How to read a scientific paper

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- Scientific papers are the heart of the science community.

- It is essential to learn how to read a paper quickly but insightfully.

  …… otherwise

Two Types of Scientific Papers Containing Two Types of Information

There are two types of scientific papers:

- ✓ **Review articles:** give an overview of the scientific field or topic by summarizing the data and conclusions from many studies.

- ✓ **Primary research articles:** contain the original data and conclusions of the researchers who were involved in the experiments and how the experiments were done.

few easy ways to distinguish between Review & Primary research

i. Many reviews will be labeled as "review“ on the first page of the article.

ii. Reviews don't have a "methods" section.

iii. In a review article, graphs, tables, or figures containing actual data will contain citations in the figure legend to the primary research papers that originally reported the findings.

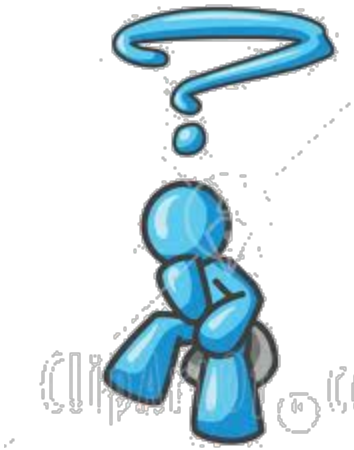
It is also wise to read several reviews by different authors

Why bother ourselves?

- ✓ Journal papers are current
  - Textbooks are often years out of date.
- ✓ Journals are generally the most accessible means of obtaining the information that you need.
- ✓ You can get a good explanation for your data and enough details to replicate what you read about.
- ✓ To find out exactly what the latest developments are in a field.
- ✓ To find out how a certain piece of research was done.
- ✓ Because one day soon you could be writing papers too!

Why?

- ✓ Learn to do research.
- ✓ Learn to think critically about quality of research papers.
  - In any discipline, there are fads and there are lasting ideas… learn to tell the difference!
- ✓ Gain perspective.



The typical anatomy of a paper

- In most scientific journals, scientific papers follow a standard format.
- Most journals use a conventional IMRD structure.

A general rule of thumb, regarding what goes where, when both reading and writing a scientific article is

Title:
Short, succinct, eye-catching

Abstract:
Why & Why

Introduction:
When, Whom, Why, What & Why

How & Where

Results:
What

Discussion:
Why & How

Note: Some journals will allow the Results and Discussion sections to be combined. In this case, the **What** and the **why** are presented together.

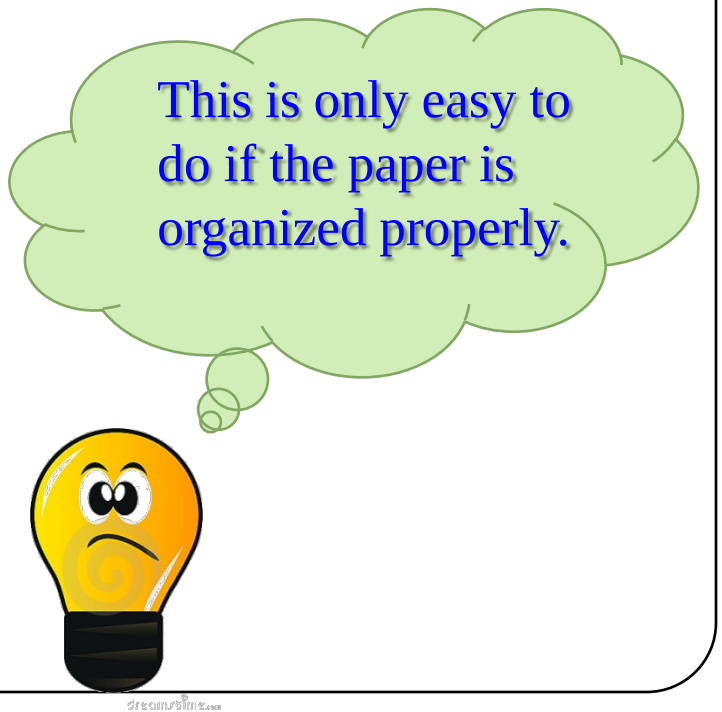
Generally...

you first read the Abstract in order to understand the major points of the work.

- It clarifies whether you in fact know enough background to appreciate the paper.
- It refreshes your memory about the topic.
- It helps you as the reader integrate the new information into your previous knowledge about the topic.

Continue…

- Introduction can be skimmed.
- The logical flow of papers goes straight from the Introduction to Results.
- Then to Discussion for interpretation of the findings.



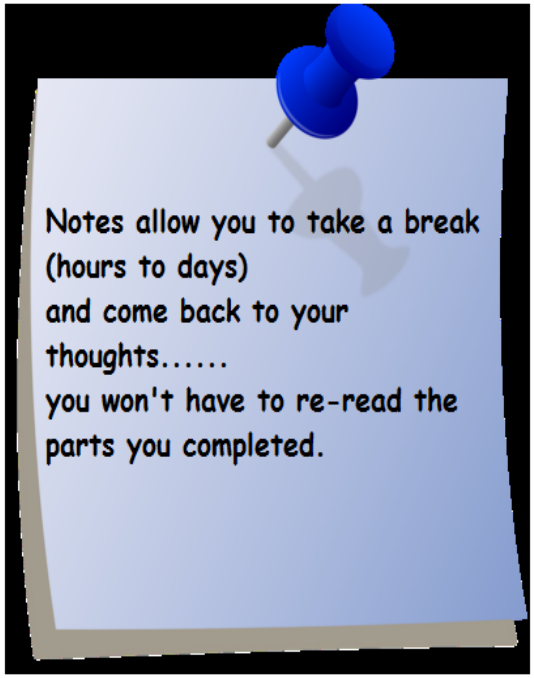
How to approach the introduction…

- ✓ Grab a blank piece of paper:
  - Take notes.
  - Draw figures.
  - Define vocabulary.

- ✓ Answer these questions:
  - What is the hypothesis being tested?
  - What are the basic conclusions?

How to read the results…

- ✓ Examine the figure.
- ✓ take notes.
- ✓ with each experiment/ figure you should be able to explain:
  - The basic procedure.
  - the question it sought to answer.
  - The results.
  - the conclusion.
  - Criticism.



How to read a discussion

Take notes and answer these questions:

- ✓ What conclusions do the authors draw?

Opinion/ interpretation?

- ✓ Describe for yourself why these data significant.

Does it contribute to knowledge or correct errors?

- By now, you may be tired of this paper…

  But don’t relax yet…

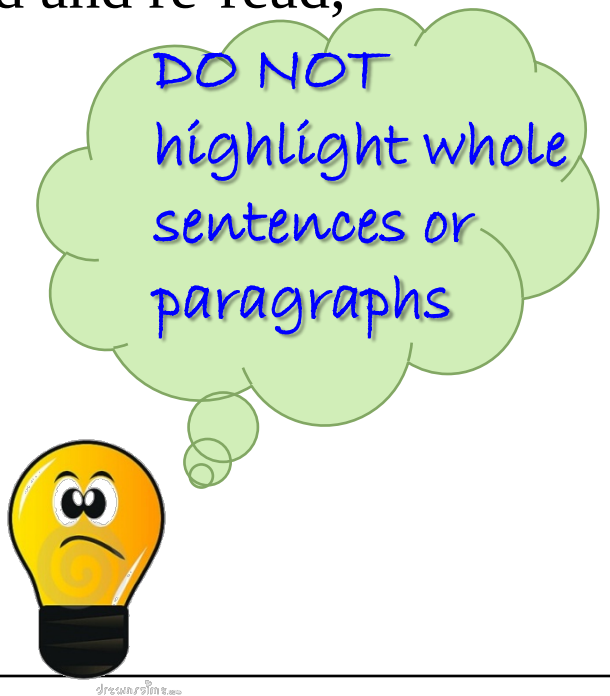
- save energy for the overall reflection and criticism.

Reflection and Criticism

- ✓ Do you agree with the authors' rationale for setting up the experiments as they did?
- ✓ Did they perform the experiments appropriately?
- ✓ Were there enough experiments to support the major finding?
- ✓ Do you see trends/patterns in their data?
- ✓ Do you agree with the author's conclusions?
- ✓ What further questions do you have?
- ✓ What might you suggest they do next?

Reading a scientific paper

- ✓ Struggle with the paper
  - Active not passive reading.
  - Use highlighter, underline text, scribble comments or questions on it, make notes.
  - If at first you don't understand, read and re-read, spiraling in on central points.



Continue…

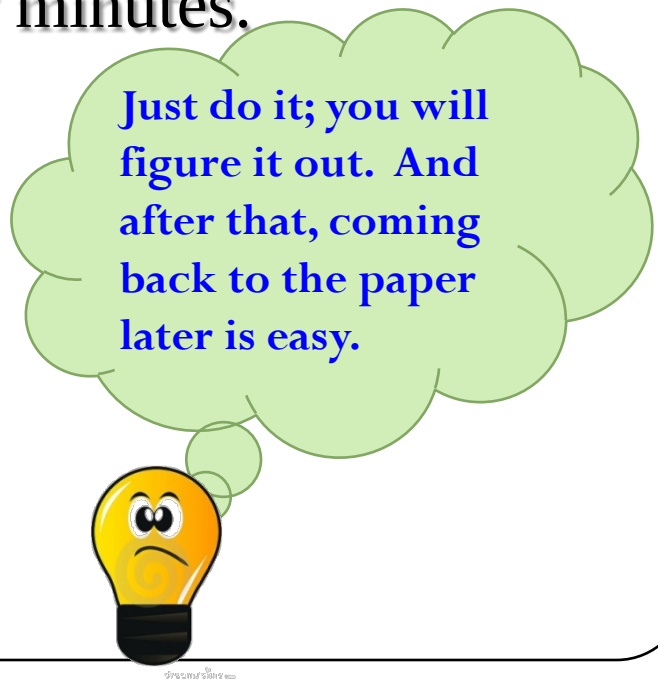
- ✓ Get into question-asking mode
  - get used to doing peer review
  - just because it's published, doesn't mean it's right
  - nit-pick

Continue…

- ✓ Move beyond the text of the paper
  - talk to other people about it.
  - read commentaries.
  - consult, dictionaries, textbooks, online links to references, figure legends to clarify things you don’t understand.

Continue...

- ✓ Don't give yourself very much time.
  - This may seem counter-intuitive, but one of the best ways to break down barriers to reading a heavy paper is to sit down twenty minutes before some other appointment absolutely determined to "figure out what this paper's about" within the twenty minutes.



Ground Rules:

- ✓ Try to understand.
- ✓ Don’t be afraid to ask.
- ✓ Be constructive.
- ✓ Be polite.
- ✓ Don’t be afraid to criticize (constructively!)

Template for Taking Notes on Research Articles:

Easy access for later use

Complete citation. Author(s), Year, Title , Journal, Volume #, Issue #, pages:

If web access: url; date accessed

KeyWords:

General subject:

Specific subject:

Hypothesis:

Methodology:

Result(s):

Summary of key points:

Significance (to the field; in relation to your own work):

Important Figures and/or Tables (brief description; page number):

Other Comments:

Exercise

RESEARCH COMMUNICATION

Real-Time PCR Assay for Rapid Detection of *GSTM1* Polymorphism in Nasopharyngeal Carcinoma Patients

Danai Tiwawech[1], Somjin Chindavijak[2], Anant Karalak[3], Takafumi Ishida[4]

Abstract

Nasopharyngeal carcinoma (NPC) is a common public health problem in Thailand. Glutathione S-transferase M1 gene deletion (*GSTM1* null genotype) carriers have been reported to be at increased risk and therefore this parameter is a potential marker for screening of NPC high-risk individuals. However, the conventional polymerase chain reaction (C-PCR) assay commonly used for *GSTM1* null genotype detection is not suitable for mass screening since it is inconvenient, time consuming and unsafe due to the use of a toxic chemical. Currently, real-time PCR (R-PCR) assay is recommended for quicker and safer detection of various genetic polymorphisms. The aim of this study was to develop a SYBR green I R-PCR assay combined with melting curve analysis for *GSTM1* polymorphism detection in Thai NPC patients. The results were compared to those from the C-PCR assay using DNA samples from peripheral blood leukocytes of 120 Thai NPC patients. The frequencies of *GSTM1* polymorphism detected by the R-PCR and the C-PCR were the same. Forty-eight individuals that were *GSTM1*+ in the R-PCR assay showed 2 peaks with melting points of 82.5°C and 87.5°C that correlated with the appearance of 2 DNA bands in the C-PCR assay (i.e., one for *GSTM1* at 215 base pairs (bp) and one for *β-globin* at 268 bp). By contrast, 72 individuals that were *GSTM1*- in the R-PCR assay showed 1 peak with a melting point of 87.5°C that correlated with the appearance of 1 DNA band for *β-globin* at 268 bp in the C-PCR assay. The R-PCR assay using SYBR Green I and melting curve analysis for *GSTM1* polymorphism detection was as reliable as the C-PCR assay but was quicker and safer and more amenable to large scale screening in Thai NPC cases.

Key Words: *GSTM1* gene - real-time PCR - nasopharyngeal carcinoma - SYBR green I - melting curve

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Introduction

Nasopharyngeal carcinoma (NPC) is a serious cancer in southern China and Southeast Asia including Thailand. This cancer ranks 6th in Thai males with the peak age at 40-50 years (Parkin et al., 1997; Deerasamee S, et al., 1999; McDermott et al., 2001). Epstein-Barr virus (EBV) infection, exposure to carcinogens and genetic susceptibility are the epidemiological risk factors that play a crucial role in NPC development (Wolf et al., 1973; Zong et al., 1992). Generally, early stages of NPC are treatable, but most patients are diagnosed at incurable late stages (Tuneet al., 1999). Early detection may provide significant improvement in the management and effective treatment of NPC. Actually, early detection of NPC relies on screening for EBV-DNA load and for anti-EBV IgA against viral capsid antigens and early antigens. Other biomarkers suggested for inclusion in new screening tests for NPC include EBV genotypes and individual cancer-susceptibility gene polymorphisms (Wolf et al., 1973; Zong et al., 1992; Mutirangura 2001; Tiwawech et al., 2003). Recent studies on the role of individual cancer-susceptibility gene polymorphisms in Thai NPC resulted in the discovery of potential diagnostic markers for early identification of non-symptomatic individuals at risk for development of NPC. Identificaiton of such individuals could lead to counseling for NPC prevention and also to sufficiently early detection of NPC to permit curative therapy leading to a reduction in morbidity and mortality.

The cancer-susceptibility gene *GSTM1* is located on chromosome 1p13.3 (Pearson et al., 1993). It is an important gene in preventing cancer development because it encodes GSTM1, a cytosolic GST class μ1 enzyme that detoxifies electrophiles derived from procarcinogens. For example, it detoxifies aflatoxin B1 (AFB1) and smoke-derived carcinogens such as polycyclic aromatic hydrocarbon and aromatic amines (Ketterer et al., 1992; Hirvonen et al., 1994; Hayes et al., 1995). Genetic polymorphism of *GSTM1* has been associated with several cancers including NPC.

Deletion of homozygous *GSTM1* alleles (i.e., in the *GSTM1* null genotype or *GSTM1*-) results in lack of enzyme activity that binds genotoxic substrates such as epoxides derived from aflatoxin B1 and polycyclic aromatic hydrocarbons (PAHs) (Seidegard et al., 1988; Hayes et al., 1995). Thus, *GSTM1*- individuals are more

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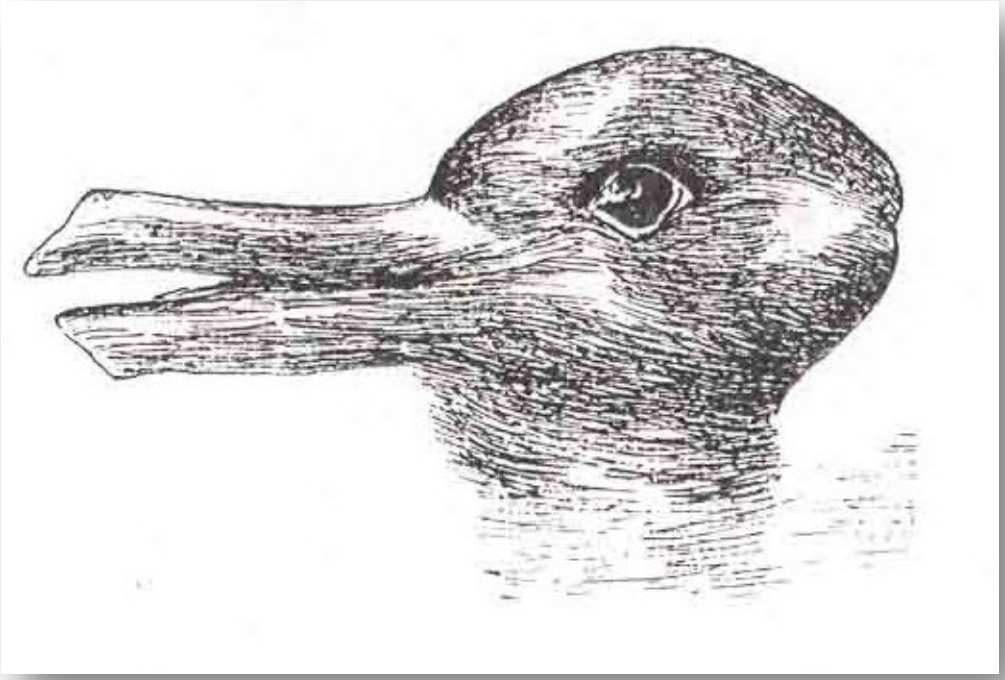
http://www.apocpcontrol.org/paper_file/issue_abs/Volume9_No2/c%20233%20Danai%206C.pdf

The famous duck-rabbit ambiguous image.

- When one looks at the duck-rabbit and sees a rabbit, one is not interpreting the picture as a rabbit, but rather reporting what one sees.



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Thank you!