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Assessing nondeductive arguments

- **Nondeductive logical strength, content, and context**
- **Some common types of nondeductive argument**
- **Inference to the best explanation**
  - **The fundamental type of nondeductive argument?**
  - **Data and explanations**
  - **Adjudication heuristics for competing explanations**

We've seen that validity--deductive logical strength--is simply a matter of the argument's form

_____: whether a deductive argument is valid depends simply on what form the argument has.

By contrast, nondeductive logical strength is not simply a matter of form of _____:

two nondeductive arguments with the very same form which _____ can be very different when it comes to logical strength. The logical strength of nondeductive arguments depends partly on their particular content, and partly on their context.

Thus, consider the following two nondeductive arguments, which share the same

form _____:

> 90% of Carleton students surveyed think that capital punishment is wrong.
> Celine is a Carleton student.
> Therefore, Celine thinks that capital punishment is wrong.
>
> 50% of Carleton students surveyed think that capital punishment is wrong.
> Celine is a Carleton student.
> Therefore, Celine thinks that capital punishment is wrong.

Intuitively, the first of these arguments is logically strong in a nondeductive sense,

but the second is not. Yet both arguments share the same logical form _____. The obvious difference between the two is that they have different particular contents: the first premise of the one argument is different from the first premise of the other.

Or consider the first of these two arguments again, only now imagine it being given in two different contexts. (For our purposes, we'll treat the **context** of an argument as a set of background information we have available to us--i.e., a set of statements, other than the elements of the argument, that we know--as we consider the argument.)

In the first context--lets call it Context 1--the background information includes the information that the survey in question covered a large number and wide variety of

Carleton students. In the second context--Context 2--the background information includes rather the information that the survey in question covered only 10 Carleton students, all of whom were members of a group called "Restoration not Retribution" (a group for people who think that our justice system should never punish people with the aim of giving them "payback" for evil deeds, but only ever with the aim of restoring their character, etc.; this group is famous for its opposition to capital punishment on the grounds that such punishment could only ever be aimed at "payback.")

It seems pretty clear that the first of the arguments above could be nondeductively logically strong in Context 1 even though it's not in Context 2--despite the fact that in both contexts the argument has the same form and the same particular content.

Thus, the logical strength of nondeductive arguments depends not just on their

logical form, but also on their **content** and on their **context**.

This fact about the logical strength of nondeductive arguments means that assessing it is a messier affair than assessing the logical strength of deductive arguments: in sorting out whether a nondeductive argument is logically strong (unlike in sorting out whether a deductive argument is logically strong), you have to consider things

other than the _form_ of the argument.

The fact that the logical strength of nondeductive arguments depends on content and context also means that our assessment of the logical strength of nondeductive arguments (unlike our assessment of the logical strength of deductive arguments) is often intertwined with our assessment of the arguments' premise truth; for in thinking about the content and context of an argument, we are often thinking about reasons for thinking that the premises of the argument may be true (or false).

There are many types of nondeductive argument. Let's consider three of the most commonly recognized ones, however: Enumerative Induction, Statistical Syllogism, and Analogical Argument.

Enumerative Induction

n% of observed *Xs* are *Ys*

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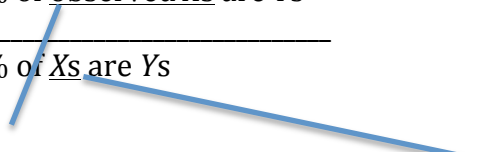
n% of *Xs* are *Ys*



sample entire class

E.g.:

90% of tested extroverts are exceptionally happy. Therefore, 90% of

_extroverts_____ are exceptionally happy.

Nearly 25% of _patients_____ experienced "brain-zaps" when coming off the antidepressant. So, nearly 25% of patients experience "brain-zaps" when coming off the antidepressant.

All Grizzly bears so far observed have been aggressive. Hence, all Grizzly bears are aggressive.

When assessing enumerative inductions, there are two general rules to keep in mind:

Size: the sample of an enumerative induction should be _sufficiently large_____

_____, so as to be representative of the entire class.

Variation: the sample of an enumerative induction should be _wide_____

_____, so as to be representative of the entire class.

Statistical Syllogism

n% of *X*s are *Y*s
a is *X*

_____
a is *Y*

E.g.:

70% of Conservatives espouse libertarian principles. Lily is _a conservative.___. So Lily espouses libertarian principles.

99% of analytic philosophy books are inaccessible to the lay reader. *Naming*

and necessity is _an analytic philosophy book_____. Hence, *Naming and necessity* is inaccessible to the lay reader.

Dave probably has a gender, since 2/3 of men have a male gender, and Dave's a man.

Clearly, when assessing the logical strength and soundness of statistical syllogisms, a key point to bear in mind is the percentage claimed in the probabilistic (statistical) premise: the higher the probability, the logically stronger the argument is typically going to be.

Analogical Argument
(aka "Argument by Analogy")

a has feature(s) *X* and feature(s) *Y*
b has feature(s) *X*
_____
b has feature(s) *Y*

basis (of the analogy) extension (of the analogy)

E.g.:

Your essay was about democracy in ancient Athens, had some quotes from Aristotle, was critical in tone, and it got an A. And since my essay was also about democracy in ancient Athens, had some quotes from Aristotle, and was critical in tone, it'll probably get an A too.

It seems pretty likely that there's an intelligent designer of the natural world. For artifacts like watches, cars, and computers, which are complex and orderly, have intelligent designers, and the natural world is complex and orderly too.

A good psyche has a rational element, a volitional element, and an appetitive element, and the rational element rules over the appetitive element by means of the volitional element. A good society has a rational element, a volitional element, and an appetitive element. Therefore, the rational element of a good society rules over its appetitive element by means of its volitional element. [An analogical argument suggested in the ancient Greek philosopher Plato's famous dialogue, *The Republic.*]

Kiu weighs more than 100kg, owns a pet, drives a Ford, and chain-smokes. Bryce also weighs more than 100kg, owns a pet, and drives a Ford. So it's likely that Bryce chain-smokes as well.

In an analogical argument, the less relevant the basis is to the extension, the logically weaker the argument.

To help determine the relevance of the basis to the extension, look for significant disanalogies.

Disanalogies: features had by one of the object compared in an analogical argument

_____ but not by the other.

Generally, the more significant disanalogies there are, or the more significant the disanalogies found, the logically weaker the analogical argument.

Thus, for the last example of an analogical argument above, significant disanalogies might include:

-Bryce is a fitness freak (and hence almost all muscle), unlike Kiu
-Kiu has a high-stress job but Bryce doesn't
-Kiu has many smoker friends, unlike Bryce.

For the analogical argument from Plato, significant disanalogies might include:

-unlike the elements of the psyche, the elements of society are comprised of people with rights;
-unlike the elements of society, the elements of the psyche are functionally limited.

For the intelligent design argument, significant disanalogies might include:

-the fact that artifacts typically come with explicit instructions from their designers, but not so the natural world
-the fact that artifacts are by definition designed, whereas this is not so for the natural world

Exercise 6.1: Name the type of nondeductive argument in each of the following examples.
Politician 1 had a conservative religious upbringing, has a law degree, gets much of his campaign funding from big business, belongs to the right-wing party, and he has little concern for the plight of the socially disadvantaged. Since Politician 2 also had a conservative upbringing, has a law degree, gets a lot of his campaign funding from big business, and belongs to the right-wing party, he probably has little concern for the plight of the socially disadvantaged as well. 80% of North American philosophy professors are atheists. Dave's probably an atheist, therefore, since he's a North American philosophy professor.

The percentage of trial subjects who experienced adverse effects from taking the drug was miniscule: about 0.001%. So hardly anyone who takes the drug will experience adverse effects.

It's very likely that she's a pessimist, since she's a fan of Existentialist philosophy, and almost everyone who's a fan of Existentialist philosophy is a pessimist.

Just about every op-ed piece I've read in *The Sun* has contained factual errors. So pretty much all *The Sun*'s op-ed pieces contain factual errors.

You've got all the classic symptoms of the typical individual suffering with kidney stones. So you've probably got kidney stones.

Every event we've ever experienced has had a cause. Thus, every event has a cause.

The vast majority of "self-help" books I've read have consisted of a strange mixture of common sense truisms and inane mantras. Most such books, therefore, seem to consist of such a strange mixture.

Inference to the Best Explanation
(aka "Abductive Argument")

Facts $f_1 \ldots f_n$ obtain
The best available explanation of $f_1 \ldots f_n$ is E
———————————————————————
E

data (or phenomena) explanation (or theory, hypothesis)

E.g.:

Various distinctive tracks have been observed in the cloud chamber. The best available explanation of the fact that various distinctive tracks have been observed in the cloud chamber is that they are caused by the activity of electrons. Therefore, the various distinctive tracks that have been observed in the cloud chamber are caused by the activity of electrons.

We've got a mouse in the house, because this best explains why there's a scratching noise behind the wainscoting, why the cereal boxes have been chewed into, and why there are distinctive droppings on the floor.

> He's become taciturn lately, unaccountably late from work, and he's stopped all those niceties he used to give me. The best reason I can think of for his taciturnness, his unaccountable lateness, and the cessation of the niceties, is that he no longer loves me. So I guess I'd better get used to the fact that he no longer loves me.
>
> Every gas so far observed expands when heated under constant pressure. The best available explanation of this that all gases expand when heated under constant pressure. Hence, all gases expand when heated under constant pressure.

In a well-known article, "The Inference to the Best Explanation" (*The Philosophical*

Review 74 (1965): 88-95), the American philosopher Gilbert Herman argued that certain central forms of nondeductive argument, such as enumerative induction, are best understood as varieties of inference to the best explanation.

It certainly seems plausible to re-interpret, or rewrite, many of the nondeductive arguments we've looked at so far as cases of inference to the best explanation. Thus, consider:

Nondeductive argument	**Rewritten as an Inference to the Best Explanation**
90% of tested extroverts are exceptionally happy. _____ 90% of extroverts are exceptionally happy.	90% of tested extroverts are exceptionally happy. The best available explanation of this fact is that 90% of extroverts are happy. _____ 90% of extroverts are exceptionally happy.
All Grizzly bears so far observed have been aggressive. _____ All Grizzly bears are aggressive.	All Grizzly bears so far observed have been aggressive. The best available explanation of this is that all Grizzly bears are aggressive. _____ All Grizzly bears are aggressive.

70% of Conservatives espouse libertarian principles.

Lily is a Conservative.

Lily espouses libertarian principles.

70% of Conservatives espouse libertarian principles, and Lily is a Conservative.

The best available explanation of why both of these facts obtain together is that Lily espouses libertarian principles.

Lily espouses libertarian principles.

Your essay was about democracy in ancient Athens, had some quotes from Aristotle, was critical in tone, and got an A.

My essay was about democracy in ancient Athens, had some quotes from Aristotle, and was critical in tone.

My essay got an A.

You essay was about democracy in ancient Athens, had some quotes from Aristotle, was critical in tone, and got an A; my essay was about democracy in ancient Athens, had some quotes from Aristotle, and was critical in tone.

The best available explanation of why all of these facts obtain together is that my essay will be judged to be of the same quality as yours (and hence get an A as well).

My essay will be judged to be of the same quality as yours (and hence will get an A as well).

Moreover, even in cases where it may seem awkward to rewrite a nondeductive argument as an inference to the best explanation, an inference to the best explanation may be what stands behind one of the premises of the nondeductive argument. For example, it's plausible that an inference to the best explanation is typically what gives us reason to accept the statistical premise of a statistical syllogism.

All of which suggests that inference to the best explanation may be the most fundamental, or at any rate the most important, form of nondeductive argument.

Now notice that for any given data set in an inference to the best explanation, there are typically multiple different explanations available.

Moreover, these different available explanations typically compete with each other. E.g.:

-Phlogiston vs. oxygen theory
-Mouse in the house vs. squirrel in the house vs. paranormal activity

An inference to the best explanation always claims that one explanation the best of the available competitors; and to say that it is the best is to say that it is better than each of the available competitors.

So, to evaluate an inference to the best explanation, we should have some way of

determining when one explanation is better than another. The purpose of adjudication heuristics is to help us determine this.

Adjudication heuristic (for competing explanations): general guidelines or rules of thumb, that helps us determine when one explanation is better than the other.

We will consider three adjudication heuristics in connection with inference to the best explanation:

Simplicity
Power
Conservation

Simplicity
(aka "Ockham's Razor," "Parsimony")

the simple explanation is a better explanation.

(I.e., if two explanations do an equally good job in all other respects of

explaining the data, prefer the one that is simpler than the other.)

(The fourteenth century Medieval philosopher William of Ockham (c. 1325) most famously advocated this principle; the Latin phrase "*Entia non sunt multiplicanda*

praeter necessitatem"--"Do not multiply entities beyond necessity [when theorizing]"--is attributed to him.)

The basic idea is that the greater the different kinds of claims you are committed to unnecessarily in theorizing or attempting to explain data, the more you have to be wrong about.

To illustrate:

> Data: there's a scratching noise behind the wainscoting, the cereal boxes have all been chewed into, and there are distinctive droppings on the floor.
>
> Explanation 1: Mouse in the house
> Explanation 2: Squirrel in the house
> Explanation 3: Paranormal activity

Commits you to different kind of claims

in addition to the normal claims that is already there.

> Data: burning coal results in greater weight, burning wood results in greater weight, burning metal results in greater weight.
>
> Explanation 1: Phlogiston theory
> Explanation 2: Oxygen theory

Commits you to a radically different kind of claim, viz. one about the substance of positive weight.

> Data: he's become taciturn lately, he's often unaccountably late from work, he's stopped giving me all those niceties he used to.
>
> Explanation 1: he no longer loves me
> Explanation 2: he no longer loves me and there's someone else in the scene

Commits you to more kinds of claims (but perhaps this is required adequately to explain all elements of the data set?)

Exercise 6.2: For each of the following inferences to the best explanation, (a) identify the data, (b) identify the explanation that is claimed to be the best available explanation of the data, and (c) provide a simpler alternative explanation.

On the course midterm, over 90% of the top grades went to women. Yet there are about as many men enrolled in the course as there are women. So, in addition to the women studying harder for the midterm, the professor must have an unfair bias towards women in his grading practices, since this is the most plausible reason I can think of to explain these facts about the midterm and enrollment.

Many people have experienced *déjà vu*--that uncanny sense, with respect to an apparently new situation, of having been in exactly the same situation before. This sense is typically very intense, and startling. Such facts about *déjà vu* are best accounted for by the past-life hypothesis, viz., the hypothesis that we have all lived many past lives in which we have witnessed situations more or less identical to some of the situations we encounter in our present lives. So the past-life hypothesis is true.

Alafair and I were the only ones who ate the spinach salad at the party, and we were the only ones to get sick afterwards. I guess that not only was the salad bad, but also that Alafair and I share an intolerance to spinach, since this makes the most sense of why only she and I ate the salad and got sick afterwards.

Every organized religion has had members who have done very evil things. The best available explanation of this fact is that not only are there bad people who belong to organized religions, but also that organized religions inherently inspire bad behavior. Thus, not only are there bad people who belong to organized religions, organized religions inherently inspire bad behavior.

Power
(aka "Generality")

the more powerful an explanation is the better explanation.

(I.e., provided two explanations do an equally good job in all other respects of explaining the data, prefer the one that has a more general applicability.)

Power helps cuts down the likelihood of mere coincidence when explaining things.

To illustrate:

> Data: the O_2 in this cylinder expands when heated under constant pressure, the CO_2 in that cylinder expands when heated under constant pressure.
>
> Explanation 1: All O_2 and CO_2 expands when heated under constant pressure
> Explanation 2: All gases expand when heated under constant pressure

More powerful, because it has a more general applicability.
(e.g., to N_2, He, H_2, etc.).

> Data: Enrique got aggravated at last month's party, he flew off the handle in the meeting a week ago, and he just stormed by my office door all in a huff.
>
> Explanation 1: Special aspects of the party, meeting, and the current situation case Enrique to lose his temper
>
> Explanation 2: Enrique is irascible

More powerful, because it has a more general applicability
(e.g., to all the other cases in which Enrique keeps losing his temper).

Exercise 6.3: For each of the following explanations of data, provide an alternative explanation that is more powerful.
Data: 97% of the adult test subjects solved the logic puzzles incorrectly. Explanation: This group of adult test subjects are particularly bad at logic puzzles. Data: Reducing the amount of butter in their diets tends to improve the cholesterol profiles of patients, reducing the amount of cream in their diets improves the cholesterol profiles of patients, reducing the amount of fried foods in their diets improves the cholesterol profiles of patients. Explanation: Diets low in butter, cream, and fried foods are causally linked to better cholesterol profiles. Data: Pavlov's dogs were trained to salivate in response to the noise of a bell even

when no food was present.
Explanation: Dogs can be trained to respond to stimuli indicative of rewards even when the rewards are not present.

Conservation
(aka "Conservatism")

> the explanation that conserves more of what we already have good reason to believe is the better explanation.

If an explanation does not conserve (or preserve) what we already have good reason to believe, then it conflicts with what we already have good reason to believe.

What we already have good reason to believe may be understood as conflicting evidence for an explanation that conflicts with it.

Thus, respecting the adjudication heuristic of Conservation allows us better to avoid conflicting evidence for crucial premises in our inferences to the best explanation.

Illustrations:

> Data: we seem to have free choice, determinism seems to be true.
>
> Explanation 1: Hard determinism
> Explanation 2: Soft determinism (compatibilism)
> Explanation 3: Libertarianism

Conserves more of what we already have good reason to believe (e.g., that we really do have free choice, that we are responsible beings, that often our free choices have causes, that our free choices are not random events, etc.)

> "[O]ur friend the amateur magician tells us what card we have drawn. How did he do it? Perhaps by luck, one chance in fifty-two; but this conflicts with our reasonable belief, if all unstated, that he would not have volunteered a performance that depended on that kind of luck. Perhaps the cards were marked; but this conflicts with our belief that he had no access to them, they being ours. Perhaps he peeked or pushed, with help of a sleight-of-hand; but this conflicts with our belief in our perceptiveness. Perhaps he resorted to telepathy or clairvoyance; but this would wreak havoc with our whole web of

belief. The counsel of conservatism is the sleight-of-hand." (W.V. Quine & J.S. Ullian, *The Web of Belief, 2nd ed.* New York: McGraw-Hill, 1978, p. 67)

Data: the magician identifies the right card.

Explanation 1: Luck
Explanation 2: Marked cards
Explanation 3: Sleight of hand
Explanation 4: Clairvoyance

Conserves more of what we already have good reason to believe.

Exercise 6.4: For each of the following explanations of data, provide an alternative explanation that conserves more of what we already have good reason to believe.
Data: Sincere people have reported that they had conscious experiences during temporary brain death. Explanation: The people in question really had conscious experiences during temporary brain death. Data: Jiejie, whom we know always to have been an honest individual in the past, was recently stopped by security while leaving the drugstore on suspicion of shoplifting. Explanation: Jiejie recently had a radical change of character, causing her to become dishonest, and as a result was stopped by security because she really was trying to steal something from the drugstore. Data: Justin has only given his home phone number, which is unlisted, to very close friends and family members, his phone keeps ringing around dinner time, the caller ID keeps displaying "Unknown Caller," and whoever keeps calling never leaves a message. Explanation: One of Justin's close friends or family members is secretly stalking him on the phone.

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Exercise 6.1 Solutions
Politician 1 had a conservative religious upbringing, has a law degree, gets much of his campaign funding from big business, belongs to the right-wing party, and he has little concern for the plight of the socially disadvantaged. Since Politician 2 also had

a conservative upbringing, has a law degree, gets a lot of his campaign funding from big business, and belongs to the right-wing party, he probably has little concern for the plight of the socially disadvantaged as well. **Analogical Argument**

80% of North American philosophy professors are atheists. Dave's probably an atheist, therefore, since he's a North American philosophy professor. **Statistical Syllogism**

The percentage of trial subjects who experienced adverse effects from taking the drug was miniscule: about 0.001%. So hardly anyone who takes the drug will experience adverse effects. **Enumerative Induction**

It's very likely that she's a pessimist, since she's a fan of Existentialist philosophy, and almost everyone who's a fan of Existentialist philosophy is a pessimist. **Statistical Syllogism**

Just about every op-ed piece I've read in *The Sun* has contained factual errors. So pretty much all *The Sun*'s op-ed pieces contain factual errors. **Enumerative Induction**

You've got all the classic symptoms of the typical individual suffering with kidney stones. So you've probably got kidney stones. **Analogical Argument**

Every event we've ever experienced has had a cause. Thus, every event has a cause. **Enumerative Induction**

The vast majority of "self-help" books I've read have consisted of a strange mixture of common sense truisms and inane mantras. Most such books, therefore, seem to consist of such a strange mixture. **Enumerative Induction**

Exercise 6.2 Solutions

On the course midterm, over 90% of the top grades went to women. Yet there are about as many men enrolled in the course as there are women. So, in addition to the women studying harder for the midterm, the professor must have an unfair bias towards women in his grading practices, since this is the most plausible reason I can think of to explain these facts about the midterm and enrollment.

The data: 90% of the top grades went to women on the course midterm, there are about as many men as women enrolled in the course.

The explanation claimed to be the best available explanation of the data: The women studied harder for the midterm than the men and the professor has an unfair bias towards women in his grading practices.

A simpler alternative explanation: The women studied harder for the midterm than the men.

Many people have experienced *déjà vu*--that uncanny sense, with respect to an apparently new situation, of having been in exactly the same situation before. This sense is typically very intense, and startling. Such facts about *déjà vu* are best accounted for by the past-life hypothesis, viz., the hypothesis that we have all lived many past lives in which we have witnessed situations more or less identical to some of the situations we encounter in our present lives. So the past-life hypothesis is true.

The data: Many people have experienced *déjà vu*, *déjà vu* is typically intense and startling to experience.

The explanation claimed to be the best available explanation of the data: The past-life hypothesis.

A simpler alternative explanation: Some experiences of new situations randomly trigger a neurologically-based strong sense of familiarity.

Alafair and I were the only ones who ate the spinach salad at the party, and we were the only ones to get sick afterwards. I guess that not only was the salad bad, but also that Alafair and I share an intolerance to spinach, since this makes the most sense of why only she and I ate the salad and got sick afterwards.

The data: Alafair and I were the only ones who ate the spinach salad at the party, Alafair and I were the only ones to get sick after the party.

The explanation claimed to be the best available explanation of the data: The spinach salad was contaminated and Alafair and I have an intolerance to spinach.

A simpler alternative explanation: The spinach salad was contaminated.

Every organized religion has had members who have done very evil things. The best available explanation of this fact is that not only are there bad people who belong to organized religions, but also that organized religions inherently inspire bad behavior. Thus, not only are there bad people who belong to organized religions, organized religions inherently inspire bad behavior.

The data: Every organized religion has had members who have done very evil things.

The explanation claimed to be the best available explanation of the data:

There are bad people who belong to organized religions and organized religions inherently inspire bad behavior.

A simpler alternative explanation: There are bad people who belong to organized religions.

Exercise 6.3 Solutions

Data: 97% of the adult test subjects solved the logic puzzles incorrectly.
Explanation: This group of adult test subjects are particularly bad at logic puzzles.
More powerful alternative explanation: Adult humans are bad at logic puzzles.

Data: Reducing the amount of butter in their diets tends to improve the cholesterol profiles of patients, reducing the amount of cream in their diets improves the cholesterol profiles of patients, reducing the amount of fried foods in their diets improves the cholesterol profiles of patients.
Explanation: Diets low in butter, cream, and fried foods are causally linked to better cholesterol profiles.
More powerful alternative explanation: Diets low in saturated fats are causally linked to better cholesterol profiles.

Data: Pavlov's dogs were trained to salivate in response to the noise of a bell even when no food was present.
Explanation: Dogs can be trained to respond to stimuli indicative of rewards even when the rewards are not present.
More powerful alternative explanation: Mammals can be trained to respond to stimuli indicative of rewards even when the rewards are not present.

Exercise 6.4 Solutions

Data: Sincere people have reported that they had conscious experiences during temporary brain death.
Explanation: The people in question really had conscious experiences during temporary brain death.
Alternative explanation that conserves more of what we already have good reason to believe: The people in question had unusual, neurologically-triggered conscious experiences just before temporary brain death, which they mistook as conscious experiences during temporary brain death.

Data: Jiejie, whom we know always to have been an honest individual in the past, was recently stopped by security while leaving the drugstore on suspicion of shoplifting.
Explanation: Jiejie recently had a radical change of character, causing her to become

dishonest, and as a result was stopped by security because she really was trying to steal something from the drugstore.
Alternative explanation that conserves more of what we already have good reason to believe: Jiejie inadvertently carried an unpaid item with her out of the drugstore.

Data: Justin has only given his home phone number, which is unlisted, to very close friends and family members, his phone keeps ringing around dinner time, the caller ID keeps displaying "Unknown Caller," and whoever keeps calling never leaves a message.
Explanation: One of Justin's close friends or family members is secretly stalking him on the phone.
Alternative explanation that conserves more of what we already have good reason to believe: Telemarketing companies have found out Justin's unlisted number and keep calling him.