International Commission on Illumination
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How to write a good paper

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The Great and the Good

- There are only a few great papers but many people can write a good paper
- A great paper is one that changes understanding
- A good paper is one that is believable and contributes to knowledge

The four C’s

- The quality of a diamond is given by the four C’s
  - Colour
  - Cut
  - Carat
  - Clarity

The four C's

- There are also four C's for a paper
  - Cause
  - Clarity
  - Completeness
  - Concision

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The Society of Light and Lighting

The lumen seen in a new light: Making distinctions between light, lighting and neuroscience

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The implicit homology between light, lighting and neuroscience limits international commerce, the effectiveness of lighting applications and the relevance of basic and applied research. A comprehensive system where the distinct, but interrelated roles of light, lighting and neuroscience are recognized provides a meaningful foundation for international commerce, for improving the value of lighting for society and the environment, and enriching the neuroscience research agenda. By replacing V(λ) with a broader luminous efficiency function, termed the universal luminous efficiency function [U(λ)], light is better defined. By formally accepting a set of benefit efficiency functions for use in lighting regulations and lighting practice, the value of lighting applications increases. By formally accepting a set of benefit efficiency functions in standards and applications, a platform for collaboration among lighting practitioners and neuroscientists is built.

1. Light, lighting and neuroscience: An introduction

In 1995, Robert Boynton gave the Frederic Ives Medal lecture – *History and current status of a physiologically based system of photometry and colorimetry*. His paper[1] is a brilliant overview of the history and technical foundations of photometry and colorimetry. Notwithstanding the elegance of style and the depth of understanding, Boynton holds an unspoken but flawed assumption that photometry, colorimetry and human vision should be homologous. This assumption is revealed by the lecture title and is embedded in every section of his paper. He develops a series of arguments for 'improving' both photometry and colorimetry based upon evidence from a suite of multidisciplinary experiments in what we now call neuroscience, this being a popular collective term for the many sub-disciplines pursuing research into the neuronal mechanisms that affect behaviour, endocrine function and physiology as well as the basic molecular and genetic structure. Perhaps even today many researchers, practitioners and manufacturers intimately concerned with light hold the same implicit assumption that with more research into the neurosciences, photometry and colorimetry can become 'better'.

This paper rejects the implicit assumption that there should be a homology between photometric and colorimetric metrology, lighting applications and neuroscience. Rather, it is argued that there are three logically distinct, although interrelated domains concerned with electromagnetic radiation, and that it is important to

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Cause

- To write a good paper you have to
  - Have something to say. There has to be a question or questions to be addressed and answered
  - You need to be aware of the audience you are trying to address

Clarity

- To be a good paper:
  - The content needs to be clear. This means writing that is sparse, not verbose; figures and tables that are easily understood and carefully captioned.
  - All the measurements made should be discussed
  - The conclusions should be supported by the data presented
  - The implications of the results and any limitations should be stated

Completeness

- There are two requirements for completeness.
  - The first is that the paper should contain enough detail for a reader to understand what was done and to replicate it if so desired.
  - The second is that the paper should be placed in the context of existing knowledge and findings

Concision

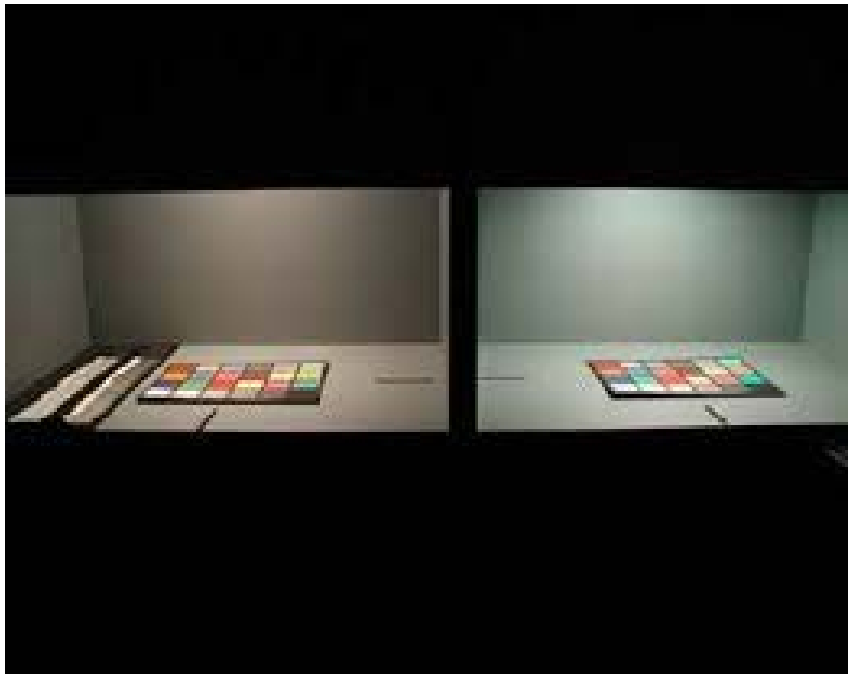
- To be concise is a virtue in a paper provided you can still be complete, although this is a difficult balance to strike. This means your literature review should not contain every paper you ever read on a subject, only those that are relevant to the question you are addressing.

Types of paper

- There are six main types of paper. They are:
  - Hypothesis testing
  - Review
  - Field test
  - Case study
  - Epidemiological
  - Thought

Hypothesis testing

- A hypothesis is a predictive statement of the form “If A then B”
- A hypothesis testing paper needs a good literature review to justify the hypothesis and set it in context
- The experimental design needs to be planned to test the hypothesis
- Converging measurements are more convincing
- Conclusions need to be related to the hypothesis
- Statistical testing is essential



Review Paper

- A review paper is an focussed discussion of a topic. A good review is very valuable
- A review should consider the topic from several different viewpoints
- A review needs to provide both analysis and synthesis
- A review needs to look to the future, not just the past

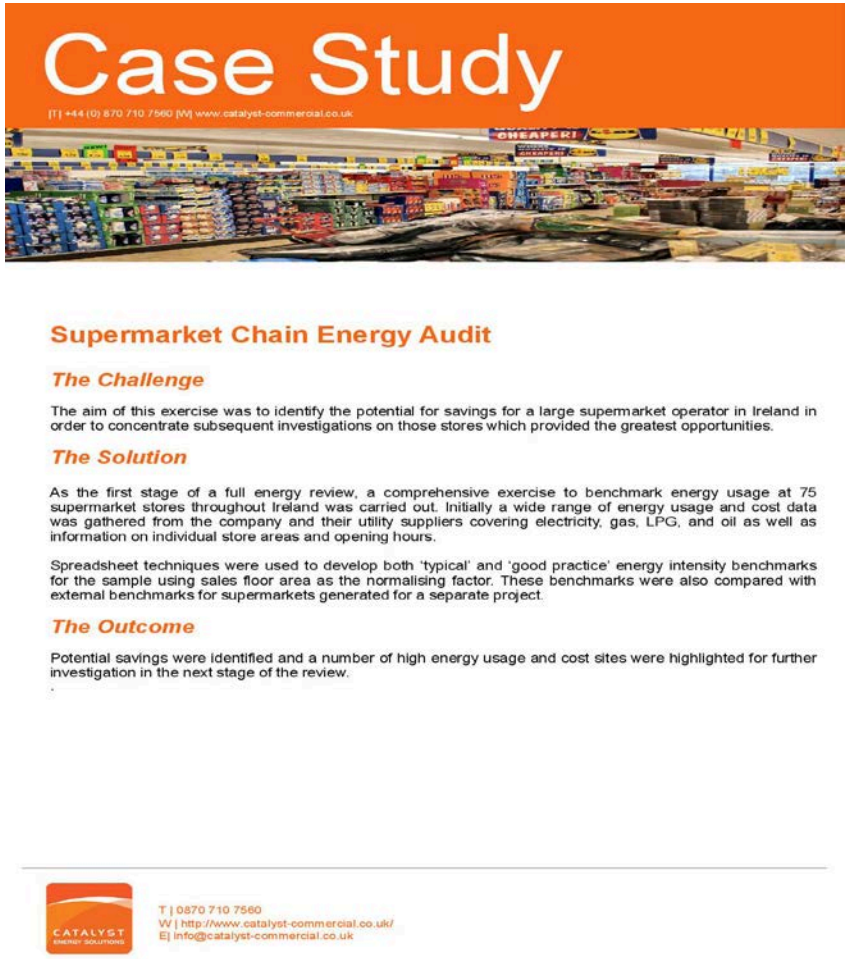
Field Test

- A field test is an experiment conducted to examine if an effect identified in the laboratory still exists in the vagaries of the real world
- Field test papers have to be written and read with caution. The test conditions need to be carefully spelt out and any alternative explanations of the results considered
- Field tests are useful for lighting practice but of limited value for creating understanding

Case study

- Case studies are only of value if they investigate the use of new technology or a new design approach

- There is no point in writing a case study paper on something that has been used extensively



Case Study

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CHEAPER!

Supermarket Chain Energy Audit

The Challenge

The aim of this exercise was to identify the potential for savings for a large supermarket operator in Ireland in order to concentrate subsequent investigations on those stores which provided the greatest opportunities.

The Solution

As the first stage of a full energy review, a comprehensive exercise to benchmark energy usage at 75 supermarket stores throughout Ireland was carried out. Initially a wide range of energy usage and cost data was gathered from the company and their utility suppliers covering electricity, gas, LPG, and oil as well as information on individual store areas and opening hours.

Spreadsheet techniques were used to develop both 'typical' and 'good practice' energy intensity benchmarks for the sample using sales floor area as the normalising factor. These benchmarks were also compared with external benchmarks for supermarkets generated for a separate project.

The Outcome

Potential savings were identified and a number of high energy usage and cost sites were highlighted for further investigation in the next stage of the review.

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Epidemiological

- Epidemiological papers are useful for exploring the consequences of lighting practice, particularly when those consequences may occur years later
- Epidemiological papers usually deal with correlation not cause
- The source of the data being correlated needs to be carefully considered for its reliability and relevance

Thought

- A thought paper is essentially an reasoned argument about the future
- It cannot be simply a series of assertions. There have to be some facts
- A thought paper can direct research into a new direction.

So much for the principles
but what about reality

- In science there are some concepts that are widely recognised but not directly defined. Examples are comfort, well-being and glare
- For these operational definitions are used
- What are the operational definitions of a good paper?

The Good Paper Two-Step

- There are two steps by which you can recognise you have produced a good paper
- The first is to have it published in a quality journal, one that has a track record and is internationally recognised
- The second is for the paper to be widely cited in a positive way, for a long time.

Getting a paper published 1

- What the author(s) have to do
  - Ask people you trust to give you an informal assessment of your paper
  - Check the scope of the journal
  - Look at recent issues to see if you are happy to be seen in such a journal
  - Follow the instructions to authors
  - Submit the paper

Getting a paper published 2

- What the editor has to do
  - Check the paper to confirm it falls within the scope of the journal and is complete
  - Allocate the paper to two or more reviewers. Reviewers are chosen on the basis of their experience in the subject of the paper and their reputation for thoroughness and fairness
  - Chase reviewers to meet deadlines

Getting a paper published 3

- What a reviewer has to do
  - Carry out a thorough review of the paper. This means:
    - Checking that the content is complete and up to date.
    - Checking that the method is understandable and sensible
    - Checking the results are presented clearly and correctly
    - Considering the discussion and alternative explanations
    - Writing a report for the editor and for the author(s)

Getting a paper published 4

- What the editor has to do 2
  - Based on the reviewers' reports make a decision whether to accept the paper as is (very rare) ; accept with minor or major revisions, reject but may resubmit or simply reject
  - Notify the author(s) of the decision with the reviewers' comments that should explain the reasons for the decision

Getting a paper published 5

- If accepted, the author(s) then need to address the reviewers' comments, revise the paper accordingly and resubmit.
- The resubmittal should contain a message indicating the author(s) response to the reviewers' comments, which have been accepted and how, and which have been rejected and why.
- The editor will then make a second decision about publication, sometimes after consulting the reviewers

Getting a paper published 6

- If the paper is now accepted, there is still a lot to do before it will appear in electronic form or in print. Among other things are satisfying the editor about the quality of the figures, correcting the proofs, transferring the copyright

- Then you wait

Getting a paper cited

- Getting your paper cited is largely outside your control unless you go in for self-citation.
- Self-citation is common but excessive use is viewed with suspicion by reviewers and other authors
- To encourage citation, it is necessary for a paper to be easily found and accessible. For this to happen it needs to be listed by search engines and listed in various bibliographies

In summary

- To write a good paper requires
  - Identification of the question to be answered and the audience to be addressed
  - Attention to the four C's
  - A clear idea of what you are trying to say and your reasons for saying it
  - A recognition that others are likely to have worked on this topic and you need to know what they did so as to put your contribution in context
  - A willingness to reveal the limitations of your work and to consider alternative explanations of your results and conclusions

Outcome

- If you do all that you should have produced a good paper
- If you do it many times you will build a reputation for good work
- If you chose your topics carefully you will make a difference