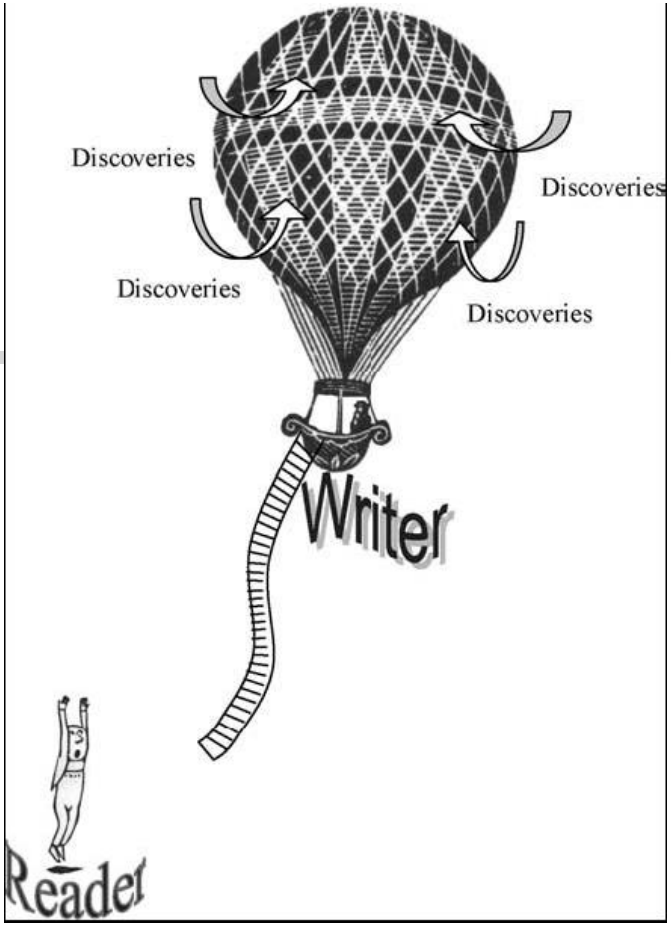
"Science is, above all, communication." (Gibs)

Scientific article



Picture from Lebrun – Scientific writing

Reasons to publish your research results

- [Peat: Scientific writing]
  - It is unethical to conduct a study and not report the findings
  - You have some results that are worth reporting
  - You want to progress scientific thought or improve health outcomes
  - You want to give credibility to your research team
  - You want your work to reach a broad audience
  - Your track record will improve
  - You will add credibility to your reputation
  - You will improve your chance of promotion
  - You are more likely to obtain research grants

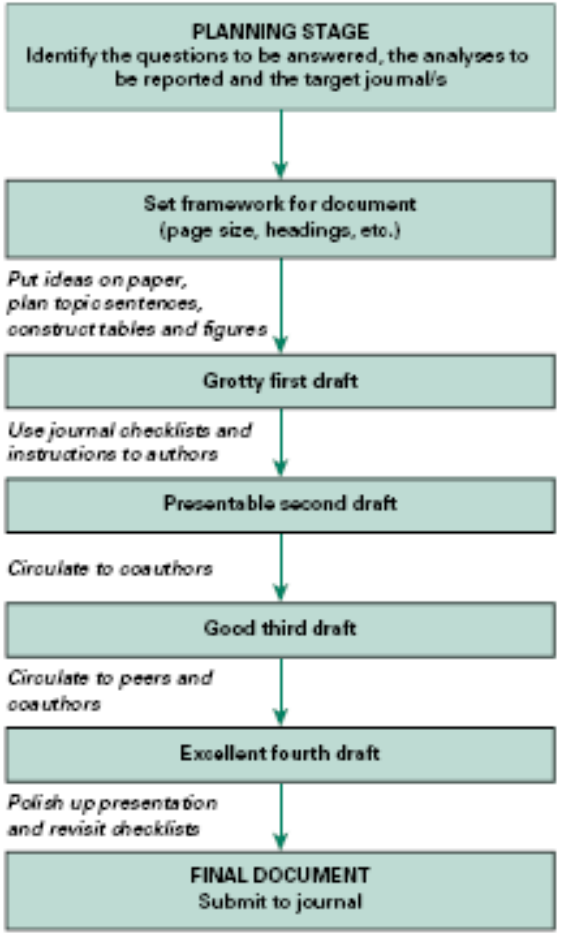
[Peat: Scientific writing -2]

Three basic aspects to effective scientific writing are thought, structure, and style.

- *Thought* is a matter of having some worthwhile results and ideas to publish. You need some new results to publish and you need to be able to interpret them correctly.
- *Structure* is simply a matter of getting the right things in the right place.
- *Style* is a matter of choosing the fewest and most appropriate words and using the rules of good grammar.

[Peat: Scientific writing – 3]

- Plan for writing



[Peat: Scientific writing – 4]

Section	Question to be answered	Purpose	Expected length with A4 paper, font size 10–12 and 1·5 line spacing
Introduction	Why did you start?	Summarise the context of your study and state the aims clearly	1 page
Methods	What did you do?	Give enough detail for the study to be repeated	2–3 pages
Results	What did you find?	Describe the study sample and use the data analyses to answer the aims	2–3 pages
Tables and figures	What do the results show?	Clarify the results	3–6 tables or figures
Discussion	What does it mean?	Interpret your findings in context of other literature and describe their potential impact on health care	2–3 pages
References	Who else has done important work in your field?	Cite the most relevant and most recent literature	20–35 references
Total document			**12–20 pages**

[Peat: Scientific writing – 5]

Deciding where to submit

- Use corporate experience
- Match your paper with the personality and scope of the journal
- Match your subject with the journal's target audience
- Consider the impact factor and citation index of the journal
- Weigh up the journal prestige, the likelihood of acceptance and the likely time until publication
- Have realistic expectations
- Scan the journals for one that matches your content and study design
- Be robust and, if rejected, select another journal

[Peat: Scientific writing - 6]

Guidelines on authorship

- Each author should have participated sufficiently in the work to take full responsibility for the content.
- Authorship credit should be based only on:
  - substantial contributions to conception and design, or analysis and interpretation of data; and to
  - drafting the article or revising it critically for important intellectual content,
  - final approval of the version to be published.
- Conditions a, b, and c must all be met. Any part of an article critical to its main conclusions must be the responsibility of at least one author.
- Editors may require authors to justify the assignment of authorship.

[Peat: Scientific writing -7]

Responsibilities of authors and coauthors

- First author
  - Takes primary responsibility for all aspects of publishing the paper
  - Conducts or supervises the data analyses and interprets the results
  - Writes the paper in consultation with coauthors
  - Maintains ownership of the master document
  - Submits the paper to a journal and deals with the correspondence
  - Responsible for archiving and documenting all data and files
- Coauthors
  - Make early decisions about the aims of the paper
  - Keep the paper on track in terms of the main messages
  - Make intellectual contributions to the data analyses
  - Contribute to the interpretation of the results
  - Review each draft
  - Take public responsibility for the content and results

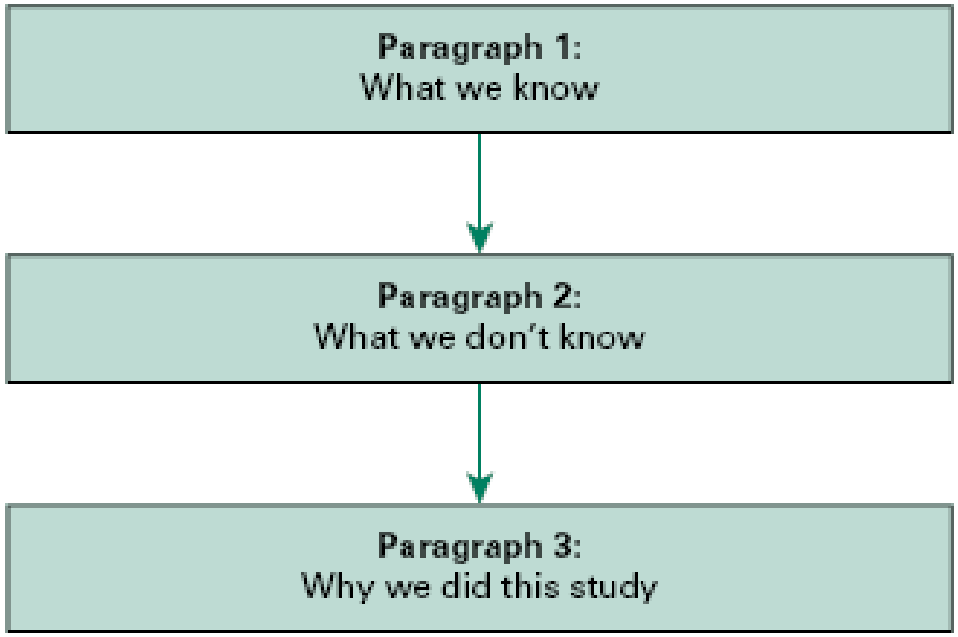
[Peat: Scientific writing – 8]

Examples of intellectual contributions to a paper

- Conception and design of the study
- Implementation and data collection
- Library searches and assembling relevant literature
- Database management
- Analysis and interpretation of the data
- Writing and critical review of the paper
- Supervising writing of a paper by a student

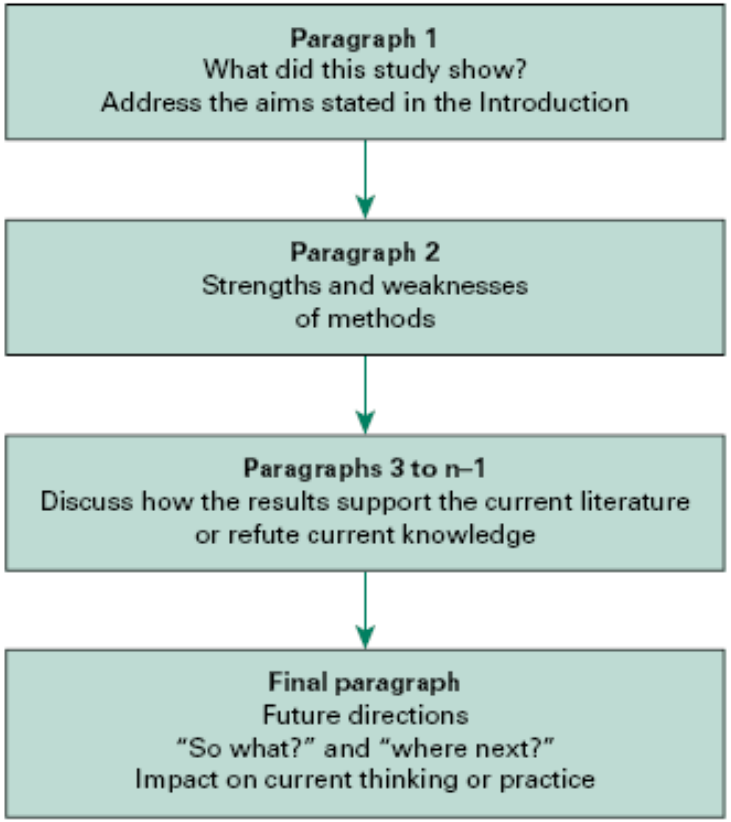
[Peat: Scientific writing – 9]

- Template for the introduction



[Peat: Scientific writing – 10]

- Template for discussions



[Peat: Scientific writing - 11]

- Construction guidelines

Title

Be short, accurate, and unambiguous
Give your paper a distinct personality
Begin with the subject of the study

Introduction

What is known
What is not known
Why we did this study

Methods

Participants
Measurements
Outcomes and explanatory variables
Statistical methods

Results

Sample characteristics
Univariate analyses
Bivariate analyses
Multivariate analyses

Tables and figures

No more than six tables or figures
Use Table 1 for sample characteristics (no *P* values)
Put most important findings in a figure

Discussion

State what you found
Outline the strengths and limitations of the study
Discuss the relevance to current literature
Outline your implications with a clear "So what?" and "Where now?"

References

All citations must be accurate
Include only the most important, most rigorous, and most recent literature
Quote only published journal articles or books
Never quote "second hand"
Cite only 20–35 references

[Peat: Scientific writing - 12

Box 4.5 Checklist questions for reviewers and writers

General

Is the work original?
Is the information important?
Was the study ethical?
Does the work add enough to what is already in the literature?
Is the title accurate and informative?
Does the abstract include the most important results?
Does the paper read well and make sense?
Are the results of interest to the readers of this journal?

Introduction

Is the length of the introduction reasonable?
Does the introduction adequately review the background and state the aims?

Methods

Are the methods well documented and detailed enough?
Are the participants adequately described and their conditions defined?
Was a satisfactory response rate achieved?
Is the equipment used adequately described?
Are the techniques used adequately described and validated?
Were the methods suitable for the study?
Is a calculation of the required sample size given?
Are all statistical methods adequately described and referenced?

Results

Is the description of the results clear and detailed?
Are the results credible, valid, and well presented?
Are the statistical methods appropriate?

(continued)

Are confidence intervals given where necessary?
Are the numbers in the text independent of the numbers in the figures and tables?
Are the stated results supported by the statistical analyses?

Discussion

Is the length of the discussion appropriate?
Does the discussion adequately consider the limitations of the study?
Does the discussion fairly review previous work?
Do the conclusions answer the aims set out in the introduction?
Are the conclusions justified and logical?

Tables and figures

Are the figures of adequate quality?
Are all of the tables and figures necessary?
Do the legends and titles of the tables and figures provide adequate information?

References

Are all of the references relevant?
Do the references fairly represent current knowledge in this field of research?
Is any major literature omitted?
Are there any misquotations or incorrect citations?

[Peat: Scientific writing – 13]

- Responsibilities of mentors
  - Provide advice and support
  - Impart knowledge, information, guidance, wisdom, and insight
  - Provide access to research and financial resources
  - Foster quality and integrity in scientific practice
  - Promote excellence in scientific writing by reviewing writing regularly and providing timely feedback
  - Provide psychological, social, and emotional encouragement
  - Motivate and inspire
  - Provide advice and foster career development
  - Organise celebrations of important achievements and successes
- Benefits of mentoring
  - Enhances teaching and leadership skills
  - Creates a legacy
  - Provides exposure to new literature and new research questions
  - Facilitates coauthorship on journal articles and reviews
  - Widens the professional network of colleagues and contacts
  - Increases leadership and job satisfaction
  - Fosters the development and retention of organisational talent
  - Contributes to the quality of the scientific profession

[Lebrun – Scientific writing -1]

The locomotive

Imagine the mind of the reader as a locomotive. The author provides the tracks and the signal boxes. What could go wrong?

1. No track — the reader does not see the text's logical progression.
2. No signal box—expectations are not set, so the engine chugs along slowly.
3. Faulty signal — the reader is misled and switches to the wrong track.
4. The train is in a tunnel—the reader will tolerate being left in the dark for a paragraph or two, in the hope that clarity will soon be restored.

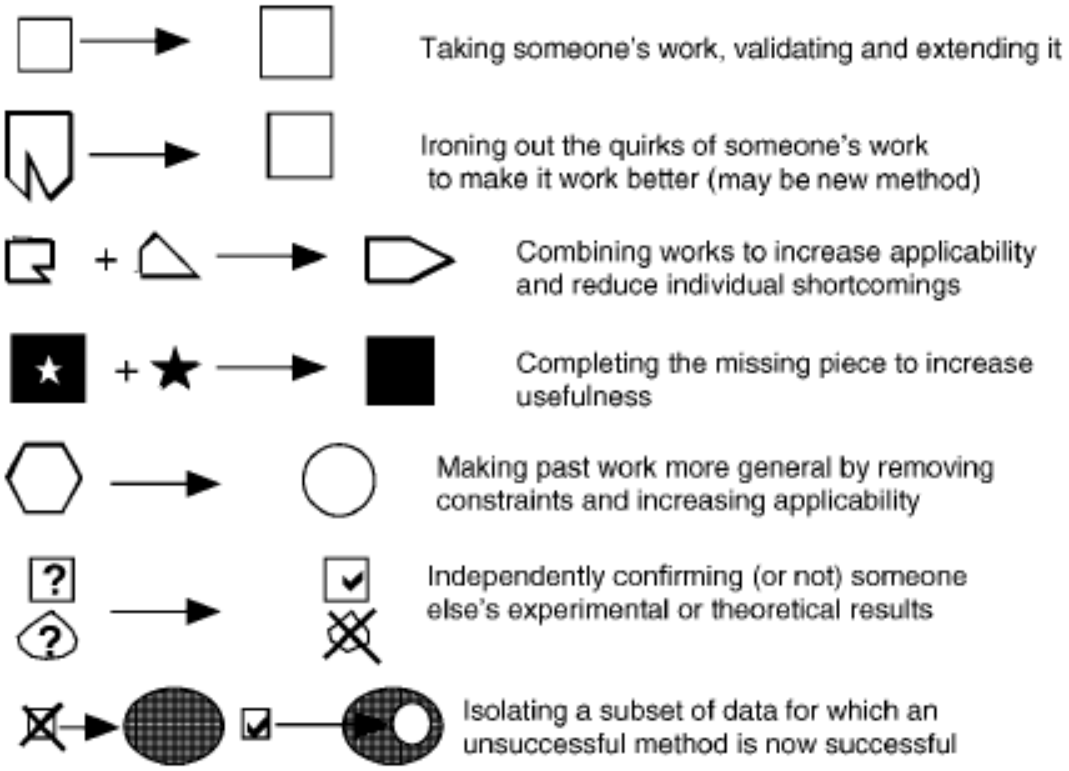
[Lebrun – Scientific writing – 2]

- **The Four Parts of an Abstract**
- Part 1:What is the problem? What is the topic of this paper?
- Part 2: How is the problem solved (methodology)?
- Part 3: What are the specific results? How well is the problem solved?
- Part 4: So what? How useful is this to science or to the reader?

[Lebrun – Scientific writing – 3]

- Introduction
  - Why now?
  - Why this?
  - Why this way?
  - Why should the reader care?
- The Introduction
  - Answers Key Reader Questions
  - Sets the Foundations of Your Credibility
  - Is Active and Personal
  - Is Engaging and Motivating

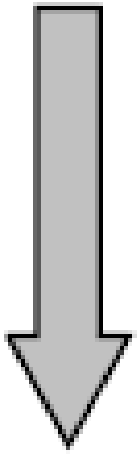
[Lebrun – Scientific writing – 4]



☛4. Various schematic story plots that work.

[Katz – From Res. To Manuscript -1]

1. Materials and Methods
2. Results
3. Discussion
4. Conclusion
5. Introduction
6. Title and Abstract



[Katz – From Res. To Manuscript -2]

- Materials and Methods - skeleton
  - A. Recipe no. 1
  - B. Recipe no. 2
  - C. . . .
- Results - skeleton
  - A. General Observations
  - B. Specific Observations
  - C. Case Studies
    - a. Best Cases and/or
    - b. Representative Cases
- Discussions – skeleton
  - A. Recap Your *Recipe→Results* Report
  - B. List Other Researchers' Reports Using Similar Recipes
  - C. Compare Your Results to Theirs
    - 1. List Similarities and Differences and/or
    - 2. Make a Prediction and/or
    - 3. Describe a Relevant Empirical Rule
- Conclusion
  - One paragraph statement of the point of the paper
- Introduction - skeleton
  - A. Background
    - 2. Available Supporting Data
    - 1. Currently-Accepted General Statement
  - B. Gap
    - C. Your Plan of Attack
- Title
  - Complete Summary in Two Lines or Less
- Abstract
  - *Skeleton 1–Simple Abstract*
    - One Paragraph: "We did. We saw. We concluded."
  - *Skeleton 2–Abstract with Subsections*
    - A. One or Two Sentence BACKGROUND
    - B. Two or Three Sentence METHODS
    - C. Less Than Ten Sentence RESULTS
    - D. One Sentence CONCLUSION
- References
  - List of All Sources Cited in the Paper Using the Appropriate Bibliographic Format
- Acknowledgements
  - One short Paragraph

[Rubens – Scientific & Tech writ.-1]

- Articles
  - Discuss a single topic in depth, usually for a journal or book
  - Narrative style— formality varies with audience expertise
  - Document type: Conceptual

- Reports
  - Present a detailed response to a proposed question or problem
  - Formal and objective in tone—extensive use of supporting evidence
  - Document type: Conceptual

[Rubens – Scientific & Tech writ.-2]

- Scientific research reports communicate the results of formal scientific studies.
- Since the audiences for such reports are generally experts, use technical terms and concepts without background explanation.
- Nonexperts may read the abstract and conclusions, however, so write these sections at a more basic level.
- Typically, these reports include the following sections:
  - Title and author attribution—precisely describes the content by using appropriate keywords that can assist in searching for the published report;
  - Abstract—summarizes the study's objectives, methods, results, and conclusions;
  - Introduction—presents the research objectives and the hypothesis;
  - Literature review—provides an overview of the current state of research and the theoretical foundation for the study;
  - Procedures—describe the subjects, methods, and materials used in the study;
  - Results—summarize the data collected from the study using graphs, charts, and tables, with accompanying narrative explanation. Present this data objectively and without interpretation;
  - Conclusions—discuss and interpret the results;
  - Appendixes—provide additional information, such as data, that may be inappropriate within the text.

[Day - How to Write & Publish a Scientific Paper – 1]

- The first journals were published only 300 years ago,
- The IMRAD (Introduction, Methods, Results, and Discussion) organization of scientific papers has developed within the past 100 years.
- The logic of IMRAD can be defined in question form:
  1. What question (problem) was studied? The answer is the Introduction.
  2. How was the problem studied? The answer is the Methods.
  3. What were the findings? The answer is the Results.
  4. What do these findings mean? The answer is the Discussion.

[Day - How to Write & Publish a Scientific Paper – 2]

- A scientific paper is a written and published report describing original research results.
- An acceptable primary scientific publication must be the first disclosure containing sufficient information to enable peers
  - (1) to assess observations,
  - (2) to repeat experiments, and
  - (3) to evaluate intellectual processes;
  - moreover, it must be susceptible to sensory perception, essentially permanent, available to the scientific community without restriction, and available for regular screening by one or more of the major recognized secondary services

[Day - How to Write & Publish a Scientific Paper – 3]

- The title of a paper is a label. It is not a sentence.
- An author of a who takes intellectual responsibility for the research results being reported.
- Abstract
  - should be viewed as a miniversion of the paper.
  - should
    - (1) state the principal objectives and scope of the investigation,
    - (2) describe the methods employed,
    - (3) summarize the results, and
    - (4) state the principal conclusions.
  - *informative* abstract designed to condense the paper.
  - *indicative* abstract (or descriptive abstract) designed to indicate the subjects dealt with in a paper, making it easy for potential readers to decide whether to read the paper

[Day - How to Write & Publish a Scientific Paper – 4]

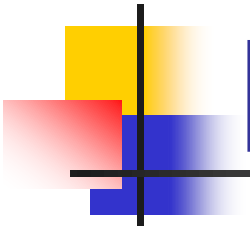
- Suggested rules for a good Introduction are as follows:
  1. The Introduction should present first, with all possible clarity, the nature and scope of the problem investigated.
  2. It should review the pertinent literature to orient the reader.
  3. It should state the method of the investigation. If deemed necessary, the reasons for the choice of a particular method should be stated.
  4. It should state the principal results of the investigation.
  5. It should state the principal conclusion(s) suggested by the results.

[Day - How to Write & Publish a Scientific Paper – 5]

- The main purpose of the Materials and Methods section is to describe (and if necessary defend) the experimental design and then provide enough detail so that a competent worker can repeat the experiments.
- Results:
  - First, you should give some kind of overall description of the experiments, providing the "big picture," without, however, repeating the experimental details previously provided in Materials and Methods.
  - Second, you should present the data.

[Day - How to Write & Publish a Scientific Paper – 6]

- Essential features of a good Discussion
  1. Try to present the principles, relationships, and generalizations shown by the Results. And bear in mind, in a good Discussion, you *discuss—you do not recapitulate—*the Results.
  2. Point out any exceptions or any lack of correlation and define unsettled points. Never take the high-risk alternative of trying to cover up or fudge data that do not quite fit.
  3. Show how your results and interpretations agree (or contrast) with previously published work.
  4. Don't be shy; discuss the theoretical implications of your work, as well as any possible practical applications.
  5. State your conclusions as clearly as possible.
  6. Summarize your evidence for *each* conclusion.



[Zobel – Writing for CS]

- Title and author
- Abstract
- Introduction
- Survey
- Results
- Summary
- Bibliography
- Appendices

[Gaither – Scientifically Speaking]

- **Arber:** A record of research should not resemble a casual pile of quarried stone; it should seem "not built, but born", as Vasari said in praise of a building.
- **Chargaff (1980):** I should like to find a way of discouraging unnecessary publications, but I have not found a solution, save the radical one . . . that all scientific papers be published anonymously.
- **Dubos (1991):** . . . a scientific paper should never try to make more than one point.
- **Mayo (1935):** Reading papers is not for the purpose of showing how much we know and what we are doing, but is an opportunity to learn.
- **Einstein:** The importance of a problem should not be judged by the number of pages devoted to it.