

Chapter 1. What is Science

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 - The **production of public knowledge** (产生公共的知识);
 - The **examination of solvable problems** (验证可以解决的问题).

Galileo and Telescope



Moons around Jupiter

There are seven windows in the head, two nostrils, two ears, two eyes and a mouth; so in the heavens there are two favorable stars, two unpropitious, two luminaries, and Mercury alone undecided and indifferent. From which and many other similar phenomena of nature such as the seven metals, etc., which it were tedious to enumerate, we gather that the number of planets is necessarily seven.... Besides, the Jews and other ancient nations, as well as modern Europeans, have adopted the division of the week into seven days, and have named them from the seven planets; now if we increase the number of planets, this whole system falls to the ground. . . . Moreover, the satellites are invisible to the naked eye and therefore can have no influence on the earth and therefore would be useless and therefore do not exist. (Holton & Roller, 1958, p. 160)

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- Scientific observations are usually **theory driven**; they test different explanations of the nature of the world.
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- Replication ensures that a particular finding is not due simply to the errors or biases of a particular investigator.

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- This process is possible only if previous knowledge is stated in such a way that any investigator can use it to build on.

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- **Publicly verifiable knowledge** means findings presented to the scientific community in such a way that they can be replicated, criticized, or extended by anyone in the community.

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- The peer review process is far from perfect, but it is really the only consumer protection that we have.

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- Will three-year-old children given structured language stimulation during day care be ready for reading instruction at an earlier age than children not given such extra stimulation?

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- This criterion of testability is often called the **falsifiability criterion**.

Thomas Jefferson



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- Part of the **creativity** involved in science is finding the problem on the farthest edge of the frontier of human knowledge that will yield to empirical techniques.
- Science is a process that **turns mysteries into problems**.
- In the case of **problems**, we know that an answer is possible and what that answer might look like even though we might not actually have the answer yet.
- In the case of **mysteries**, we can't even conceive of what an answer might look like.

Questions?