How I write a scientific paper:

Selling your data with power writing.

by

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A talk presented locally, invited at other University and at National Scientific meetings.

I. What is a paper?

II. Parts
- A. Title
- B. Abstract
- C. Introduction
- D. Materials and Methods
- E. Results (& Discussion)
- F. (Discussion)
- G. Acknowledgments
- H. References
- I. Tables
- J. Figures and Captions

III. Where do I Begin?
- A. Data, then
- B. Everywhere

IV. Data
- A. The heart of the work!
- B. What is your point? or, What hypothesis was tested?

V. The parts in detail
- J. Figures and Captions
  - They should tell the story;
  - Think of final size in journal
  - Caption should allow figure to stand alone
- I. Tables
- A. Title
  - Primary key words
- B. Abstract
  - Secondary key words
  - Packed with concrete information
- C. Introduction
  - Only information that points to your point, hypothesis
- D. Materials and Methods
  - Can another person repeat exactly what you've done?
- E. Results (& Discussion)
  - Lead reader to your point, interpretation, conclusions
- F. (Discussion)
- G. Acknowledgments
  - Support, Funding reports.
- H. References
  - All as appropriate

VI. The Writing
- A. Write to the reader's expectations!
- B. Write with emphasis.
- C. Write for mind control
- D. Write to persuade the reader.

VII. How?
- A. At the document level
  1. Issue, topic
  2. persuasive discussion
  3. Coda, finale, conclusion
  4. Chaining
- B. At the paragraph level
  1. Issue, topic
  2. persuasive discussion
  3. Coda, finale, conclusion
  4. Chaining
- C. At the sentence level
  1. Bold, with emphasis on point
  2. Simple and direct
  3. Chaining
     - a. old-p --> new-1 (Issue)
     - b. old-1 --> new-2
     - c. old-2 --> new-3
     - d. old-3 --> new-4
     - e. old-4 --> new-5
     - x. ...
     - z. Coda, finale, conclusion, emphasis

VII. Concrete Examples

1. Jurkiewicz BA; Buettner GR.(1996) *Photochem. Photobiol.* **64:**918-922

2. Kelley EE; Buettner GR; Burns CP. (1997) *Photochem. Photobiol.* **65:**576-580.

VIII. *Finis*

Types of Writing

Creative

Persuasive, narrative writing

Who is the audience?

- Technical Experts?
- Knowledgeable in area?
- Broader Area?
- All Scientists?
- All Readers?

I. What is a paper?

A means to publish data.

DATA

Interpretation

Definition: 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 (*e.g.* currently, Biological Abstracts, Chemical Abstracts, Index Medicus, Excerpta Medica, Bibliography of Agriculture, etc., in the United States and similar facilities in other countries).[1, 2]

[1] Council of Biology Editors. (1968) Proposed definition of a primary publication. *Newsletter, Council of Biology Editors.* November, p. 1-2.

[2] Day, Robert A. (1983) *How to Write and Publish a Scientific Paper*. iSi Press, Philadelphia, PA. p. 2.

II. Parts

A. Title

B. Abstract

C. Introduction

D. Materials and Methods

E. Results (& Discussion)

F. (Discussion)

G. Acknowledgments

H. References

I. Tables

J. Figures and Captions

III. Where do I Begin?

A. Data, then

B. Everywhere

IV. Data

A. The heart of the work!

B. What is your point?

or,

What hypothesis was tested?

What problem was addressed

J. Figures and Captions

1. **They should tell the story;**
   Story board
2. **Think of final size in journal**
   See Kelley figures.

3. **Caption should allow Figure to stand alone.**

4. ***Informative* rather than *descriptive* title.**

Examples:

Kelley *et al.* Figure 1

Jurkiewicz Figures 1 & 3

Figure 4

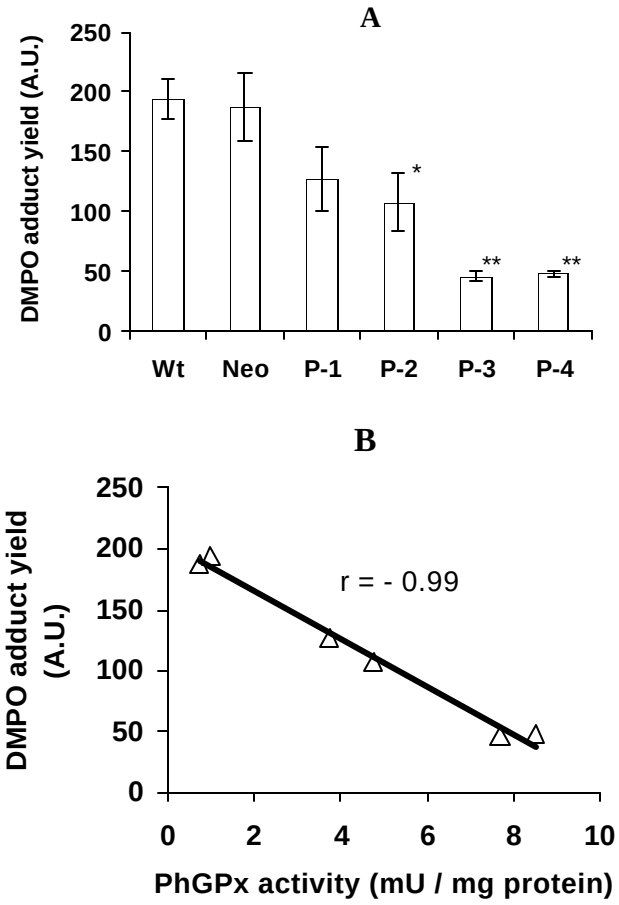

Figure 5. PhGPx inhibits $^1O_2$-induced lipid-derived radical generation.[3]

A. Cells were pretreated with 6 μg/mL Photofrin for 24 h in full media. After 5-min light exposure, cells were incubated for 6 h in the dark. Radical formation was then assessed using EPR spin trapping. Each spectrum represents the signal-averaged result of 45 scans. The height of the low-field line of the DMPO/lipid-derived radical adduct was used as a measure of radical yield. **Inset:** An example X-band EPR spectrum of the DMPO adduct (a^N = 15.2 G, a^H = 10.2 G in ethyl acetate) formed from MCF-7 cells. Control cells were incubated with Photofrin but not exposed to light. The yield of DMPO adduct in the control samples was below the limit of detection (data not shown).

(Mean ± SE, n = 3, * $p < 0.05$, ** $p < 0.005$ compared to Wt.)

B. Lipid radical formation correlates inversely with PhGPx activity. Data are derived from Figures 3A and 5A.

Figure 5

[3] Wang HP, *et al.* (2001) *Free Radic Biol Med.* in press.)

I. Tables

Same as Figures, make them easy to understand.

UV Light Increases Iron in Skh-1 Mouse Skin[4]

Skin Sample	[Fe(III)Desferal]/μM
Non UV Exposure	5.2 ± 0.4
UV Exposed (16 weeks)	10.0 ± 2.3

n = 3; mean ± SEM; p ~ 0.1

[4] Jurkiewicz BA. unpublished.

Table 1 Size of nine leukemia cell lines[5]

Cell Line	Median Diameter mm	SD[b,c] ± mm	Range[b] mm	Range[d] mm
CEM	9[a]	1.8	5.2 - 14.1	8 - 12
HEL	12.1[b]	1.3	9.1 - 15.8	10 - 18
HL-60	10[a]	1.4	6.1 – 13.6	8 - 12
K-562	14.3[b]	1.6	9.3 – 18.7	10 -20
KG-1	10.3[b]	1.4	6.1 – 13.3	8 - 18
L1210	10.4[b]	1.1	7.5 – 13.3	8 - 10
Molt-4	11.4[b]	1.3	8.5 – 15.5	10 - 12
THP-1	12.5[b]	1.4	9.2 – 16.6	8 - 12
U-937	13.0[a]	1.8	9.1 – 18.3	8 - 18

[a] These diameters were determined using conventional light microscopy and were used as standards for the flow cytometric determinations.

[b] These values were determined from the FSC measured by flow cytometry, using the equation: cell diameter = (0.0893•FSC - 0.677) μm.

[c] The standard deviation (SD) of the cell diameter distribution was determined from the gaussian FSC distribution. Using the equation in [b], ($FSC_{median} \pm SD_{FSC}$) was converted to cell diameters. The SD in μm is then estimated as the range of these two values/2.

[d] These values were determined using a micrometer and conventional light microscopy.

Table 1

[5] Schafer FQ. (2000) partially published.

A. The Title

1. **Make a list of the *Primary key words***

2. **Construct an informative title that contains these key words (or the most important of them).**

3. **The title will most likely have a verb in it.**

4. **If appropriate, the title should state the main conclusion of the paper.**

5. **Use mainstream words.**

6. **Let it age; constantly rethink, especially as you are putting on the final touches to the manuscript.**

B. Abstract

Secondary key words

Packed with concrete information

If appropriate:

Introduction

Hypothesis/Problem

Data/Facts

Conclusion

< 250 words

Example: See Jurkiewicz

C. Introduction

Present information that points to:

your point,

your hypothesis,

your problem; i.e.

The reason for the work.

But also think about educating the reader so they can understand where you are going and how you are getting there.

At the end is often a general statement of the findings.

Example: See Jurkiewicz or Kelley

D. Materials and Methods

Can another person,
competent in this field, repeat
exactly what you've done?

E. Results (& Discussion)

Lead reader to:
your point, and
your interpretation, and
your conclusions

F. (Discussion)

G. Acknowledgments

Support, Funding reports.

H. References

All as appropriate

VI. The Writing

A. Write to the reader's expectations!

B. Write with emphasis.

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VII. How?

A. At the document level

1. Issue, topic

2. Persuasive discussion

3. Coda, finale, conclusion

4. Chaining, *i.e.* everything flows

B. At the paragraph level

1. Issue, topic

2. Persuasive discussion

3. Coda, finale, conclusion

4. Chaining, *i.e.* everything flows

Examples:

J10, J12

K12, K13, K14

C. At the sentence level

1. Bold, with emphasis on point

2. Simple and direct

3. Chaining

a. old-p --> new-1 (Issue)
b. old-1 --> new-2
c. old-2 --> new-3
d. old-3 --> new-4
e. old-4 --> new-5
x. ...
z. Coda, finale, conclusion,

Always ask what should be the emphasis of a sentence.

Examples:

K1, Chaining
J16, Chaining and emphasis

end