

How to write a paper for Chemical Engineering Science



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BE(Hons), MA, PhD, FTSE, FIChemE

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Outline



- Some background to CES and myself
- To publish or not to publish...
- Writing a quality manuscript
 - Article construction
 - Language
 - Technical details
- Revisions and response to reviewers
- Ethical issues
- Conclusions: some specific thoughts on CES

Chem. Eng. Sci.



The Journal publishes papers on the <u>fundamentals</u> of chemical engineering, including <u>applications</u> of biology, chemistry, and physics. Descriptions of **original and significant results** based on experiments and/or developments in theory are appropriate. Such results may be the outcome of studies that range from the **molecular level to the systems** level.

The scope of industrial activity that defines issues suitable for the journal is interpreted broadly to include biotechnology, chemicals, energy, food, forest products, materials, microelectronics, nanotechnology, and specialty chemicals and pharmaceuticals. Contributions addressing global issues such as water availability, energy utilization, and sustainable resources are especially welcome.

工程学是科学的应用, 科学是工程学的基础

- Tianjin University Museum

Chem. Eng. Sci.



- Founded 1951 in Europe, leader in pace and quality
- 1st Executive Editor P.V. Dankckwerts, 1958-1982
- Executive Editors act independently and report to the Chair (idea of senior scholars disseminating knowledge)
- Impact Factor
 - -2008:1.88
 - -2009: 2.14
- Cited Half life: 8.8 yrs (2008)
- 24 Issues per year

Executive Editors



- Alex Bell, UC Berkeley (Executive Editor and Chairman of the Board)
- Ian Metcalfe, Newcastle University, UK
- Anton Middelberg, University of Queensland, Australia
- Ron Rousseau, Georgia Tech, USA
- Kai Sundmacher, MPI Magdeburg, Germany

My Background



- BE (ChemEng) and PhD, University of Adelaide (UoA), Australia
- Lecturer, Senior Lecturer, UoA 1991-98
- Lecturer, Senior Lecturer, Reader,
 University of Cambridge, 1998-2003
- Fellow of the Cambridge-MIT Institute
- Professor and Federation Fellow, then Premier's Fellow, 2003-present

My Research



- Chemical Engineering
 - Biomolecular Engineering
 - Biopharmaceutical Engineering
 - Vaccine Engineering
 - Biorenewables
- Group of 20 researchers (5 here this

week)











www.uq.edu.au/cbe

My Research







To publish or not to publish...

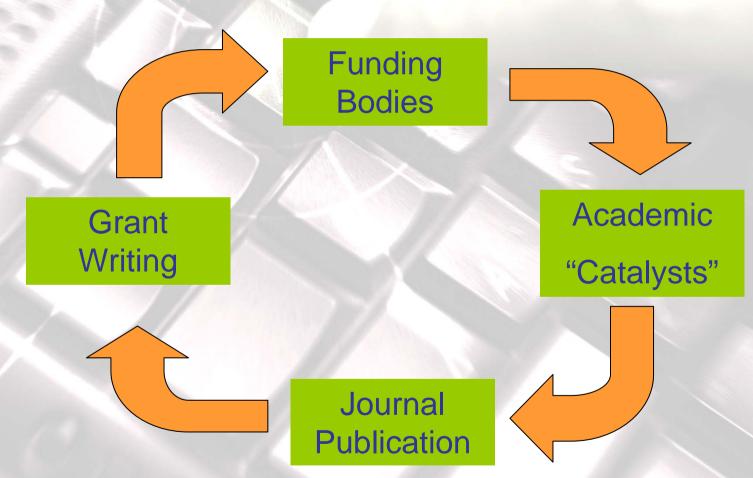
Why publish?



- Engineers publish to share findings that advance knowledge and understanding
 - To present new, original results or methods
 - To rationalize published results
 - To review the field or summarize a particular topic
 - To make your ideas (and yourself) known
 - For the right reasons!

Publish or perish





Publishers do not want zero-cited articles



Editors now regularly analyze citations per article

"The statistic that 27% of our papers were not cited in 5 years was disconcerting. It certainly indicates that it is important to maintain high standards when accepting papers... nothing would have been lost except the CV's of those authors would have been shorter..."

- Marv Bauer, Editor, Remote Sensing of Environment

Publishers do want quality



WANTED

- Originality
- Significant advances in field
- Sound methods and conclusions
- Readability
- Studies that meet ethical standards

NOT WANTED

- Duplications or minor extensions
- Reports of no interest
- Work out of date
- Inappropriate methods or conclusions
- Studies lacking depth of analysis or data



"Just because it has not been done before is no justification for doing it now."

Peter Attiwill, Editor-in-Chief, Forest
 Ecology and Management

Is the problem significant and is the study interesting to the journal's readers?





- Have you done something new and interesting?
- Have you checked the latest results in the field?
- Have the findings been verified?
- Have the appropriate controls been performed?
- Do your findings tell a nice story or is the story incomplete?
- Is the work directly related to a current hot topic?
- Have you provided solutions to any difficult problems?

If all answers are "yes", then start preparing your manuscript.



DO NOT gamble by scattering your manuscript to many journals

Only submit once!

Do not publish minor variations!!

International ethics standards prohibit multiple simultaneous submissions, and editors DO find out!



Consulting the Guide for Authors will save your time and the editor's

All editors hate wasting time on poorly prepared manuscripts

It is a sign of disrespect



Writing a quality manuscript

Article construction

Article structure



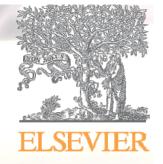
- Title
- Authors
- Abstract
- Keywords

Need to be accurate and informative for effective indexing and searching

- Main text (IMRaD)
 - Introduction
 - Methods
 - Results
 - <u>Discussion</u> (Conclusion)
- Acknowledgements
- References
- Supplementary material

Each has a distinct function

Title



A good title should contain the fewest possible words that adequately describe the contents of a paper

DO

Convey main findings of research

Be specific

Be concise

Be complete

Attract readers

DON'T

Use unnecessary jargon

Use uncommon abbreviations

Use ambiguous terms

Use unnecessary detail

Focus on part of the content only

Title



Preparation of a miglyol-based emulsion in phosphate buffered saline using peptide surfactant AM1 in the controlled shear environment of a confined flow yields stable drug delivery emulsion.



Novel nanomeulsion preparation for drug delivery

Microfluidic preparation of oil-in-water drug delivery emulsions stabilised with biocompatible surfactant

"SAEF" Abstract



Types:

Start by clearly stating the topic being addressed and indicating its importance

Avoid over-reaching claims of significance and also being too narrow

Elaborate on the opening by explaining the specifics of your study; what have you done, how, and what did you discover?

Finish by stating your conclusions and why they are significant

The abstract is critical for reviewers – make it interesting!

Abstract



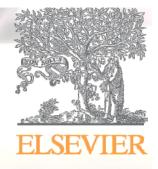
The quality of an abstract will strongly influence the editor's and reviewers

A good abstract:

- Is precise and honest
- Can stand alone
- Uses no technical jargon
- Is brief and specific
- Cites no references

Use the abstract to "sell" your article

Abstract



Carbon dioxide (CO2) and methane (CH4) are considered to be major greenhouse gases that have a direct impact on the world's atmosphere. It is critical that effective separation and capture technologies be developed to reduce the amount of greenhouse gases into our environment. Present liquid and solid capture and separation technologies cannot realize the regeneration of the saturated solution/adsorbent at ambient temperature (25 degrees C), which is a critical feature for the proper operation of these types of pressure swing systems. The present study uses triethanolamine (TEA) to modify the surface of SBA-15 and the resulted adsorbent showed promising performance in separating CO2 from its mixture with CH4. TEA did not change the ordered structure of SBA-15, but to enhance its selectivity for CO2. The modification enlarged the difference between the equilibrium adsorption of CO2 and that of other gases. The separation coefficient between CO2 and CH4, evaluated on the basis of breakthrough curves, enlarged to as much as more than seven times due to the modification. In addition, the modification allowed the adsorption of CO2 reversible, and the saturated adsorbent was regenerated at the ambient temperature either by purging it with the purified gas or by vacuuming. Repeated adsorption/regeneration experiments proved the stability of the separation performance of the adsorbent. Perhaps add a broad concluding statement, if appropriate.

Liu XW (Liu, Xiuwu), Zhou L (Zhou, Li), Fu X (Fu, Xin), Sun Y (Sun, Yan), Su W (Su, Wei), Zhou YP (Zhou, Yaping)

Introduction



Provide the necessary background information to put your work into context

It should be clear from the introduction:

- Why the current work was performed
 Aims and significance
- What has been done before
- What was done and achieved (in brief terms)

Be comprehensive in coverage of approaches, but also try to be brief.

Do not simply catalog papers and ideas!

Introduction



DO

- •"Set the scene"
- •Outline "the problem" and hypotheses, and frame these within the existing literature
- •Ensure that the literature cited is balanced, up to date and relevant
- Define any non-standard abbreviations and jargon

Introduction



DON'T

- Write an extensive review of the field
- •Cite disproportionately your own work, work of colleagues or work that supports your findings while ignoring contradictory studies or work by competitors
- Describe methods, results or conclusions other than to outline what was done and achieved in the final paragraph
- Overuse terms like "novel" and "for the first time"

Methods



The Methods section must provide sufficient information so that a knowledgeable reader can reproduce the experiment

List suppliers of reagents and manufacturers of equipment, and define apparatus in familiar terms:

"using an AD 340C plate reader (Beckman Coulter)"

OR

"using a plate reader (Beckman Coulter AD 340C)

NOT

"using a Beckman Coulter AD 340C."

Results



The main findings of the research

DO

- •Use figures and tables to summarize data
- •Show the results of statistical analysis
- •Compare "like with like"

DON'T

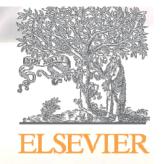
- •Duplicate data among tables, figures and text
- •Use graphics to illustrate data that can easily be summarized with text

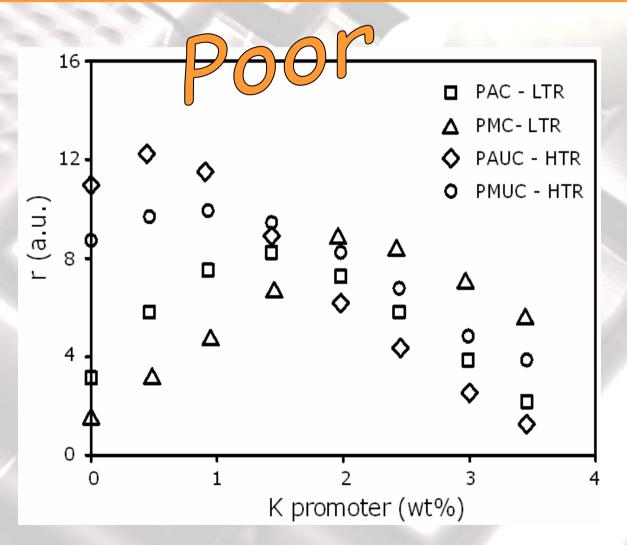


Figures and tables are the most effective way to present results

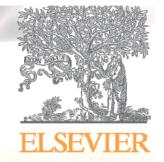
BUT:

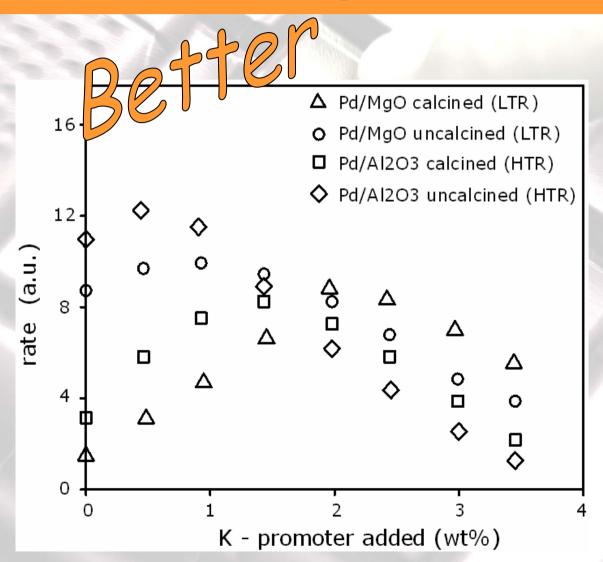
- •Captions should be able to stand alone, such that the figures and tables are understandable without the need to read the entire manuscript
- The data represented should be easy to interpret
- Colour should only be used when necessary





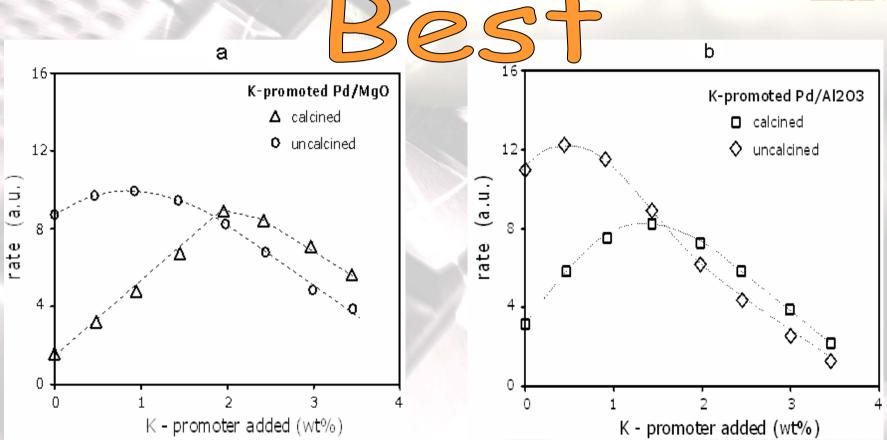
- Legend is poorly defined
- •Graph contains too much data
- No trend lines





•Legend is well defined but there is still too much data and no trendlines





- Legend is clear
- Data is better organized
- Trend lines are present

Discussion



Describe

- •How the results relate to the study's aims and hypotheses
- How the findings relate to those of other studies
- •All possible interpretations of your findings
- Limitations of the study

Avoid

 Making "grand statements" that are not supported by the data

Example: "This novel treatment will massively reduce the cost of azeotropic distillation"

Introducing new results or terms

Conclusion



Put your study into **CONTEXT**

Describe how it represents an advance in the field Suggest future experiments

BUT

Avoid repetition with other sections

Avoid being overly speculative

Don't over-emphasize the impact of your study

Do not use dot points

Acknowledgements



Acknowledge anyone who has helped you with the study, including:

- •Researchers who supplied materials or reagents,
- •Anyone who helped with the writing or English, or offered critical comments about the content
- Anyone who provided technical help

State why people have been acknowledged and ask their permission

Acknowledge sources of funding, including any grant or reference numbers

References



Use the CES Journal style (see authors guide)

Check

- Spelling of author names
- Punctuation
- •Number of authors to include before using "et al."
- Reference style

Avoid

- Personal communications, unpublished observations and submitted manuscripts not yet accepted
- •Citing articles published only in the local language
- Excessive self-citation and journal self-citation
- Missing references

Supplementary material



Information related to and supportive of the main text, but of secondary importance

Includes:

- •Important data
- Method validation
- New derivations
- Additional controls
- Video footage

Will be available online when the manuscript is published



Writing a quality manuscript

Language



"Journal editors, overloaded with quality manuscripts, may make decisions on manuscripts based on formal criteria, like grammar or spelling. Don't get rejected for avoidable mistakes; make sure your manuscript looks perfect"

Arnout Jacobs, Elsevier Publishing

Thus, both the science and the language need to be sound

The three "C"s



Good writing possesses the following three "C"s:

- Clarity
- Conciseness
- Correctness (accuracy)

The key is to be as brief and specific as possible without omitting essential details

Know the enemy



Good writing avoids the following traps:

- Repetition
- Redundancy
- Ambiguity
- Exaggeration
- Circularity of argument
- Poor ideas structure

These are common annoyances for editors

Repetition and redundancy



Vary the sentences used when writing the abstract or describing findings at the end of the introduction

Don't copy from other sections verbatim!

Avoid words with the same meaning

In addition, images were also captured with ...

After flotation, particles were then...

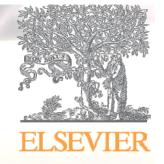
Repetition and redundancy



Avoid circular sentences

In order to examine differences in particle collection efficiency, collected foam was diluted and solutions were subjected to light scattering, to size particles and thus determine particle attachment yield.

The reason for the experiment is described twice, in slightly different terms



Ambiguity

Ensure correct use of "which", commas and hyphens

"extreme pressure homogenisation"

has a different meaning from

"extreme-pressure homogenisation"

In "To capture images of bubble density, we performed video capture, using a high-speed camera" The second comma should be deleted

Ambiguity



Ensure correct use of "which", commas and hyphens

In "Data were normalised to the internal reference housekeeping gene actin, which showed..."

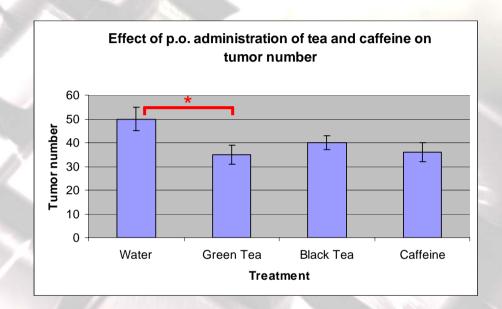


The "which" is used incorrectly, referring to actin rather than to the normalisation of data

"Data were normalised to the internal reference housekeeping gene actin, revealing that..." is correct

Exaggeration





"There was a massive decrease in the number of tumors following p.o. administration of green tea"

Beware of exaggeration but do indicate significance

Other common traps



Inconsistent tense – don't mix tenses in the same sentence

Before drugs were encapsulated, layer-by-layer electrolytes are...

Inconsistent use of plural or singular

In eight experiments, a sample from the riser of the airlift reactor was taken



In eight experiments, samples from the riser of the airlift reactor were taken

Other common traps



Incorrect use of etc. / and so on

"The two groups of data were compared using a variety of statistical methods including a t-test, chi squared analysis, etc."

It is important here to define the tests used as they are particular to the paper, not part of a natural series and not obvious to the reader

Language Editing Services



Your manuscript is precious, invest in it

- Specialist scientific language editing services are commercially available to polish the language in your manuscript prior to journal submission
- Rates start from \$8 per page

More information can be found on the Elsevier website at:

http://www.elsevier.com/wps/find/authorsview.authors/languagepolishing

Use of an English-language editing service listed here is not mandatory, and will not guarantee acceptance for publication in Elsevier journals



Writing a quality manuscript

Technical details

Layout



- Keep line spacing, font and font size consistent throughout
- double-spaced 12-point Times New Roman or Arial is preferred
- Use consistent heading styles throughout and no more than three levels of heading
- Number the pages
- Order and title sections as instructed in the Guide for Authors – Figure and Table sections are normally together following References
- •Ensure references are complete

Length



Think about the reviewer -

- 20-40 pages is optimal
- how long would it take you to review an 80-page manuscript?
- Editor will ask you to shorten it (or simply reject)

Be selective in data inclusion -

- will pages of CFD output be informative?
- sufficient data to support your assertions

Cover letter



- This is your chance to speak to the editor directly
- Keep it brief, but convey the particular importance of your manuscript to the journal
- What is the significance?
- Suggest potential reviewers (not from the same institution!)

This is your chance to convince the editor that they should send your paper for review

Cover letter



Include:

- Editor name Address to journal editor, not generic
- First sentence provide title, author list and journal name
- Briefly describe:
 - your research area and track record
 - the main findings of your research
 - the significance of your research
- Confirm the originality of the submission
- Confirm that there are no competing financial interests



Revisions and Response to Reviewers

Final checks



Revision before submission can prevent early rejection What can I do to ensure my paper is in the best possible state prior to submission?

- Ask colleagues to take a look and be critical
- •Check that everything meets the requirements set out in the Guide for Authors – again!
- Check that the scope of the paper is appropriate for the selected journal
- •Check the paper passes the "interesting" test

Final checks



Revision before submission can prevent early rejection What can I do to ensure my paper is in the best possible state prior to submission?

- •If necessary, get a colleague or approved editing service to improve the language and ensure that the manuscript possesses the three "C"s
- •Ensure that the literature cited is balanced and that the aims and purpose of the study, and the significance of the results, are clear
- Use a spellchecker



Carefully study the reviewers' comments and prepare a detailed letter of response

- •Respond to all points; even if you disagree with a reviewer, provide a polite, scientifically solid rebuttal rather than ignore their comment.
 - •Paper may be sent back to the reviewer!
- •Include a marked version showing changes, if requested
- •Perform additional calculations, computations, or experiments if required; these usually serve to make the final paper stronger. Put these into the paper, not just the rebuttal.



The reviewer is clearly ignorant of the work of Bonifaci et al. (2008) showing that the electric field strength in the ionization zone of the burned corona is less than the space charge free field before the corona onset....



Thank you for your comment. However, we feel that the assumption in our model is supported by recent work by Bonifaci et al. (2008), who showed that the electric field strength in the ionization zone of the burned corona is less than the space charge free field before the corona onset





- •State specifically what changes you have made to address the reviewers' comments, mentioning the page and line numbers where changes have been made, or referring to the marked copy
- •Avoid repeating the same response over and over; if a similar comment is made by multiple people explain your position once and refer back to your earlier response in responses to other reviewers or the editor



Clearly differentiate responses from reviewers' comments by using a different font style

Reviewer's Comments: It would also be good to acknowledge that geographic routing as you describe it is not a complete routing solution for wireless networks, except for applications that address a region rather than a particular node. Routing between nodes requires further machinery, which detracts from the benefits of geographic routing, and which I don't believe you have made practical.

Author's reply: We agree and will add an appropriate caveat. Note that for data-centric storage (name-based exact-match and range queries for sensed events), the storage and query processing mechanisms "natively" address packets geographically – without a "node-to-location" database.

Dr. Ramesh Govindan, Professor, Computer Science Department, University of Southern California

Accepting rejection



Don't take it personally!

- Try to understand why the paper has been rejected
- •Evaluate honestly will your paper meet the journal's requirements with the addition of more data or is another journal more appropriate?
- •Don't resubmit elsewhere without significant revisions addressing the reasons for rejection and checking the new Guide for Authors

Accepting rejection



Suggested strategy for submitting elsewhere:

- •In your cover letter, declare that the paper was rejected and name the journal
- Include the referees' reports and show how each comment has been addressed
- •Explain why you are submitting the paper to this journal; is it a more appropriate journal?



Ethical Issues





Unethical behavior "can earn rejection and even a ban from publishing in the journal"

Terry M. Phillips, Editor, Journal of Chromatography B

Unethical behavior includes:

- Multiple submissions
- Redundant publications
- Plagiarism
- Data fabrication and falsification
- •Improper use of human subjects and animals in research
- Improper author contribution

Multiple submissions



Multiple submissions save your time but waste editors'

The editorial process of your manuscripts will be completely stopped if the duplicated submissions are discovered

"It is considered to be unethical...We have thrown out a paper when an author was caught doing this. I believe that the other journal did the same thing"

James C. Hower, Editor, *International Journal of Coal Geology*

Multiple submissions



Competing journals constantly exchange information on suspicious papers

You should not send your manuscripts to a second journal UNTIL you receive the final decision from the first journal

DON'T DO IT!!

Redundant publication



An author should not submit for consideration in another journal a previously published paper

- Published studies do not need to be repeated unless further confirmation is required
- •Previous publication of an abstract during the proceedings of conferences does not preclude subsequent submission for publication, but full disclosure should be made at the time of submission

Redundant publication



- •Re-publication of a paper in another language is acceptable, provided that there is full and prominent disclosure of its original source at the time of submission
- •At the time of submission, authors should disclose details of related papers, even if in a different language, and similar papers *in press*

Plagiarism



"Plagiarism is the appropriation of another person's ideas, processes, results, or words without giving appropriate credit, including those obtained through confidential review of others' research proposals and manuscripts"

Federal Office of Science and Technology Policy, 1999

Plagiarism



"Presenting the data or interpretations of others without crediting them, and thereby gaining for yourself the rewards earned by others, is theft, and it eliminates the motivation of working scientists to generate new data and interpretations"

Bruce Railsback, Professor, Department of Geology, University of Georgia

For more information on plagiarism and self-plagiarism, please see: http://facpub.stjohns.edu/~roigm/plagiarism/

Plagiarism



Plagiarism is a serious offence that could lead to paper rejection, academic charges and termination of employment. It will seriously affect your scientific reputation

DON'T DO IT!

Unacceptable paraphrasing, even with correct citation, is considered plagiarism

Paraphrasing



Original (Gratz, 1982):

Bilateral vagotomy resulted in an increase in tidal volume but a depression in respiratory frequency such that total ventilation did not change.

Restatement 1:

Gratz (1982) showed that bilateral vagotomy resulted in an increase in tidal volume but a depression in respiratory frequency such that total ventilation did not change.



Ronald K. Gratz. *Using Other's Words and Ideas*.

Department of Biological Sciences, Michigan Technological University

Data fabrication and falsification



- Fabrication is making up data or results, and recording or reporting them
- Falsification is manipulating research materials, equipment, processes; or changing / omitting data or results such that the research is not accurately represented in the research record

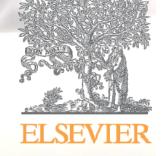
"The most dangerous of all falsehoods is a slightly distorted truth"

G.C. Lichtenberg (1742–1799)

Unethical research

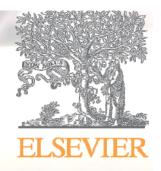


- Experiments on human subjects or animals should follow related ethical standards, namely, the Helsinki Declaration of 1975, as revised in 2000 (5)
- If doubt exists concerning the compliance of the research with the Helsinki Declaration, authors must explain the rationale for their approach and demonstrate approval from the institutional review body



Conclusion Some Specific Thoughts on Chem. Eng. Sci.

Chem. Eng. – Trends



- Smaller, faster, better processing
- Processing across multiple scales from molecule to process to system
- Sustainability and the challenges we face globally – energy, water, climate, environment
- Life science interface
- Modern materials
- Computational interpretation of experiments

CES – "Hot" Topics



- All of the preceding areas, including
 - Confined flows (microfluidics)
 - Biomolecular engineering
 - Multi-scale complexity
 - Energy, Water, Environment
 - New tools (e.g NMR) for better processes
 - Fundamental advances in the science core of chemical engineering

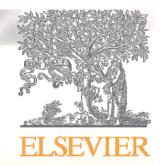
... and anything that is interesting to the readers

CES – "Cold" topics



- Old problems (e.g., experimental distillation of ethanol and water in conventional columns)
- Trivial case studies
- Straightforward application of the discipline core
- CFD studies that lack novelty & interest
- Poorly thought out or uninteresting work
- Studies that are not chemical engineering

Recent "hot" papers



Nanostructures for enzyme stabilization

Sorption-enhanced steam reforming of methane in a fluidized bed reactor with dolomite as CO2-acceptor

Computational fluid dynamics (CFD) modeling of spouted bed: Assessment of drag coefficient correlations

Desulfurization of diesel using ionexchanged zeolites

Predictive control of particle size distribution in particulate processes

Mass transport and surface reactions in microfluidic systems

A miniaturized methanol reformer with Si-based microreactor for a small PEMFC

Theory or Application?



- Either, or preferably both
- Avoid trivial application:
 - Is the application novel and interesting (nonobvious, or easily done?)
- For application, avoid simple parametric studies ("Effect of stirrer speed on ...")
- Application of old theory in a new way can be very exciting
- Re-inventing old studies is not ethical

What Excites Interest?



- Well written manuscript in a hot field or with a clear new contribution to the core discipline
- A very well written abstract (excites referee)
- Figures that convey a clear and interesting story
- A well balanced introduction, fully cited

What does not?



"The effect of stirring speed on the anaerobic digestion of pig waste"

"A re-evaluation of the ethanol-water azeotrope reveals a 1% error in the pinch point ethanol concentration"

Major enhancement of DNA sequence speed by re-engineering the optical efficiency of fluorescence detection"

What gets you accepted?



Attention to details

Check and double check your work (perhaps with a colleague)

Consider the reviews and change your paper based on them

English must be good (use a review service)

Presentation, structure and clarity of ideas are important

Take time on the introduction and especially the abstract

Acknowledge those who have helped you

New, original, previously unpublished and interesting

Critically evaluate your own manuscript

Ethical rules must be obeyed

- adapted from Nigel John Cook, Ore Geology Reviews

Initially Developed for Elsevier by the Edanz Group







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