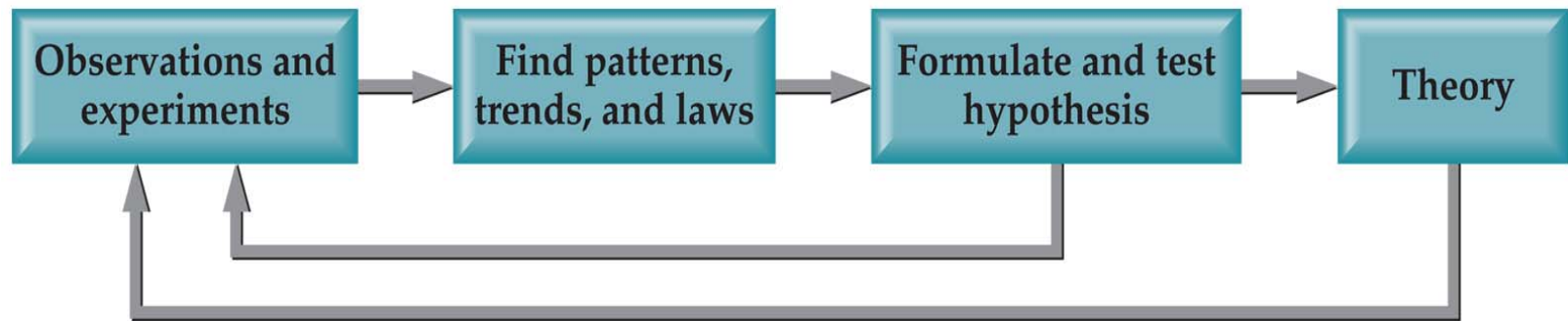


The Inquiry Wheel

Designing Inquiry- Based Science Fair Projects

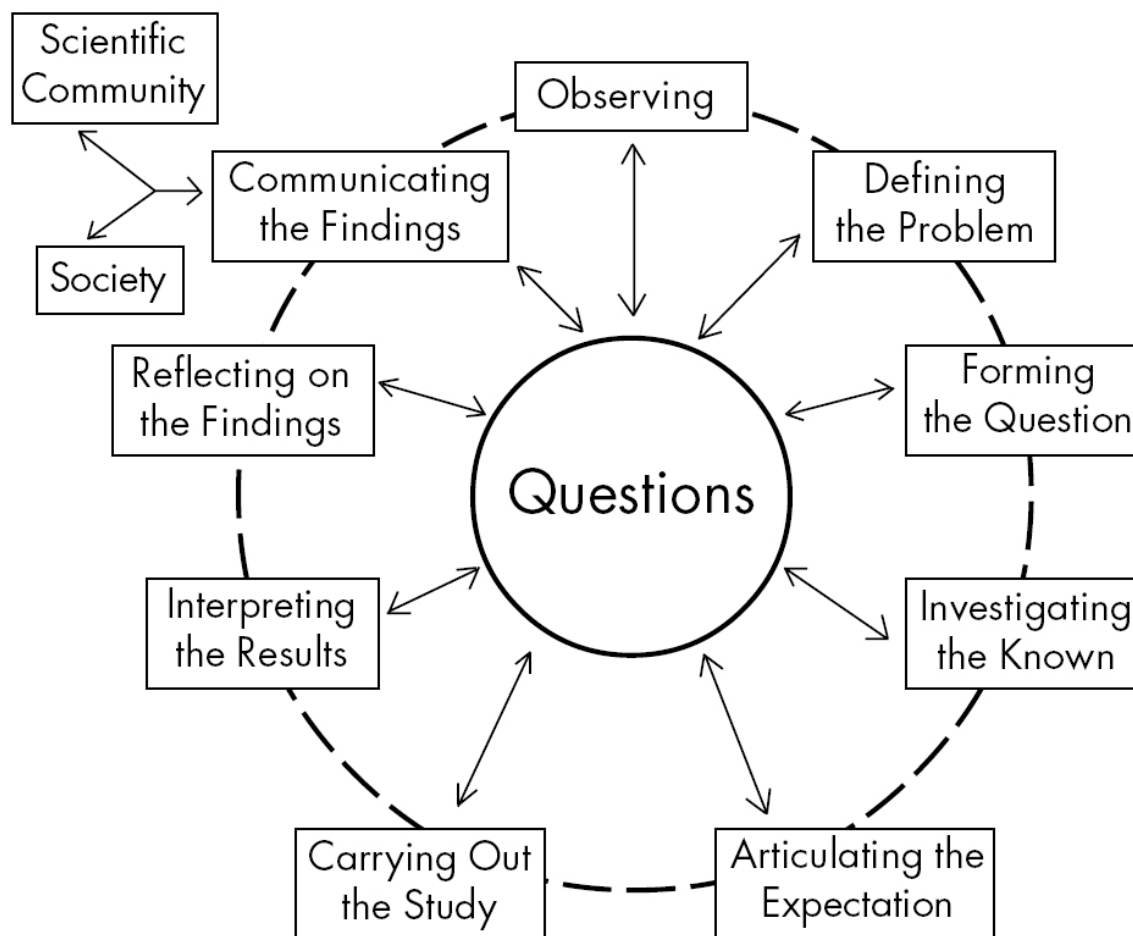
Robert J. LeSuer
Assistant Professor of Chemistry
Chicago State University
October 1, 2005

Scientific Method



- Science isn't linear.
- Good science doesn't always lead to a theory.
- Communication key aspect of science.

Scientific Inquiry – The Wheel



Observing

EVERYDAY OBSERVATIONS

(literature, walking through the park, cooking)

lichen growing
on trees
in Chicago

colors in black
magic
markers

hardening
of
egg yolks



Defining the Problem

THINKING WITH BROAD STROKES

lichen biology,
ecology,
environmental
factors

properties of inks, ink
formulations,
separation science

cooking science, social science,
interface of biology and chemistry
proteins and biochemistry



Forming the Question

Asking a question that can be answered
Sometimes harder than it seems!

What influences
the growth
of lichen
on trees?

Can the ink
of a black marker
be separated?

What happens when an egg is
cooked? Can the physical properties
be controlled? Do they influence
taste? Can they be measured by a
scientist?



Investigating the Known

MOVING FROM CERTAINTY TO UNCERTAINTY
makes a great science project

lichen growth dependent on:
rain and sunshine
pollution
disturbances
(lichen expertise in Chicago)

black inks contain
multiple colors
common chemistry demonstration

albumin proteins in egg white
protein structure and denaturation



Articulating the Expectation

AIMING FOR A RESULT HELPS TO FOCUS THE SCIENCE
(hypothesis)

Lichen will grow on the
sunniest side of the
tree.

The red component in a
black marker is the same
as that in a red marker.

Egg protein hardening
influences taste of
product



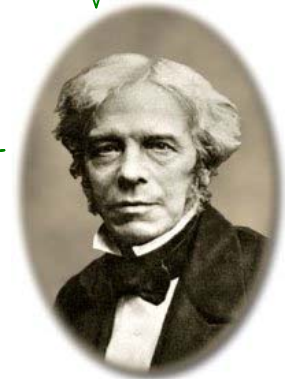
Carrying out the Study

COLLECTING DATA
(not where science begins!)

measure lichen density on trees, noting where on tree the lichen grows and estimate sun exposure

determine optimal conditions for paper chromatography or other separation

correlate cooking time with egg white hardness; perform taste test



Interpreting the Results

WHAT DO THE DATA SAY?

Are procedures sound?

Does literature support results?

Do others have constructive
comments on results?



Reflecting on the Findings

WHAT DO THE DATA MEAN?

What's the big picture?

Application to other
questions?

Significance of findings?



Communicating the Findings

Why do science if you don't tell others about it?

Who should know about your work?

Scientific community

General public

Communication happens throughout an investigation
(I've been speaking to you all along, haven't I?)



The Inquiry Wheel

- Fueled by Questions
- Sparked by Investigations
- Questions are the Core of Inquiry
- Scientific Inquiry
 - Process is discipline-free
 - Implementation is discipline specific



Thank You!

