I.   LOGIC AND ARGUMENTATION[1]

A. LOGIC

1. To arrive at the truth we have to reason correctly.

2. Logic is the study of correct reasoning.

3. It doesn't attempt to determine how people in fact reason.

4. Rather it attempts to determine how people should reason if they want to avoid error and falsehood.

B. DEDUCTIVE AND INDUCTIVE ARGUMENTS

1. **Arguments come in two basic varieties: deductive and inductive.**

   a. **Good deductive arguments** are valid; the truth of the premises guarantees the truth of the conclusion.

   b. **Good inductive arguments** are not valid; the truth of the premises, at best, only makes the conclusion possible.

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[1] From Schick, Theodore, Jr. and Vaughn, Lewis, Doing Philosophy: An Introduction through Thought Experiments, 2nd ed. (New York: McGraw Hill, 2003), Ch. 2.

C. **DEDUCTIVE ARGUMENTS**

1. If the premises are true, the conclusion must be true.

2. "A deductive argument intends to show that its conclusion is true beyond the possibility of doubt" (S, 13).

3. **Validity** – "A valid argument is one whose conclusion must be true if the premises are true" (S, 13).

4. "Validity is purely a matter of the argument's form, which means that the truth or falsity of the premises don't affect the argument's validity" (S, 13).

5. **Soundness** – and argument is sound if it is a valid argument and the premises are true.

6. "Deductive arguments can be either truth-functional or categorical" (S, 14).

7. **Example of a valid argument that is unsound**

   P1: If it is cloudy, it is raining
   P2: It is cloudy_____
   C: Therefore, it is raining

8. **Valid Arguments**

   a. Some valid argument forms:

      1. Affirming the antecedent

      2. Denying the consequent

      3. Hypothetical syllogism

      4. Disjunctive syllogism

      5. Valid arguments with true premises are sound

9. **Valid truth-functional inferences:**

Affirming the Antecedent (*Modes Ponens*):

$p \rightarrow q$
$\underline{p \qquad}$
q

Example 1:

P1: If Iraq as WMD (p), then Iraq is a threat (q).

P2: Iraq has WMD (p).

_____

C: Therefore, Iraq is a threat (q).

Example 2:

P1: If the soul is immortal (p), then thinking doesn't depend on brain activity (q).

P2: The soul is immortal (p).

_____

C: Therefore, thinking doesn't depend on brain activity (q).

Are the above arguments sound?

Example 3:

P1: If it rains, it is cloudy (r→c)

P2: It rains (r).

_____

Therefore, it is cloudy.

Example 4: Products on Sale

P1: If a product goes on sale, we should go buy it. (ps→b)

P2: Macy's is having a sale on all of its products. (ps   )

_____

  C: Therefore, I should go buy products at Macy's. (b   )

Denying the Consequent (*Modes Tolens*):

$$p \rightarrow q$$
$$\underline{\sim q}$$
$$\sim p$$

Example 1:

P1: If Iraq has WMD, Iraq is a threat.

P2: Iraq is not a threat.

———————————————————————

C: Therefore, Iraq does not have WMD.

Example 2:

P1: If the soul is immortal (p), then thinking doesn't depend on brain activity (q).

P2: Thinking depends on brain activity (not q).

———————————————————————————————————

C: Therefore, the soul is not immortal (q).

Hypothetical syllogism:

p → q
q → r
p → r

Example 1:

P1: If the Federal Reserve Board raises interest rates (p), it will be more difficult to borrow money (q)

P2: If it's more difficult to borrow money (q), home sales will fall (r).

_____

C: Therefore, if the Federal Reserve Board raises interest rates (p), home sales will fall (r).

Example 2: The Desire for Money

P1: The desire for money (dm) causes suffering (s). (dm→s)

P2: Having a girlfriend (g) leads to the desire for money (dm). (g→dm)

_____

C: Therefore, having a girlfriend (g) causes suffering (s). (g→s)

Example 3: Listening to Authority

P1: Authority figures often know what is best for us. (A→B)

P2: Those who know what is best for us should be obeyed. (B→O)

P3: The government is an authoritative institution. (G→A)

_____

C: Therefore, the government should be obeyed. (G→O)

Example 4: Finding Meaning in Others

P1: Meaning can be found in the lives of other people. (M→ OP)

P2: The lives of other people can be seen on television sitcoms. (OP → TV)

_____

 C: Therefore, we should seek meaning through watching television sitcoms. (M → TV)

Example 5: Driving a Mercedes and eating at Jack-in-the-Box

P1: Owning a Mercedes implies belonging to a higher class. (M→HC)

P2: Belonging to a higher class means you are too sophisticated to eat at fast food restaurants such as Jack-in-the-box. ((HC→S)→ not F)

_____

C: Therefore, if you drive a Mercedes, you should not eat at Jack-in-the-Box. (M→ not F)

Example 6: Sacrificing for the Family

P1: If Family is considered to be important and valuable, we should sacrifice our needs to that of the family.

P2: Smith regards his family as important and valuable.

_____

 C: Therefore, Smith should sacrifice his needs to that of his family.

Example 7: Sacrificing for a Loved One

P1: If you love someone, you should sacrifice everything for him/her. (L→S)

P2: Jack loves Jane. (J→L)

_____

 C: Therefore, Jack should sacrifice everything for Jane, including his life passions. (L→S)

Disjunctive syllogism:

p ∨ q
~p_____
q

Example:

Either Sally walked (p) or rode the bus (q)
She didn't walk (not p)._____
So, she rode the bus (q).

10. Valid categorical inference patterns:

All As are Bs
All Bs are Cs
Alls As are Cs

All As are Bs
No Bs are Cs
No As are Cs

Some As are Bs
All Bs are Cs__
Some As are Cs

No As are Bs
All Cs are Bs
No As are Cs

11. **Formal deductive fallacies**: "Unlike valid arguments, the premises of these fallacies can be true while the conclusion false" (S, 20).

Affirming the consequent:

$p \rightarrow q$
$\underline{q}$
p

Example 1:

P1: If Iraq has WMD, Iraq is a threat.

P2: Iraq is a threat.

_____

C: Therefore, Iraq has WMD.

Invalid because there could be other reasons for Iraq being a threat, not only if it possesses WMD.

Example 2:

P1: If Chicago is the capital of Illinois (p), then Chicago is in Illinois (q).

P2: Chicago is in Illinois (q)

_____

C: Therefore, Chicago is the capital of Illinois (p).

Invalid because the conclusion is false. The capital of Illinois is Springfield.

Example 3:

P1: If Dave sings to Susan on Valentine's Day, he is a romantic and sweet guy.

P2: Dave is a romantic and sweet guy.

_____

C: Dave sings to Susan on Valentine's Day.

Denying the antecedent:

$p \rightarrow q$
$\sim p$
$\sim q$

Example 1:

P1: If Iraq has WMD, Iraq is a threat.

P2: Iraq does not have WMD.

C: Therefore, Iraq is not a threat.

Invalid because even if Iraq does not have WMD, there could be other reasons for it to be a threat.

Example 2:

P1: If Joe is a bachelor (p), then Joe is male (q).

P2: Joe is not a bachelor (not p).

C: Therefore, Joe is not a male (not q).

Invalid because the conclusion is false. A bachelor by definition is an unmarried, adult male.

D. INDUCTIVE ARGUMENTS

1. An **inductive argument** that would establish its conclusion with a high degree of probability (if its premises were true) is a strong argument.

2. A **strong inductive argument** with true premises is a cogent argument.

3. **Some potentially cogent** inductive argument forms:

    a. Enumerative Induction: "Generalization about a group of things after observing only some members of that group" (25).

    b. Analogical Induction: The analogy between one similar thing with another.

    c. Hypothetical Induction (inference to the best explanation).

4. Examples

Example 1: Gondorf Studying for an Exam

P1: Every time Gondorf spends at least one hour studying for his math exam, he passes with a score of at least 90%.

P2: Gondorf spent one hour studying last night for today's math exam.
_____

  C: Therefore, Gondord will likely achieve at least a 90% on the exam.

Example 2: The Best-Explanation Design Argument (419)

P1: The universe exhibits apparent design.

P2: The best explanation of this apparent design is that it was designed by a supernatural being.
_____

C: Therefore it's probably that the universe was designed by a supernatural being, namely, God.

E. CRITERIA OF ADEQUACY

1. Criteria of adequacy are used to identify the best explanations.

2. The goodness of an explanation is determined by:

   a. The amount of understanding it produces

   b. The amount of understanding produced by an explanation is determined by how well it systematizes and unifies our knowledge.

   c. The extent to which a hypothesis systematizes and unifies our knowledge is measured by various criteria of adequacy such as:

      1. **Consistency**, both internal and external

      2. **Simplicity**: The number of assumptions made by a hypothesis

      3. **Scope**: The amount of diverse phenomena explained by the hypothesis

      4. **Conservatism**: How well the hypothesis fits with what we already know

      5. **Fruitfulness**: the ability of a hypothesis to successfully predict novel phenomena.

F. **FALLACIOUS ARGUMENTS**

1. An argument is fallacious if it contains

    a. Unacceptable premise
    b. Irrelevant premises
    c. Insufficient premises

2. Fallacies characterized by unacceptable premises include:

    a. **Begging the question**: circular argument

        Example:

        "Jane has telepathy," says Susan
        "How do you know?" asks Jill.
        "Because she can read my mind," replies Susan.

    b. **False dilemma**: presumes that there are only two alternatives when in fact there are more.

        Example:

        "You are either with us or you are against us in the fight against terror."

        President Bush November 6, 2001 news conference

        *Note as well, that this statement equivocates with 'You' and 'us'. Is Bush using 'us' to mean 'Bush's Administration', "The United States", or something else?

3. Fallacies characterized by irrelevant premises include:

    a. **Equivocation**: when a word is used in two different senses

            All elephants are mammals
            This elephant is small_____
            Therefore, this elephant is a small mammal

    b. **Composition**: an argument that claims that what is true of the parts is true of the whole.

        Example:

        Every part in this car was designed well.
        So the car is designed well.

c. **Division: an argument that claims that what is true of the whole is true of the parts.**

   Example:

   This is the best football team.
   So, each player is the best at his position

d. ==**Attack on the person the person;** *ad hominum*==

   Examples:

   Kant wrote degrading comments about women.
   Feminists should not study Kant.

   George W. Bush graduate from Yale with a 2.0 GPA. People who graduate with a 2.0 GPA are dumb. Therefore, his policy on the Iraq war is dumb.

e. **Genetic fallacy:** to argue that a claim is true or fasts based on its origin.

f. ==**Appeal to authority**==

   Example:

   "Nothing will benefit human health and increase chances of survival for life on earth as much as the evolution to a vegetarian diet."

   Albert Einstein, physicist, Nobel Prize 1921

   Q: Because Einstein was a Nobel Prize-winning physicist, does it follow that he's knowledgeable about human health?

g. ==**Appeal to the masses**==

h. ==**Appeal to tradition**==

i. ==**Appeal to ignorance**==

   Example:

   No one has proven that aliens do not exist
   It must be reasonable to assume that they do.

j. ==**Appeal to fear**==

4. **Fallacies characterized by insufficient premises include:**

   a. **<mark>Hasty generalization</mark>**

   b. **Faulty analogy**

   c. **<mark>False cause;</mark>** *post hoc, ergo propter hoc* (**"After this, therefore because of this"**)

Appendix I

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│                         │
│  P1: Iraq has WMD       │
│                         │
└─────────────────────────┘


┌─────────────────────────┐                    ┌─────────────────────────┐
│                         │                    │                         │
│  P2:                    │ ──────────────▶    │  C: Iraq is a threat    │
│                         │                    │                         │
└─────────────────────────┘                    └─────────────────────────┘


┌─────────────────────────┐
│                         │
│  P3:                    │
│                         │
└─────────────────────────┘
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