A Crash Course in Logic and Its Relations to the Climate Change Debate

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Logical methods allow us to examine truth claims for many different applications. The arguments used for and against Anthropogenic Climate Change studies make an interesting test case for studying logic employed in this debate.

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What is Logic?

Logic is the study of methods for evaluating whether the premises of an argument adequately support its conclusion.

A Means of Formalizing Thought — Systematic Thinking

Supports Various Deductive Systems — "Truth Engines"

Provides Methods for determining that a Given Argument's Conclusion is correct, given that the Premises are True.

TRUE PREMISES + VALID ARGUMENT = CORRECT CONCLUSION

Arguments are typically used to Persuade and to Discover Truth.

Order of Sciences & Logic

Science:	Terms/Relations Introduced:
1. Logic of Propositions.	Implies, And, Or, Not, False
2. Logic of Classes.	Thing, All _ is _, Non-
3. Arithmetic.	Number, Less Than, Equal to, Greater Than
4. Geometry.	Point, Line, Plane, Intersects, …
5. Kinematics.	Time, Motion
6. Mechanics.	Mass, Particles of Matter
7. Physics.	Force, Electricity, Atom, etc.
8. Biology.	Life, Animal, Plant
9. Etc……	

The Laws of Thought

Certain LAWS are at the core of all LOGICAL THINKING.

"These are not claimed as MERE Hypotheses, but as **INCONTROVERTIBLE PREMISES OF ALL RATIONAL HUMAN THOUGHT**."

1. Law of Identity [A=A]: Things can be identified. They have an identity. They can be distinguished from other objects, as opposed to being indistinguishable, or having no identity at all. That is, knowledge is possible.
2. Law of ***Non-Contradiction*** [not (A and non-A)]: No proposition can be both True and False at the Same Time and Place and in the Same Way.
3. Law of the ***Excluded Middle***: In Logic, either a Proposition is True -or- it is False. It must be one or the other.

Law 2 tells us A cannot be BOTH True AND False.

Law 3 tells us that A must be EITHER True OR False.

Philosophy of Science

- Feynman: The difference between Real Science and a case where we're being Bamboozled by Fancy Terminology is where we insist that a theory be described using Ordinary Language.
- This guards against learning "a mystic formula for answering questions."
- Einstein: "You cannot really understanding something unless you can explain it to your grandmother."
- Oxenham: "It is equally useful for testing the claims of others. If someone cannot explain something in plain English, then we should question whether they really do themselves understand what they profess."

Feynman: The Scientific Method

- Based on ***Theory***, develop CONCLUSIONS & PREDICTIONS.
- Perform EXPERIMENTS that either are CONSISTENT or INCONSISTENT with the THEORY.
- INCONSISTENT: Theory is FALSE.
- CONSISTENT: Theory COULD BE FALSE (but hasn't been proven false, YET).
- A THEORY CAN NEVER BE PROVEN RIGHT, Only TENTATIVELY TRUE.
- https://artofuncertainty.wordpress.com/2015/01/06/anomalies-and-falsification-in-science/

The Fate of Anomalies

Sometimes **one or more anomalies completely dethrone the current paradigm.** Far more often….they don't.

1) **It turns out to be an experimental artifact, a mistake.** The observation of neutrinos traveling faster than light turned out to be a consequence of a loose cable!
2) **It is a real effect, but incomplete. A missing piece of the observation, once found, restores consistency with the theory.** Feynman's example: Superconductivity, at first, seemed to contradict atomic physics. Eventually a subtle quantum mechanical phenomena explained the effect.
3) **It represents a real problem, but after modification (major or minor) the essence of the theory survives.**

- https://artofuncertainty.wordpress.com/2015/01/06/anomalies-and-falsification-in-science/

Epistemology: Study of Knowledge

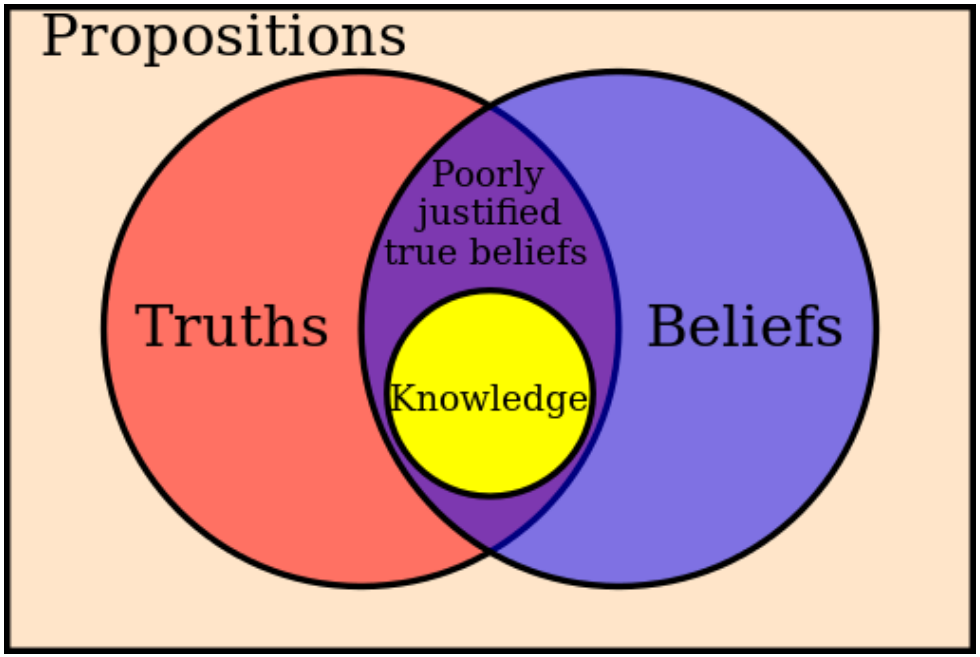
How do we know WHAT we know?

Distinction between Knowledge (passing familiarity) and Experience (Wisdom).

Seeing people riding bicycles vs. riding a bike yourself.

Seeing people swimming vs. swimming yourself.

Beliefs vs. Justification



Karl Popper: Falsifiability

Popper is known for his rejection of classical inductivist views on the scientific method, in favour of empirical **falsification**: An empirical theory can never be proven **true**, but it can be **falsified**, meaning that it can and should be scrutinized experimentally**.**

Popper proposed this theory of “falsifiability” in 1963 to solve The ***Problem of Demarcation***, to denote what is and what is not science: An idea is scientific if it can conceivably be proven wrong.

To say that a given statement (e.g., the statement of a law of some scientific theory)—call it "T"—is "falsifiable" does not mean that "T" is false. Rather, it means that, **if** "T" is false, **then** (in principle), "T" could be ***shown*** *to be* false, by observation or by experiment.

Gödel's Incompleteness Theorem

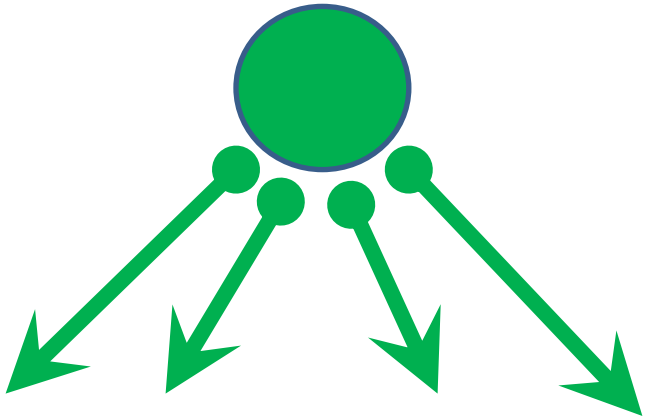
Czech-born mathematician Kurt Gödel (1931) argued that within any logical system, there would always be some propositions that couldn't be proven either true or false using the rules and axioms of that system itself.

You need to go *outside* the system in order to come up with new rules and axioms, but by doing so you'll only create a new, larger system with its own unprovable statements.

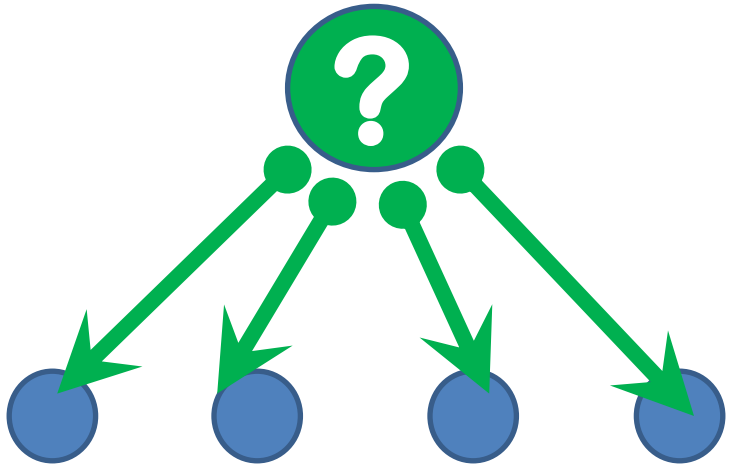
Gödel's Theorem has been used to argue that a computer can never be as smart as a human being because the extent of its knowledge is limited by a fixed set of axioms, whereas people can discover unexpected truths.

Formal vs. Informal Logic

Formal	***In-Formal***
HYPOTHETICAL	***Factual***
TOP-DOWN	***Bottom-Up***
DEDUCTIVE	***Inductive***
PREDICTIVE	***Experimental***



MANY DEDUCTIVE SYSTEMS POSSIBLE



Only One Non-Formal System

How to Build a Deductive System

1. List all **indefinable terms** and **relations**.

2. Define **all other terms** and **relations** using indefinables.

3. Construct a set of **assumed propositions, called postulates**. These can only contain indefinables and the new terms and relations based on indefinables.

4. Ensure that the above postulates are **consistent** and **independent** (no contradictions and no postulate can be derived from another as a theorem).

5. **Deduce theorems** based on the definitions and postulates explicitly set down.

Undefinables

EXAMPLES:

NUMBER --- MANY

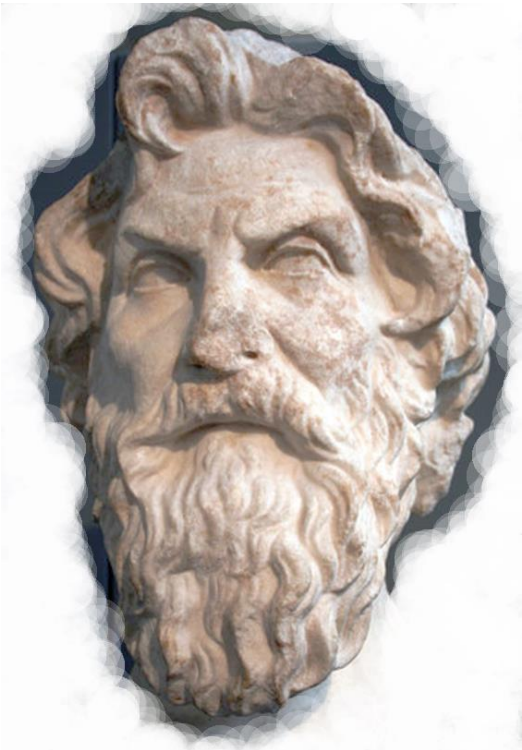
QUANTITY --- AMOUNT

LABOR --- TOIL --- WORK

INFINITY >> $10^{10^{10^{10}}}$

Euclidean Geometry I

- Euclid is considered the first to have constructed a working Deductive System.
- Inherited Systems: Propositional Logic, Arithmetic
- Euclid adopted “Common Notions” but did not make Undefinables Explicit.
- A few examples of Euclid’s Common Notions:
  - Things which equal the same thing also equal one another.
  - Equals added to equals, are equal.
  - Things which coincide with one another equal one another.



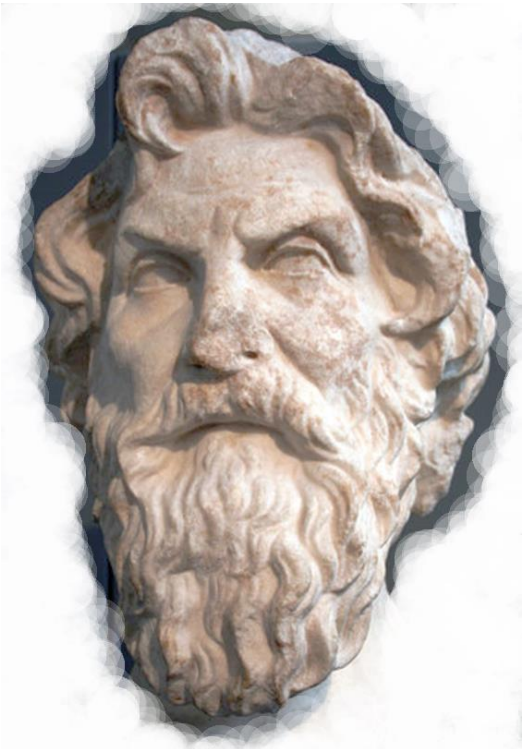
Euclid (ca. 330-270 BC)

Euclidean Geometry II

- A few examples of Euclid's Terms:
  - A ***point*** is that which has no part. (1.)
  - A ***line*** is a breadthless length. (2.)
  - A ***surface*** is that which has length and breadth only. (5.)
  - A pair of ***parallel straight lines*** are straight lines which, being in the same plane and produced indefinitely in both directions, do not meet one another in either direction. (23.)
  - A ***circle*** is a plane figure contained by one line [which is called the circumference], and all the straight lines coming from one point of those lying within the figure and falling [upon the circumference of the circle] are equal to one another. (15.)
- More Euclidean Terms: Acute Angle, Obtuse Angle, Right Angle, Circle, Center of a Circle, Diameter, Circumference, Right Triangle, etc.

Euclid's 5 Postulates

1. Between any pair of points a straight line can be drawn.
2. A finite straight line can be continuously extended to produce an infinite straight line.
3. For every point and every distance a circle can be drawn.
4. All right angles are equal to one another.
5. A straight line falling on two straight lines that makes interior angles on the same side that are less than two right angles, the two straight lines, if produced indefinitely, intersect on that side.



Euclid (ca. 330-270 BC)

System 1: Propositional Logic

Chrysippus was among the most influential philosophers of the Hellenistic period. He is usually thought of as the most important influence on Stoicism.

Chrysippus suggested that the following most basic inference schemata:

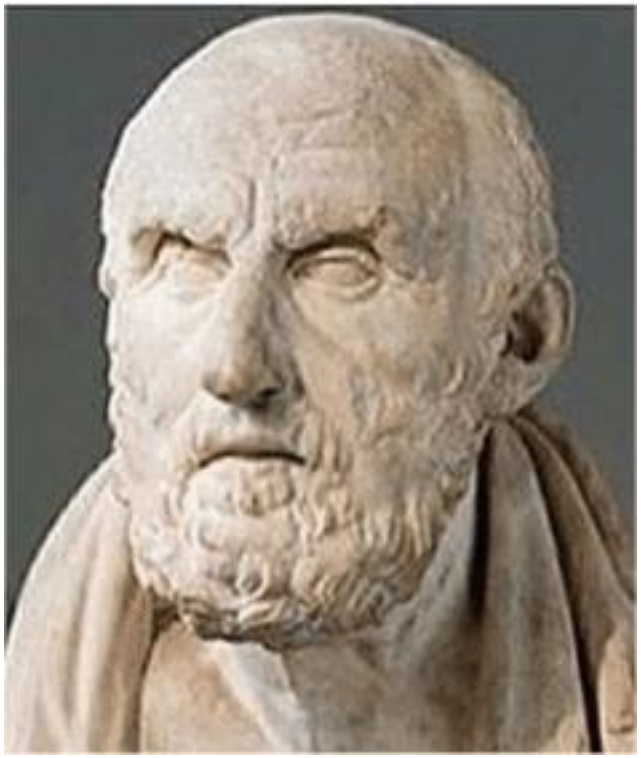
1. If the first, then the second;
   but the first; therefore the second.

2. If the first, then the second;
   but not the second; therefore, not the first.

3. Not both the first and the second;
   but the first; therefore, not the second.

4. Either the first or the second [but not both];
   but the first; therefore, not the second.

5. Either the first or the second;
   but not the second; therefore the first.



Chrysippus (ca. 280-207 B.C.)

Propositional Argument Forms

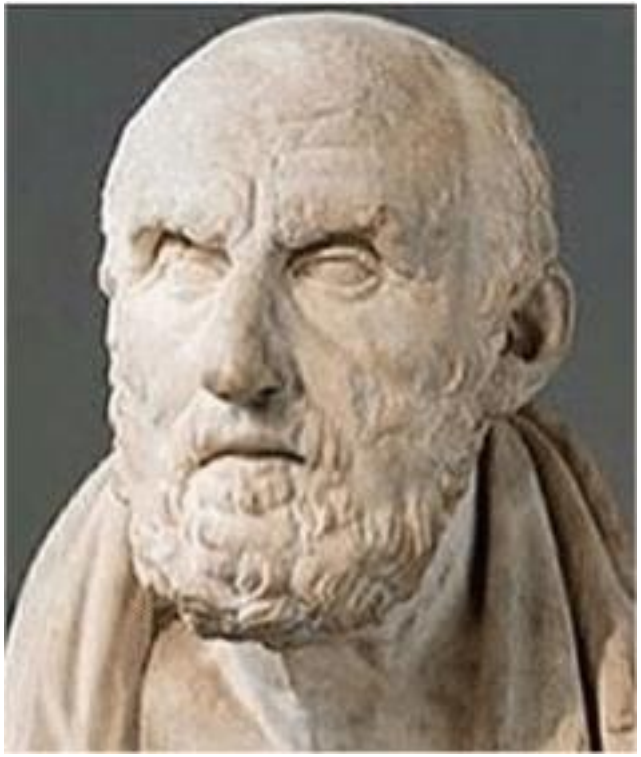
The 5 Schemata introduced can be further explained in terms of the following:

1. **Modus Ponens** (**Affirmation Mode**) also called **Constructive Hypothetical Syllogism**:
   If the first, then the second;
   but the first; therefore the second.

2. **Modus Tollens** (**Denial Mode**) also called **Destructive Hypothetical Syllogism**:
   If the first, then the second;
   but not the second; therefore, not the first.

3. **Complex Constructive Dilemma**:
   If P then Q, and if R then S, but either P or R is true; hence, either Q or S, but not both.

4. **Complex Destructive Dilemma**:
   If P then Q, and if R then S, but either Q is false or S is false; hence, either P is false or R is false.



Chrysippus (ca. 280-207 B.C.)

Postulates

From the Latin: *Postulare* – To Demand.
"Self-Evident" Starting Statements.

Problem: No one can agree on what constitute a complete set of sufficient "Self-Evident" statements.

Solution (?): Experts. Concensus. "Obvious."

Problem: What everyone knows to be true (or false) in one generation is likely to be found false (or true) in the next generation.

Postulates vs. Axioms

Both Postulates and Axioms insist that certain fact are self-evident. (No proof given.)

Axioms are Postulates arising from assumed prior more basic systems. Axioms thus represent more basic truths. Example: Euclid's "Common Notions"

Axiomatic Methods: Scientific and Logical theories constructed from Axioms and Postulates. Produce valid results if the Axioms are true.

Propositions vs. Premises

An **argument** is constructed of …

two or more declarative **propositions** known as **premises**

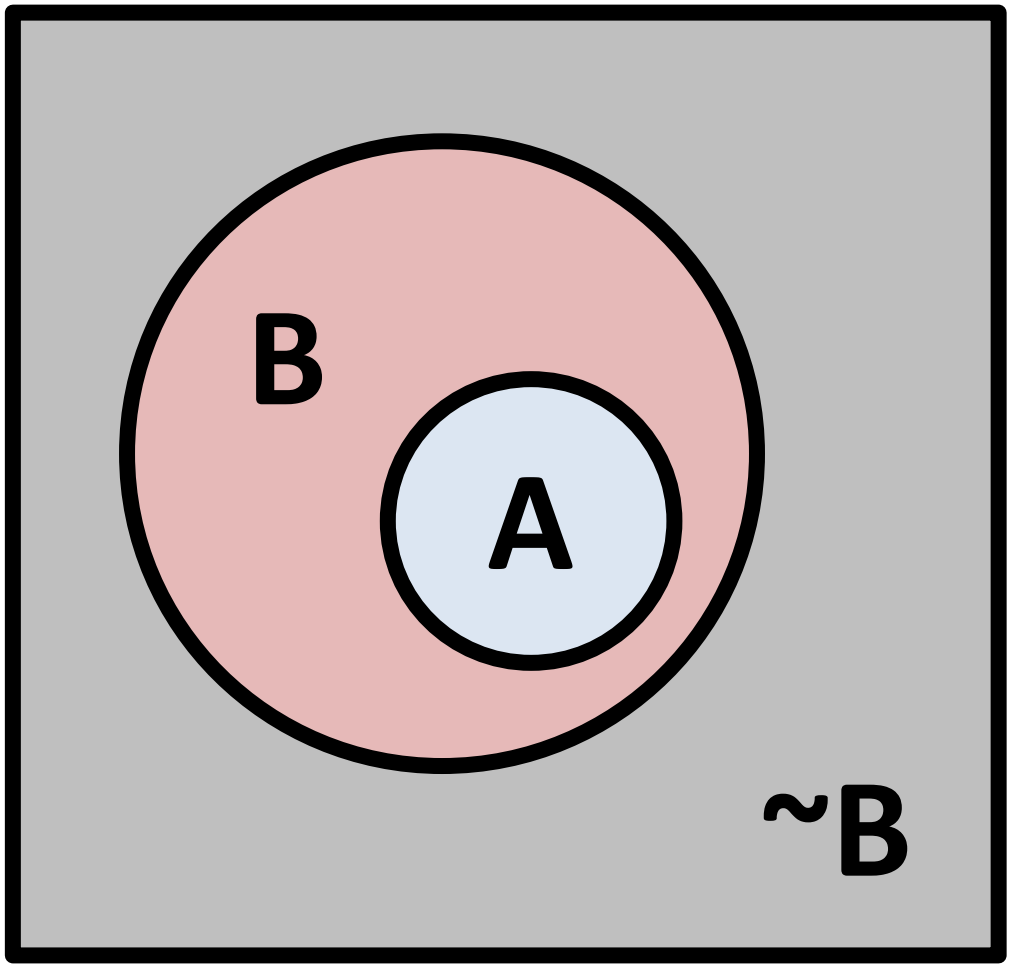
+ another declarative **proposition** known as the **conclusion**.

The **premises** support the **conclusion**.

Both the **conclusion** and the **premises** are **propositions**.

https://www.quora.com/Whats-the-difference-between-a-preposition-and-a-premise

Implication



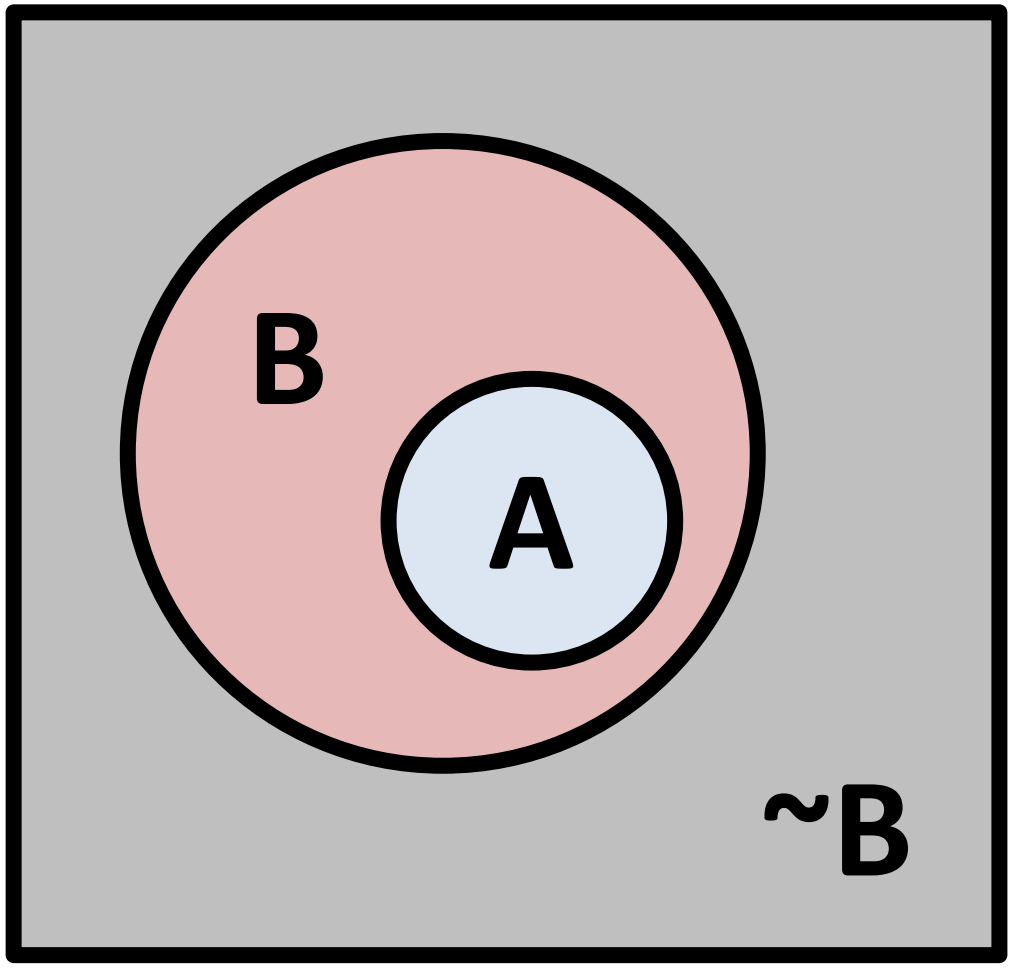
$A \rightarrow B$

READ:

A IMPLIES B

If A lies COMPLETELY WITHIN the region where B is TRUE...
THEN, if A is TRUE, then B must be TRUE as well.

Implication



If A lies COMPLETELY WITHIN the region where B is TRUE...
THEN, if A is TRUE, then B will be TRUE as well.

In Other Words:

A **CANNOT** BE TRUE WHILE B IS FALSE.

A → B

The Law of Contradiction and Interchange

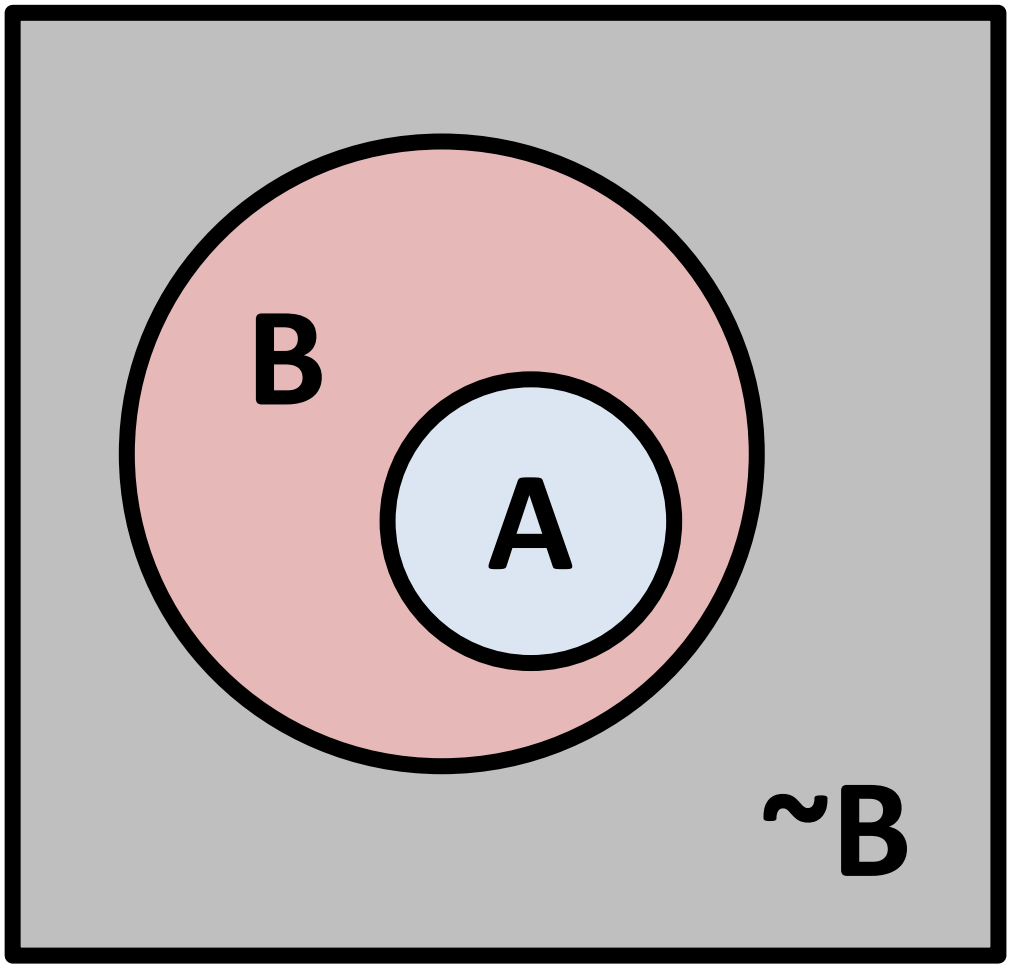
If the truth of P implies that Q is true,

then one can use Contradiction and Interchange to produce the second rule that says,

If Q is not true (false), then this implies that P is also false.

This is the means of producing the Modus Tollens Argument.

Reverse Implication



If A → B

Then

~B → ~A

Math Analog:

If +5 < +8

Then -8 < -5.

If A lies COMPLETELY WITHIN the region where B is true …
IF B is NOT TRUE... THEN, A cannot be TRUE either.

What's a Syllogism?

SYLLOGISM = "WITH" (SUL) "REASONING" (LOGIC).

A Syllogism is a **LOGICAL COMPUTATION**.

Consists of a 2-Premises:

A VERY GENERAL STATEMENT ← **The MAJOR PREMISE**

A "SPECIFIC" STATEMENT ← **The MINOR PREMISE**

Followed by …

THE **CONCLUSION**

Example:

Reptiles do not have fur.	R=Reptiles; F=Fur bearin critters
A crocodile is a reptile.	C=Crocodiles.
Crocodiles do not have fur.	

What's an Enthymeme?

While a Syllogism contains a MAJOR and a MINOR premise, and then a CONCLUSION…

An **Enthymeme** is an abbreviated syllogism that only contains one premise plus the conclusion, the other premise is implied.

For example: 'He must be a socialist because he favors a graduated income-tax.'

Here the conclusion is "He is a socialist." This has been deduced from an expressed premise (He favors a graduated income-tax) and an implied premise (e.g., Anyone who favors a graduated income-tax is a socialist.)."

(Edward P.J. Corbett and Robert J. Connors, *Classical Rhetoric for the Modern Student*, 4th ed. Oxford University Press, 1999)

What's a Sorites?

While a Syllogism ONLY contains a MAJOR and a MINOR premise, and then a CONCLUSION, a **Sorites** is (in effect) an **EXTENDED SYLLOGISM**.

In logic, a *sorites* is a chain of categorical syllogisms or enthymemes in which the intermediate conclusions have been omitted. Also known as *chain argument or polysyllogism*.

Example:
All bloodhounds are dogs.
All dogs are mammals.
No fish are mammals.
Therefore, no fish are bloodhounds.

Omitted Intermediate Conclusion: All bloodhounds are mammals.

FALLACY CORNER

Logical Fallacies

Equivocation
Amphibology
Accent
Accident
Many Questions
False Cause
False Analogy
Tetralemma
Petitio Principii
Ignoratio Elenchi
Double Standard
Asserting the Consequent
Denying the Antecedent
Inconclusive Dilemma
Denial of One and All
Ungranted Premise
Unclear Theory or Term
Inappropriate Fixation
Composition and Division
Concept Doubting Percept
Non Sequitur

Logical Fallacy: Non Sequitur

Example:
Let P = God Exists.
Let Q = God's Existence can be Proved.

Inference Proposition R: P → Q.
But God's Existence hasn't been Proved (~Q).
Therefore ~P = God does not Exist.

However, P → Q has not itself been proven.
Therefore, Non-Sequitur.

Logical Fallacy: Non Sequitur

Essentially a final, catch-all fallacy. Latin: Does not Follow. This fallacy is so broad everything else can be considered a special case.

Committed when proposition P is purported to infer the truth of proposition Q, but then inferring that P is true when Q is true.

But Q could be True, even if P is False. Inference only works P → Q. Then P, therefore Q. Or ~Q, therefore ~P.

Logical Fallacy: Petitio Principii

Petitio Principii = Begging the Question

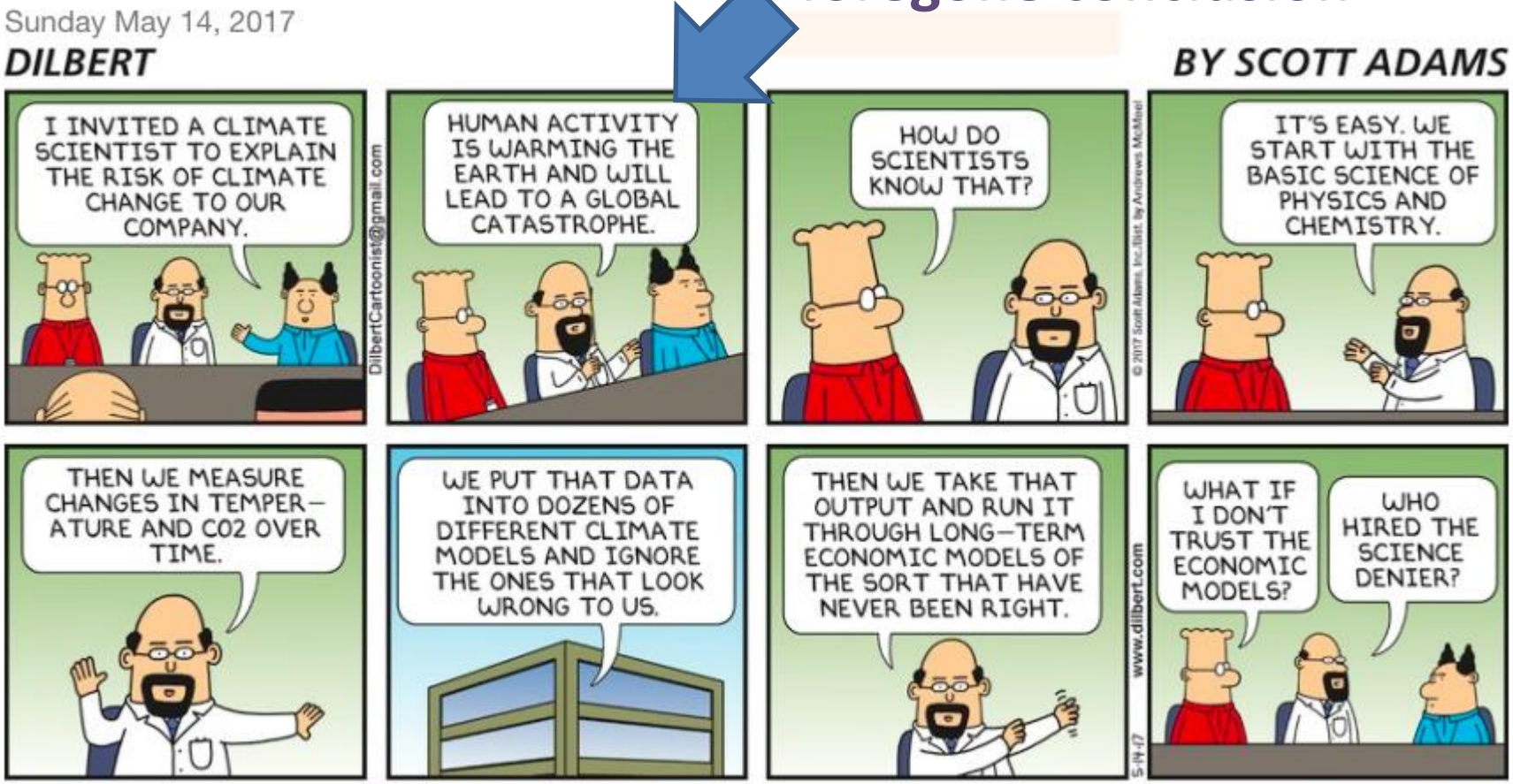
Assuming in an argument the proposition to be proven.

Example:
I ought not to do this act, because it is wrong.
How do you know it's wrong?
Because I shouldn't do it.

Petitio Principii Example

Global Warming is a Fact!

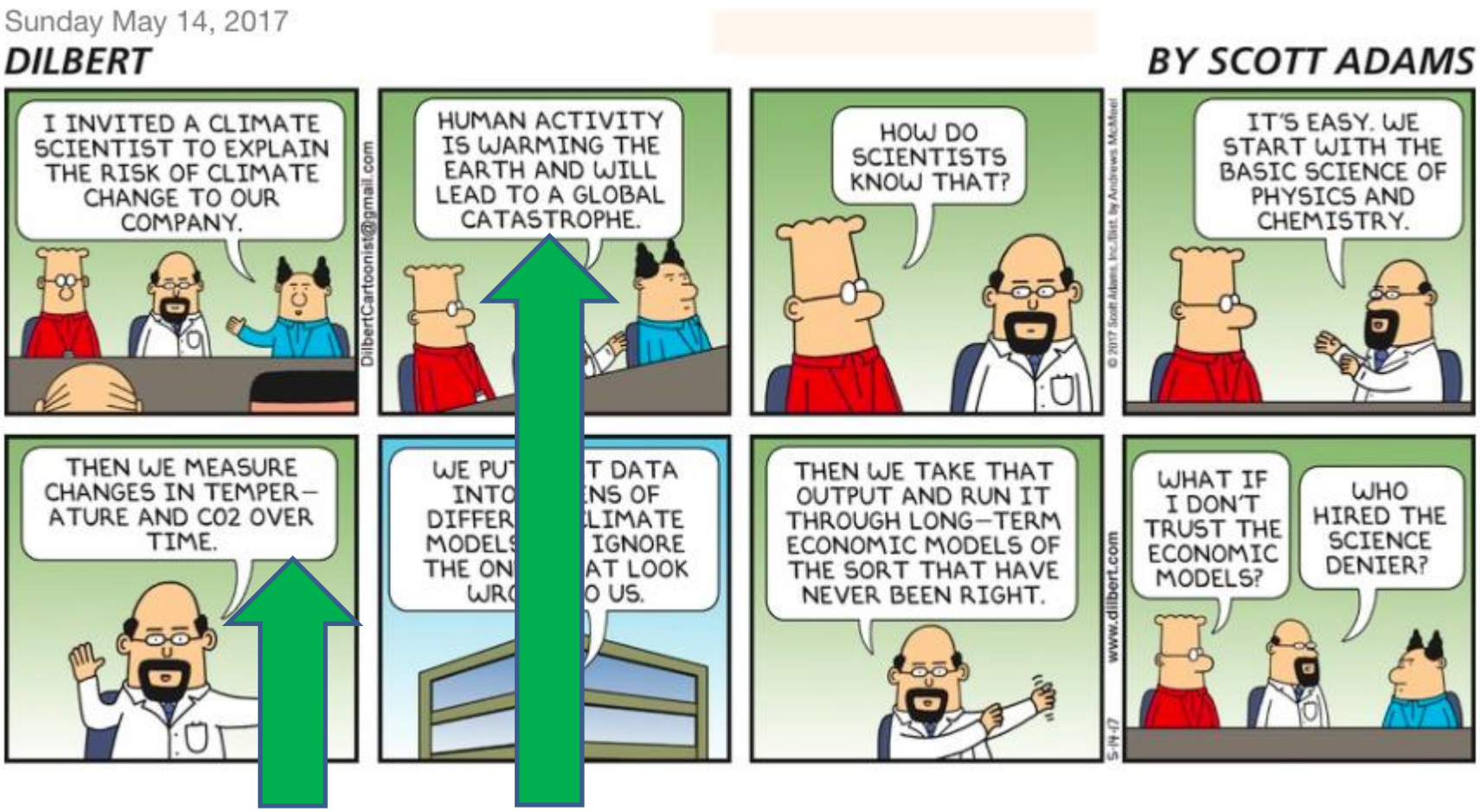
Mann begins with his foregone conclusion



Logical Fallacy: Ungranted Premise

Taking for Granted a Given Premise which is not generally accepted and/or which has not been adequately supported, or indeed which is generally NOT accepted or which has been convincingly refuted in the past.

Ungranted Premise Examples



Assumption 1: Correlation = Causation (False Cause)

Assumption 2: Proper data handling methods

Assumption 2: Mitigation Efforts will Fail

Logical Fallacy: Ignoratio Elenchi

Ignoratio Elenchi = Ignorance of the Subject

Attempting to Refute an Opponent's Argument by instead proving something totally irrelevant.

Example:
In a Jury Trial the true object is to prove or disprove the innocence or guilt of the accused. Instead, one or both lawyers attempt to destroy the reputation of the opposing lawyer.

Argumentum ad Hominem

Logical Fallacy: Ignoratio Elenchi

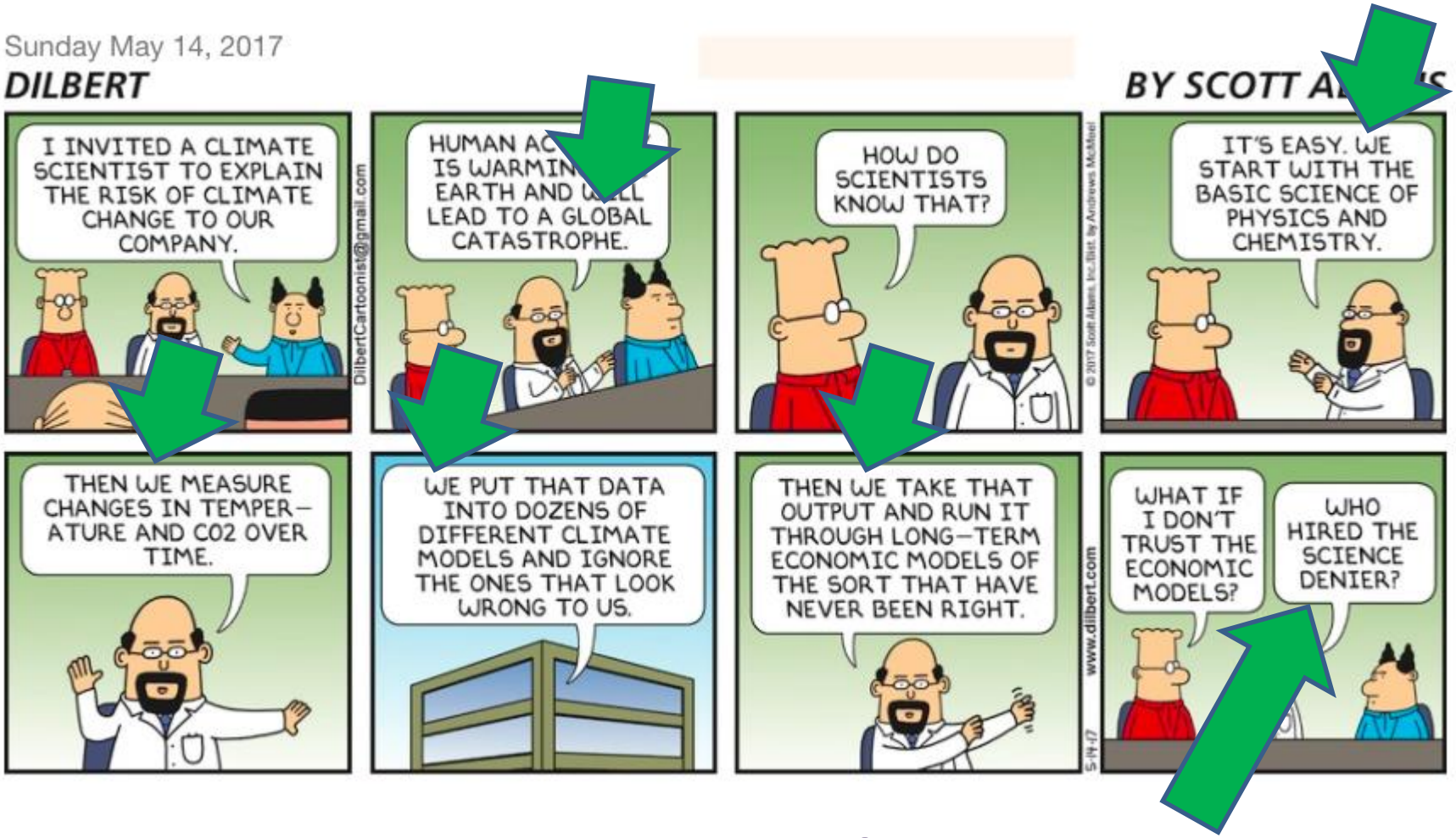
Ipse Dixit **= Appeal to Authority**

Often used as a Form of Proof. (Some hardly consider it a fallacy at all.)

Argumentum ad Misericordiam **= Emotional Appeal**

Wrapping oneself in the flag. Opposing views are Heretical, Unscientific, Un-American, Dangerous. (But don't actually refute the ideas.)

Ignoratio Elenchi Example



Ad Hominem Attacks on Dilbert/Scott Adams

Ipse Dixit: Appeals to Authority "We" (IPCC, 97%, etc.)

Misericordiam Emotional Appeal – Global Catastrophe

Logical Fallacy: False Cause

***Post Hoc Ergo Propter Hoc*: Attributing the Wrong Cause to an Event. (Event A preceded Event B, therefore it caused B to occur.)**

Latin: “After this, therefore because of this."

Anecdotal Evidence of an event happening ONCE due to a cause does not count as satisfactory proof that it happens that way all the time.

Logical Fallacy: False Cause

Examples:

The rooster crows immediately before sunrise; therefore the rooster causes the sun to rise.

Correlation does not imply Causation. Cargo Cult. Gambling "winning" numbers. Baseball superstitions.

CO-2 Levels have risen, therefore Every Weather Event is caused by Global Warming.

Logical Fallacy: False Analogy

Analogies are often used in science and elsewhere to help understand similar phenomena. BUT… Analogies cannot take the place of facts. Some analogies have been shown to be false.

Example: Using analogy to understand the atom based on the behavior of the solar system.

Example: Greenhouse Gases act in the same way that a Greenhouse works.

Logical Fallacy: Asserting the Consequent

A False Syllogism:

If P is True, then Q is True. **$P \rightarrow Q.$**

But, in fact, Q IS True. **Q**

Therefore P must be True. **$\therefore P.$**

But Inference only goes ONE WAY: **$P \rightarrow Q.$**

Knowing the Truth/Falsehood of Q says nothing about P.

Logical Fallacy: Asserting the Consequent

Example:

Premise 1: Bacon was a great writer if he wrote Shakespeare's plays.

Premise 2: But in fact, Sir Francis Bacon was one of the greatest writers of all time.

Conclusion: Therefore Bacon must have written Shakespeare's plays.

That is, IF Bacon wrote Shakespeare's plays, THEN Bacon was a great writer.

Asserting Consequent Example

If Humans Caused Climate Change (AGW) is occurring,
THEN Storms, Ice Melt, etc.
BUT *Storms, Ice Melt, etc.*
Therefore, AGW.

But *Anecdotal* or even Actual results DO NOT PROVE HUMAN-CAUSED CLIMATE CHANGE!

NOT A VALID ARGUMENT because Inference does NOT go backwards!

Why? Because MULTIPLE POTENTIAL CAUSES (Sun, Ocean Cycles, etc.) for CLIMATE CHANGE.

Logical Fallacy: Denying the Antecedent

Another False Syllogism:

If P is True, then Q is True. $P \rightarrow Q.$

But, in fact, P is False. $\sim P$

Therefore Q must be False. $\therefore \sim Q.$

But Inference only works when P is True.

The Principle of Contradiction and Interchange:

$P \rightarrow Q$ **allows us to write** $\sim Q \rightarrow \sim P.$

Equivalent to Asserting the Consequent.

Logical Fallacy: Denying the Antecedent

Example:

Premise 1: If we had better housing conditions, the poor people of our country would be happy.

Premise 2: But, as a matter of fact, we have the poorest housing conditions.

Conclusion: Hence, the poorer people cannot possibly be happy.

Logical Fallacy: Denying the Antecedent

Premise 1: If Climate Skeptics obtain their funding from only "Clean Sources," THEN we (the PC community) *might* accept their results.

1. If P, then Q.

Premise 2: But, as a matter of fact, Climate Skeptics obtain their funding from the *Evil Oil Companies*.

But…
2. not-P.

Conclusion: Therefore, their results can't possibly be any good.

Therefore,
3. not-Q.

Logical Fallacy: Double Standard

Being severe in the treatment of one's opponent's argument(s), while being lenient to one's own argument(s), although the two arguments are formally similar or have similar strengths and/or weaknesses.

Example:
Obamacare was passed without debate.
Replacement passing without debate.

Example: Double Standard

Climate Change Skeptics can't Publish in Open Literature because Climate Hockey Team actively patrols to keep Skeptics from publishing.

Hockey Team then uses the Talking Point: Skeptics don't publish.

When Skeptics do get published their papers get attacked, publisher gets attacked.

Example of Language Diagnosis

"I'm very concerned about Milo Yiannopoulos and Ann Coulter and some of these other right-wing speakers coming to the Berkeley campus, because it's just a target for black bloc to come out and commit mayhem on the Berkeley campus and have that potentially spill out on the street," Arreguin said in an interview with the San Francisco Chronicle.

"I obviously believe in freedom of speech, but there is a line between freedom of speech and then posing a risk to public safety," Arreguin continued. "That is where we have to really be very careful — that while protecting people's free-speech rights, we are not putting our citizens in a potentially dangerous situation and costing the city hundreds of thousands of dollars fixing the windows of businesses."

Berkeley Mayor Jesse Arreguin

The Facts

1. In February, a Milo talk was cancelled.
2. In April, a Coulter talk was cancelled.
3. Last Thursday, Sept 14, a talk by Ben Shapiro, a former Breitbart editor, went forward, with $600,000 in security by Berkeley police.
4. 9 protestors were arrested, 4 for possession of banned weapons (sticks, pipes, etc.). About 1,000 protested the speech.
5. More speeches by conservative activists are planned.
6. Leftwing activists routinely speak on campus with no problems.

What's the Mayor's Argument?

Let M = Milo Yiannopoulos or Ann Coulter or some of these other right-wing speakers come to speak at the Berkeley campus.

Let B = Black Bloc comes out and commits mayhem on the Berkeley campus and it spills out onto the street.

Let F = Mayor Arreguin believes in freedom of speech rights.

Let R = Actions that pose a risk to public safety.

Let W = Actions that cost the city of Berkeley hundreds of thousands of dollars fixing the Windows of businesses.

Let P = Protecting people's free-speech rights."

Here is his thesis:

1. If F, then P.
2. F.
3. If M, then B.
4. If B, then (R and W).
5. not-(R and W).

Let us see if this makes sense.

Antifa members (wearing Black Bloc) in front of Sproul Hall prior to Milo talk.

Milo talk is Cancelled at Last Minute.

First, 1 & 2 is seemingly a separate syllogism. Based on Modus Ponens, we must conclude:

6. P.

3. If M, then B.
4. If B, then (R and W).

Next, we can collapse 3 & 4 to conclude:
7. If M, then (R and W).

But then, using Modus Tollens, from 5 & 7, we obtain the conclusion that since not-(R and W) (5.), therefore,

8. not-M.

But M ***is*** a form of free speech. That is to say, M is in the class of free speech.

Therefore, we may add an element the mayor has seemingly omitted: If you say you're going to protect free speech, then you should be willing to protect M.

9. If P, then M.

But based on 1 & 9, (1. If F, then P.), we may collapse these two to produce,

10. If F, then M.

Thus, from 8 (not-M) & 10, we see that,

11. not-F. (The mayor actually doesn't believe in free speech.)

Based on the mayor's argument, either not-M, and therefore not-(R and W) and not-F. Or, M, and therefore R and W and F.

But the mayor seems to believe that he can maintain his belief in free speech (F), while keeping Milo and/or Ann Coulter from speaking, violating their free speech rights (not-M), and not protecting free speech (not-P), because otherwise Black Bloc will run rampant throughout the city (R and W). This appears to violate premise 1. F → P.

What the mayor seems to be ignoring is that, as mayor, he has the responsibility to maintain law and order:

12. If P, then not-(R and W).

That is, mayor Arreguin thinks that Milo and Ann do not deserve protection, and Black Bloc thugs cannot be stopped.

The “solution” here would appear to be that definition B needs to be broken down into two elements:

Let B = Black Bloc comes out on the Berkeley campus and their presence spills out onto the streets of the city of Berkeley.

Let C = Black Bloc Commits Mayhem on campus and in the city.

Let us then replace premise 4. with the following:

13. If (B and not-P), then C.
14. If C, then (R and W).

In a sense I am here expanding the definition of P from merely protecting free speech rights to also include the mayor's job protect property rights as well.

We might as well also consider the rights of the students who invited Milo and Coulter to the UC-Berkeley campus to be allowed to hear what these speakers have to say.

But if the mayor believes that If M, then (R and W), then from
3. If M, then B. and 13. If (B and not-P), then C. and
14. If C, then (R and W); therefore not-P, and therefore not-F.

That is, lack of protection is the sole reason why the mayor could believe that M will lead to (R and W).

And perhaps this goes deeper. For if the Black Bloc thugs of Antifa, etc., left-wing extremists, knew that any time they arrived to riot and create chaos that they would be immediately arrested, then perhaps,

15. If P, then not-B.

And, by the Principle of Contradiction and Interchange, therefore,

16. If B, then not-P.

Then cases, 3., 13., and 14. collapse to

17. If (M and P), then not-(R and W).
18. If (M and not-P), then (R and W).

Ultimately, this goes back
to the mayor himself, for
from 1., 2., 9., 10., and 17.,

19. If F, then (P and M and
not-(R and W)).

But, in fact, not-M,
therefore, not-F, by Modus Tollens.

Image from Breitbart story: **Berkeley Mayor Apologizes, Retracts Claim that MILO is a 'White Nationalist' … And Replaces It With A New Lie**

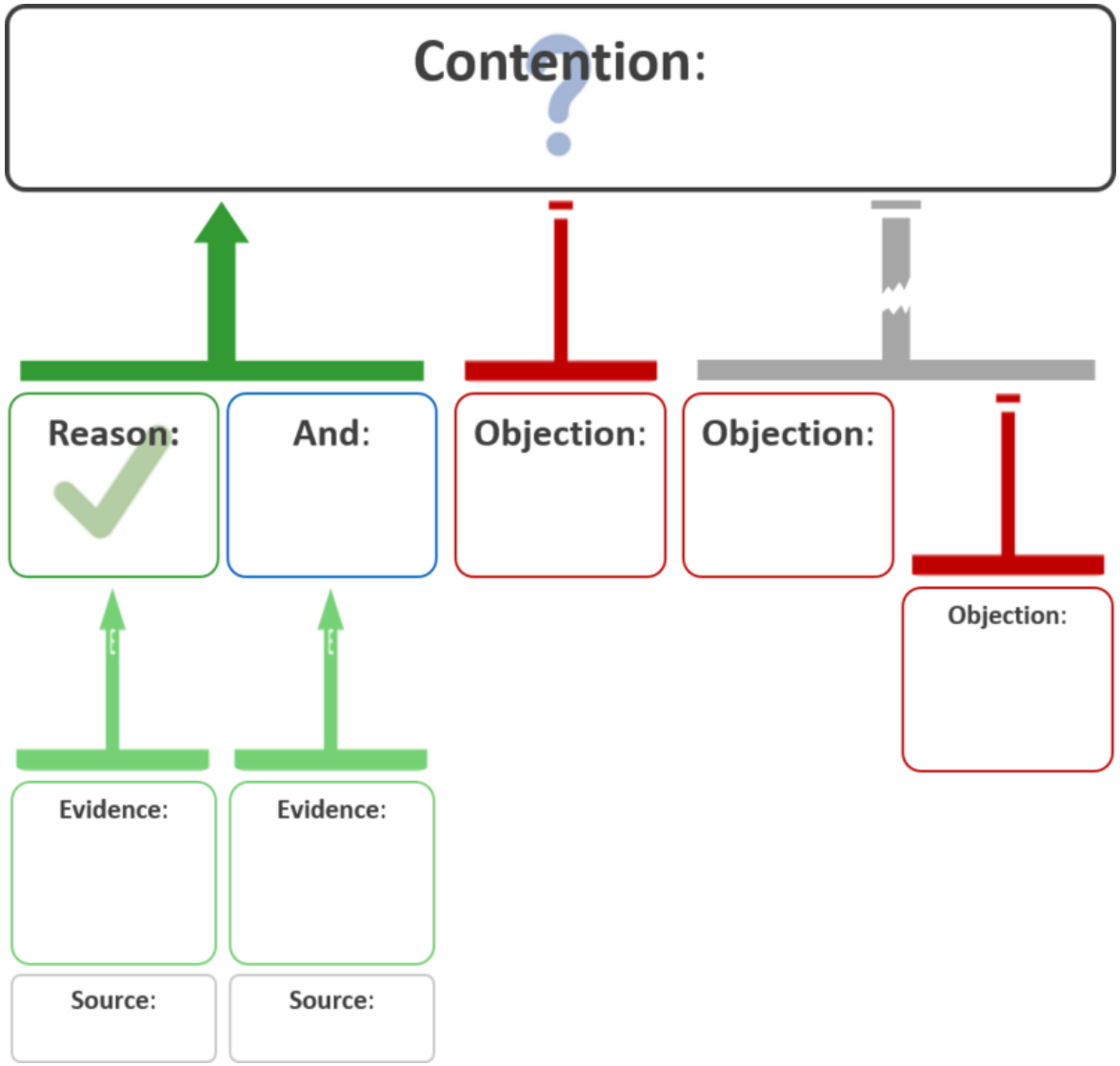
This is, of course, not the conclusion
the mayor wished us to draw, but it
seems to be reasonable, and is consistent with his actions and
other related comments and positions..

How to Argue: Argument Maps

What needs to be proved?

Shown?

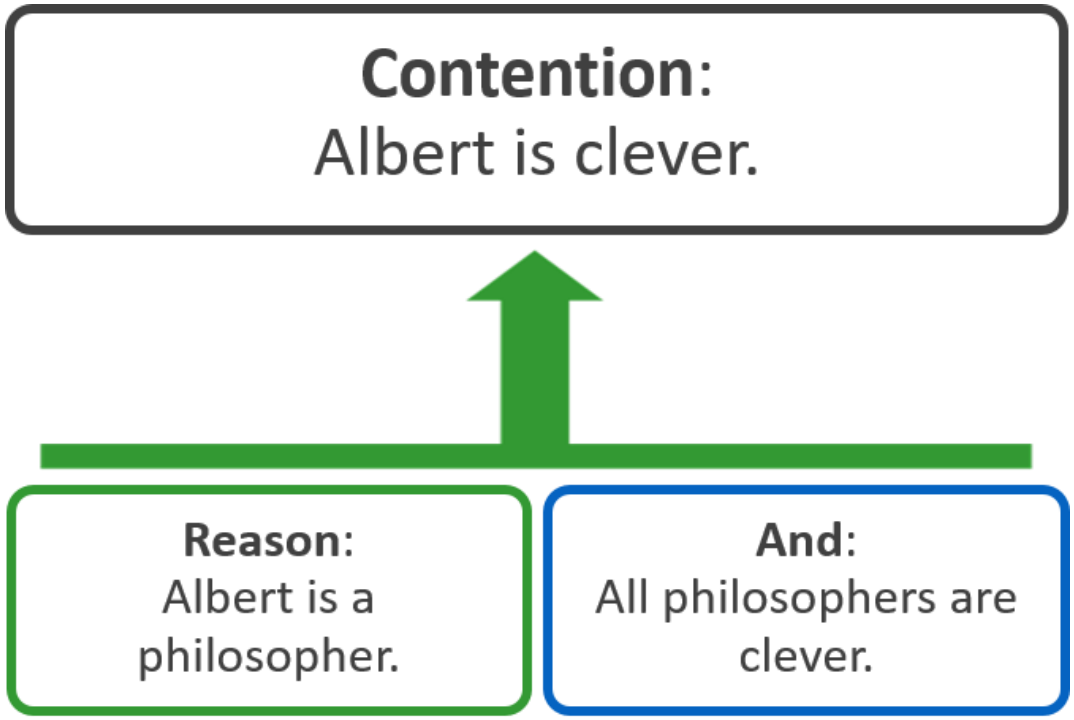
Argued?



Information and Data

Construct Basic Lemmas

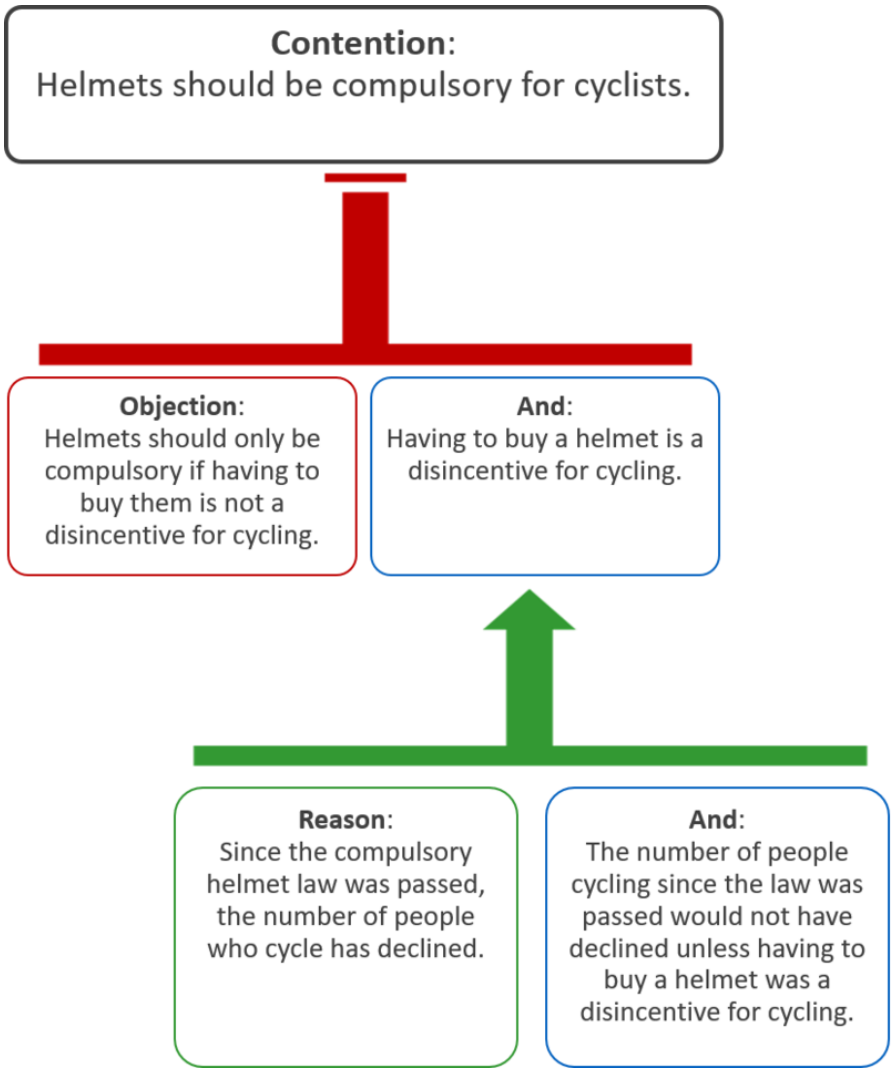
To support your main contention construct building blocks to the main proof.



Information and Basic Points

Address Counter-Arguments

Outline substance of Objections and develop Counter-Arguments.



Arguments against Arguments

Reductio Ad Absurdum: *Reduction to Absurdity*
A way of disproving an Argument (Invalid).

Given a *Modus Ponens* Type Argument:

1. If P is true, then Q is true.
2. But P is true.
3. Therefore (conclusion) Q is true.

Method involves asserting Q is false, but P is true, then showing that Premise 1 is false.

Reduction to Absurdity

Example: In a location where there is a sign saying not to pick the flowers a small child says to his mother, "It's just one flower.“

The mother responds, "Yes, but if everyone who came by picked just one flower, there would be none left.“

Translation of Child’s Argument:

Let P = It is permissable to pick a flower from a flower garden even if there is a sign not to do so, as long as only one flower is picked.

Let Q = No harm will come to the flower garden.

If P, then Q; P; Therefore, Q.

The Child’s argument assumed only 1 lawbreaker picking a single flower. The Mother assumed multiple lawbreakers.