Welcome to Bio 1030

Biology Today

Text: Essential Biology

Syllabus: Circulating

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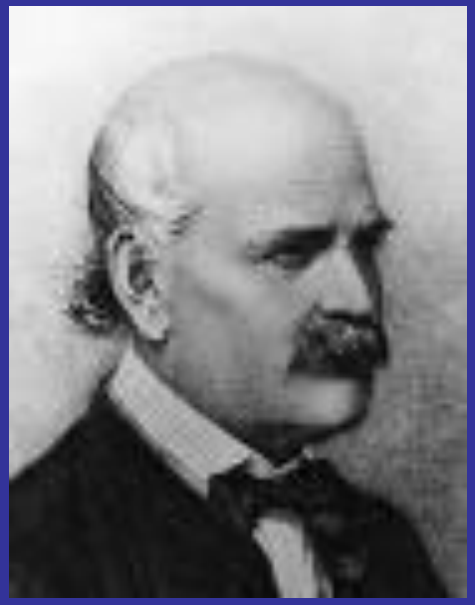
Lecture 1: Nature of Scientific Inquiry

Assigned Reading: Carl G. Hempel: Scientific Inquiry (to be posted)

First, need to meet our main protagonist

Ignaz Semmelweis



A physician of Hungarian birth, did this work during the years from 1844 to 1848 at the Vienna General Hospital.

Nature of Scientific Discovery:

Step 1. Context: Available body of knowledge.

In our example, Childbed Fever, a form of blood poisoning contracted during or shortly after childbirth

Nature of Scientific Discovery:

Step 2. A problem:

Year/ Ward	1844	1845	1846	Avg
1st Div	8.2% (260/3157)	6.8	11.4	8.8%
2nd Div	2.3	2.0	2.7	2.3%

Step 3. Adopting a Reasonable Hypothesis

(plural: Hypotheses). An explanation. An Educated Guess.

Some Hypotheses can be eliminated by thinking and known facts:

e.g., Something in Vienna's air? No, should apply to both maternity divisions and to street births.

Crowding? No, 2nd div was more crowded (people tried to avoid 1st like the plague).

One Genuine difference between the two divisions:

Priest bearing sacraments, preceded by an attendant with a bell, only passed through 1st division, not second

Hypothesis 1: It's the priest (this is a psychological explanation):

Can this hypothesis be ruled out by thinking or the known facts?

If not, how do you rule it out?

Steps in Scientific Discovery: 3. Predictions and Tests

If it's the priest, then . . .

Results of test: No changes in mortality rates

Conclusion: It's not the priest?

A second hypothesis

1st Division: Delivering lying on back

2nd: On side

How do you test this hypothesis?

Result: No difference

1847: Infection from cadavers?

Maternity Division I (but not Div. II) was part of a teaching hospital. Medical students would dissect corpses and then routinely walk over to the ward, to deliver babies. Could this be the cause of infection?

If so, what predictions can we make?

Prediction & Test: Wash hands in a chlorinated lime solution

Ward	1844-1846 Avg	1848 Avg
1st Div	8.8%	1.3%
2nd Div	2.3%	1.3%

So, scientific discovery:

1. Context
2. Problem
3. Hypotheses and Predictions
4. Actual Tests

Now, the story tells us also a great deal about the history of science. What do you think happened next?

- Semmelweis got fired
- 1860 (13 years later): Mortality rate in 1st division: 35%
- Wrote an “open letter to physicians of Europe”
- Placed in an asylum, tortured, and beaten to death

So, a few scientists are indeed heroes. But the scientific establishment is often, then and now, heartless. To move up in science or medicine, you have to network, play the game

Useful Links:

Childbed Fever Today

An internet play about the life of Ignaz Semmelweis