). *The nature of insight*. The MIT Press.
- Tversky, A., & Kahneman, D. (1973). Availability: A heuristic for judging frequency and probability. *Cognitive Psychology*, 5(2), 207–232. [https://doi.org/10.1016/0010-0285\(73\)90033-9](https://doi.org/10.1016/0010-0285(73)90033-9)