

Research Project Course

Lecture 1: Research Terminology

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Tentative Syllabus

- **Week 1:** Research terminology
- **Week 2:** Experimental Design
- **Week 3:** How to do statistics for your research?
- **Week 4:** How to write your research project? Part 1
- **Week 5:** How to write your research project? Part 2
- **Week 6:** How to use EndNote to manage references

EXAM: You must prepare a write-up on your own research project. Note you should use ALL Course Materials to write your research

How do you conduct and write your research project?

Grading system

• Research Project course	10%
- Assignments	
• Preliminary Oral Presentation	20%
• Mentor	10%
• Final Oral Presentation	40%
• Mentor	20%
Total grade	100%

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What is research?

- Research is a process of searching for an answer for a specific question through a systematic analysis.
- The results of research lead to new findings which eventually would enhance our understanding in a specific topic.
- Research is indispensable in economical, social and political progress.

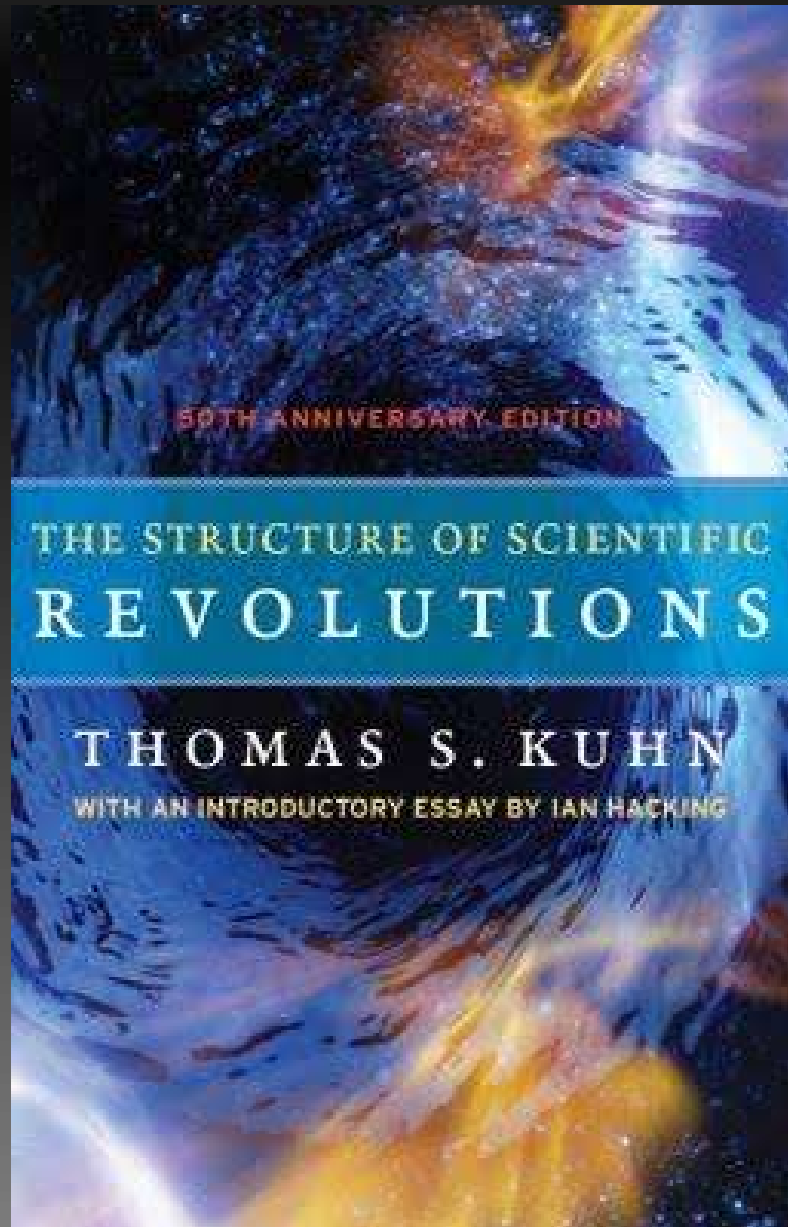
What are the aims of Research?

- to discover new knowledge
- to investigate a phenomenon to identify the cause-effect relationship
- to develop new scientific tools
- to find solutions to scientific problems
- to solve problems that we encounter in our life

What motivates you to do research?

- To fulfil a requirement for a degree
- To solve a biological problem
- Curiosity for finding new things
- To get recognition

Research and progress in science



Research and progress in science

- **Thomas Kuhn's (1922-1996) Theory of Scientific Revolutions**
- **History of Science**
- **Paradigm:** is a widely accepted approach to solving scientific problems in a specific field of science.
- **Puzzle-solving:** Daily activity of researchers, trying to solve problems that are thought to have solutions.
- **Anomaly:** when a puzzle cannot be solved.
- **Crisis:** search for new methods and approaches which lead to scientific revolution.
- **Paradigm shift:** old paradigm replaced by new paradigm.

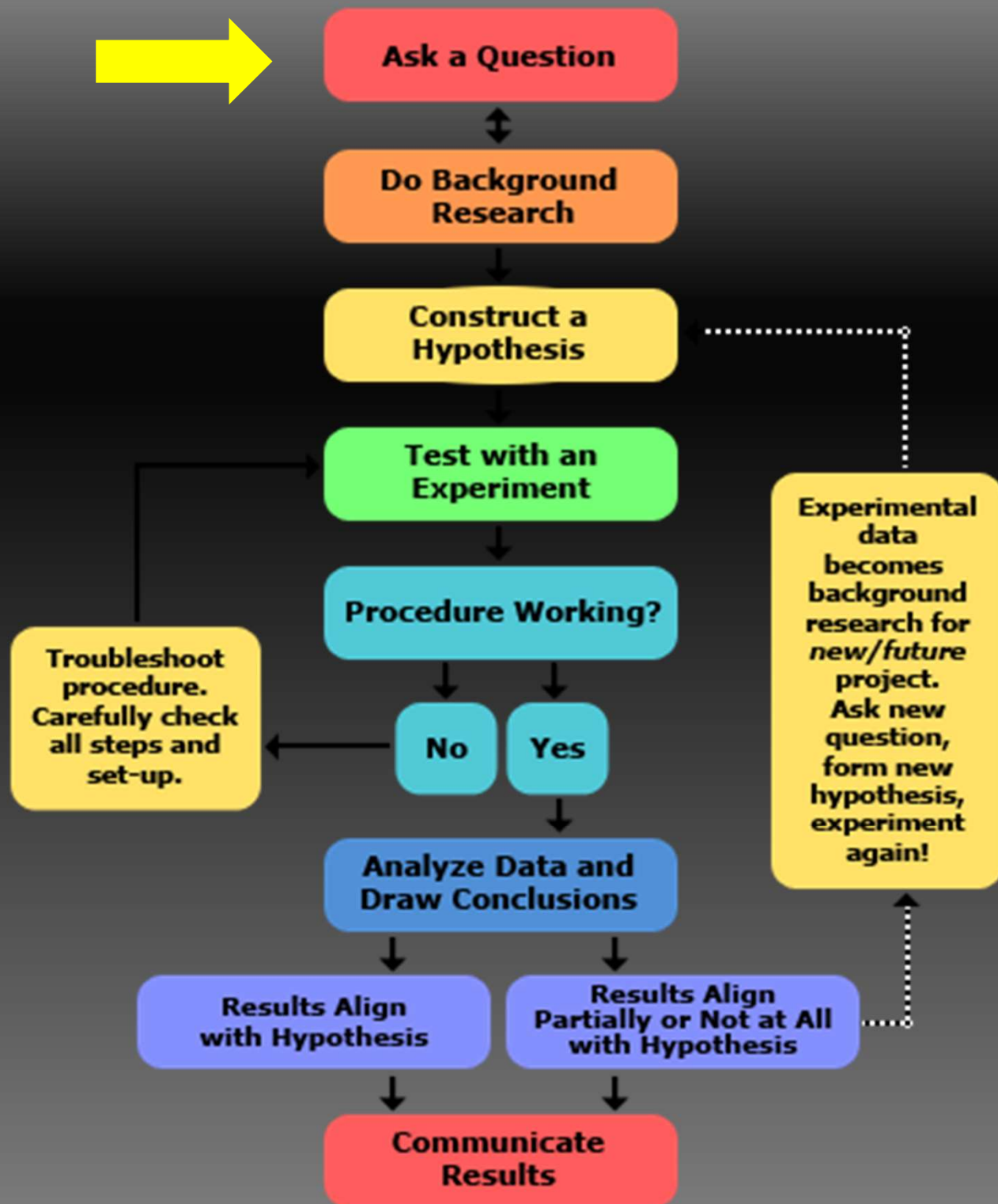
Research Requirements

- Space-Lab
- Funding-Money
- Tools and equipment
- Idea
- Literature Review
- Knowledge – data collection – how to use tools and equipment.
- Writing skills

Scientific Research Method

Observation





Basic Research Protocol Checklist

- Project title?
- Problem and goal: the what and why of the project. What is the hypothesis?
- Background: what is now known? Give references to published work.
- The setup: the how of the project.
- Design: how will observations be collected?
- The size of the study.
- Material: what will be included in the study (data from medical registries, human subjects, experimental animals, organ preparations, cell cultures, subcellular systems, chemicals)?
- Variables: what will be measured—and when?

Basic Research Protocol Checklist

- Analysis: how will data be analyzed? Statistical methods?
 - Presentation of results: scientific journal or report or perhaps also a popular press article? Order of authors' names?
 - Financing and administration: who is paying; who is responsible for what; what are the deadlines?
 - Time plan: when will the project finish?
- If a funding proposal is involved, this list might be supplemented with:
- Why should the project be conducted; why it is important?
 - Indication of expertise: are all procedures to be used routine in the primary group or co-operating groups, or do you intend to devote time and resources to establishing special procedures?

General Terminology in Research

- **Hypothesis:** an idea that has not been proven
- **Experiment:** a scientific test in which you perform a series of actions and carefully observe their effects to learn about something. (used to test the validity of hypothesis)
- **Treatment:** is a process of changing something.

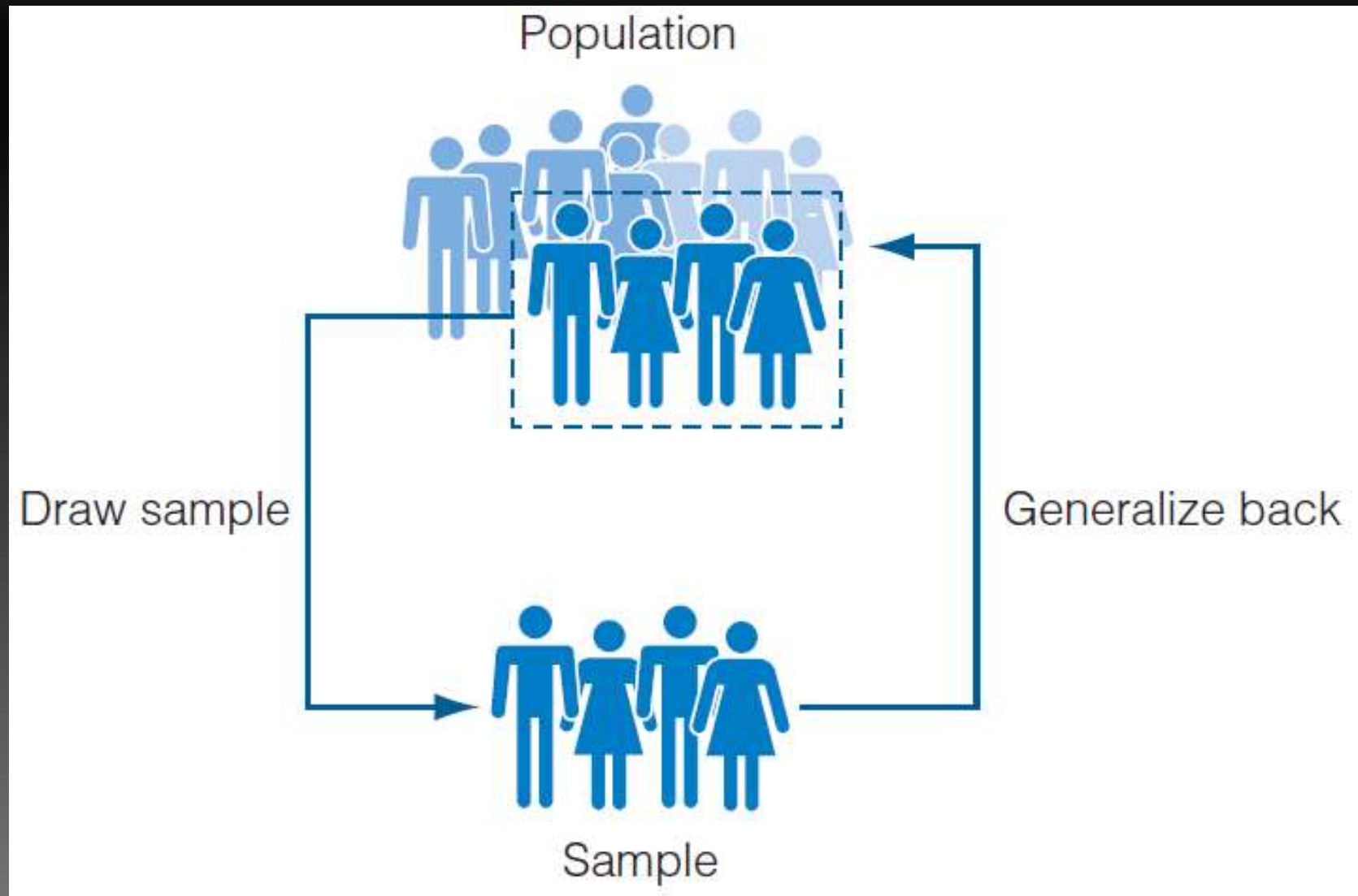
General Terminology in Research

- **Factor:** experimental variables, controllable conditions (light, temperature).
- **Experimental error:** variability due to the techniques or handling.
- **Replication:** repeating an experiment or procedure more than once. (repetition)
- **Randomization:** arrangement of treatments to experiments in a random way.

General Terminology in Research

- **Sample:** number of repetitions that represents the population.
- **Sample size:** total number of samples used in an experiment.
- **Reproducibility:** to cause something to happen again in the same way.
- **Ethics:** rules that determine acceptable and unacceptable things in research.
- **Plagiarism:** to claim other people's work to be your own.

General Terminology in Research



General Terminology in Research

- **Types of variables**
- **Independent variables:** are changed in the experiment.
- **Dependent variables:** are affected by independent variables.
- **Control variables:** should not be changed.

Research in **MEDICAL AND BIOLOGICAL SCIENCES**

From Planning and Preparation
to Grant Application and Publication

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Questions?