Part III: What is a Scientific Paper

Lecture 4,5: ***In this section we will learn (a) what is a scientific paper; (b) what are the building blocks of a scientific paper or thesis; and (c) what are the information we should write to each one of these building blocks***

Co-funded by the
Erasmus+ Programme
of the European Union

Part III: What is a Scientific Paper

- "Interesting and unpublished" is equivalent to "non-existent"

Co-funded by the
Erasmus+ Programme
of the European Union

Part III: What is a Scientific Paper

- It is a form of communication
- Share your Results and Promote the building of new knowledge & Advancement of Science
- Building your confidence & ego after getting criticism back from the reviewers
- Getting a Reputation in the field
- Get an Academic Job
- Help your lab get funding
- Satisfy grant requirements
- Publishing is the Academics' currency (number and impact of your publications)

Co-funded by the
Erasmus+ Programme
of the European Union

Part III: What is a Scientific Paper

- A technical paper is a **coherent** and **formal** presentation of a research work
- **Characteristics** of a technical paper or thesis are:
  1. Written Clearly
  2. Use formal expressions
  3. Verbose and rhetoric expressions should be avoided

Co-funded by the
Erasmus+ Programme
of the European Union

Part III: What is a Scientific Paper

Monthly Technical Report

(Due to AQRP Project Manager on the 8th day of the month following the last day of the reporting period.)

PROJECT TITLE	Quantification of Industrial Emissions of VOCs, NO2 and SO2 by SOF and mobile DOAS	**PROJECT NUMBER**	10-006
PROJECT PARTICIPANTS (Enter all institutions with Task Orders for this Project)	Chalmers University of Technology University of Houston (UH)	**DATE SUBMITTED**	04/08/11
REPORTING PERIOD	**From: February 16, 2011 To: March 31, 2011**	**REPORT NUMBER**	1
Invoice Number that accompanies this Report:		**Chalmers:** 50029620 **UH:** 1-53934	
Amount of funds spent during this reporting period:		**Chalmers:** $11,688.00 **UH:** $48,310.13	

Detailed Accomplishments by Task *(Include all Task actions conducted during the reporting month.)*

Task1: *Preparatory phase*

In the first phase of the project we have prepared for the campaigns.
On the Chalmers side, this work includes logistical planning and instrument preparation for the campaigns. The technical work includes an improved optical setup for the SOF instrument and acquiring and setting up a telescope and a special holder for the SOF FTIR spectrometer for thermal emission measurements. In addition, the retrieval algorithms for the DOAS have been developed for real time analysis. The instruments were packed and shipped by air from Sweden to Houston at the end of March 2011.

On the UH side the work includes installation of the shell, suspension and electrical modifications on the truck. Inside the shell the racks (1 with lift mechanism) have been built and secured, the air conditioner installed, and the electrical system (4 marine batteries, 1800W 120V inverter, 1800W 230V inverter, 600W 120V inverter) is operational and charging from the secondary alternator. Inside the truck three laptop mounts have been installed, along with a remote control panel for the 3 inverters and alternator, and a NHTSA compliant passenger airbag shutoff switch (to prevent airbag deployment when computers are in front of the instrument operator). Installation of the weather station on the front of the truck, 4G router, vehicle lettering, and back up camera system. The meteorological tower is being put together. iMet radiosondes (iMet-1-AB 403 MHz GPS radiosondes) as well as corresponding de-reelers, balloons, and parachutes and delivered to UH. It has been tested as a system.

Co-funded by the Erasmus+ Programme of the European Union

Part III: What is a Scientific Paper

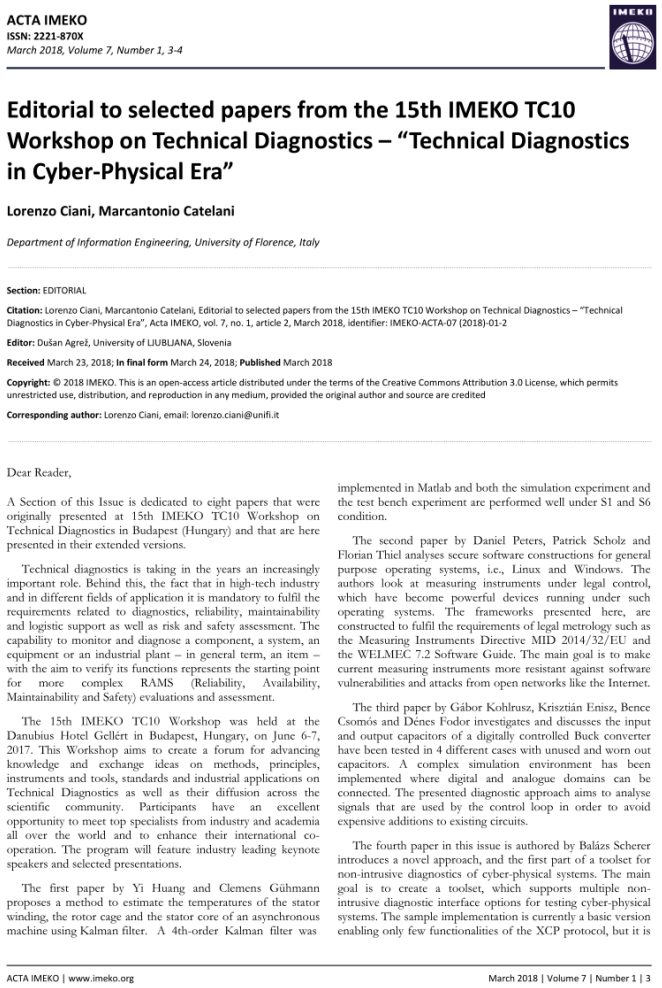
A technical report characteristics

1. For internal use

2. To outline early research ideas

Co-funded by the
Erasmus+ Programme
of the European Union

Part III: What is a Scientific Paper



ACTA IMEKO
ISSN: 2221-870X
March 2018, Volume 7, Number 1, 3-4

Editorial to selected papers from the 15th IMEKO TC10 Workshop on Technical Diagnostics – "Technical Diagnostics in Cyber-Physical Era"

Lorenzo Ciani, Marcantonio Catelani

Department of Information Engineering, University of Florence, Italy

Section: EDITORIAL

Citation: Lorenzo Ciani, Marcantonio Catelani, Editorial to selected papers from the 15th IMEKO TC10 Workshop on Technical Diagnostics – "Technical Diagnostics in Cyber-Physical Era", Acta IMEKO, vol. 7, no. 1, article 2, March 2018, identifier: IMEKO-ACTA-07 (2018)-01-2

Editor: Dušan Agrež, University of LJUBLJANA, Slovenia

Received March 23, 2018; **In final form** March 24, 2018; **Published** March 2018

Copyright: © 2018 IMEKO. This is an open-access article distributed under the terms of the Creative Commons Attribution 3.0 License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited

Corresponding author: Lorenzo Ciani, email: lorenzo.ciani@unifi.it

Dear Reader,

A Section of this Issue is dedicated to eight papers that were originally presented at 15th IMEKO TC10 Workshop on Technical Diagnostics in Budapest (Hungary) and that are here presented in their extended versions.

Technical diagnostics is taking in the years an increasingly important role. Behind this, the fact that in high-tech industry and in different fields of application it is mandatory to fulfil the requirements related to diagnostics, reliability, maintainability and logistic support as well as risk and safety assessment. The capability to monitor and diagnose a component, a system, an equipment or an industrial plant – in general term, an item – with the aim to verify its functions represents the starting point for more complex RAMS (Reliability, Availability, Maintainability and Safety) evaluations and assessment.

The 15th IMEKO TC10 Workshop was held at the Danubius Hotel Gellért in Budapest, Hungary, on June 6-7, 2017. This Workshop aims to create a forum for advancing knowledge and exchange ideas on methods, principles, instruments and tools, standards and industrial applications on Technical Diagnostics as well as their diffusion across the scientific community. Participants have an excellent opportunity to meet top specialists from industry and academia all over the world and to enhance their international co-operation. The program will feature industry leading keynote speakers and selected presentations.

The first paper by Yi Huang and Clemens Gühmann proposes a method to estimate the temperatures of the stator winding, the rotor cage and the stator core of an asynchronous machine using Kalman filter. A 4th-order Kalman filter was implemented in Matlab and both the simulation experiment and the test bench experiment are performed well under S1 and S6 condition.

The second paper by Daniel Peters, Patrick Scholz and Florian Thiel analyses secure software constructions for general purpose operating systems, i.e., Linux and Windows. The authors look at measuring instruments under legal control, which have become powerful devices running under such operating systems. The frameworks presented here, are constructed to fulfil the requirements of legal metrology such as the Measuring Instruments Directive MID 2014/32/EU and the WELMEC 7.2 Software Guide. The main goal is to make current measuring instruments more resistant against software vulnerabilities and attacks from open networks like the Internet.

The third paper by Gábor Kohlrusz, Krisztián Enisz, Bence Csomós and Dénes Fodor investigates and discusses the input and output capacitors of a digitally controlled Buck converter have been tested in 4 different cases with unused and worn out capacitors. A complex simulation environment has been implemented where digital and analogue domains can be connected. The presented diagnostic approach aims to analyse signals that are used by the control loop in order to avoid expensive additions to existing circuits.

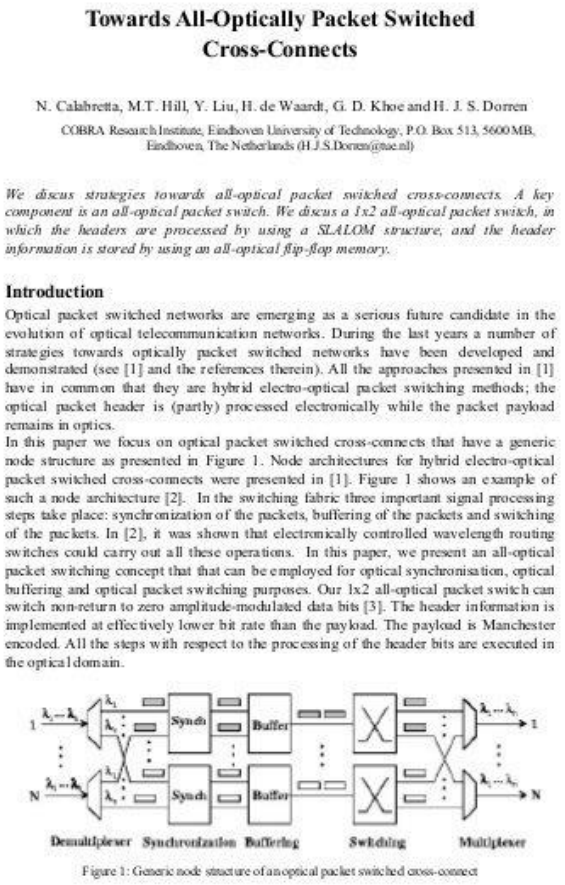
The fourth paper in this issue is authored by Balázs Scherer introduces a novel approach, and the first part of a toolset for non-intrusive diagnostics of cyber-physical systems. The main goal is to create a toolset, which supports multiple non-intrusive diagnostic interface options for testing cyber-physical systems. The sample implementation is currently a basic version enabling only few functionalities of the XCP protocol, but it is

A workshop paper characteristics are the following :

1. To present early acquired results
2. A workshop paper is usually in conjunction with a conference

Co-funded by the Erasmus+ Programme of the European Union

Part III: What is a Scientific Paper



Towards All-Optically Packet Switched Cross-Connects

N. Calabretta, M.T. Hill, Y. Liu, H. de Waardt, G. D. Khoe and H. J. S. Dorren

COBRA Research Institute, Eindhoven University of Technology, P.O. Box 513, 5600 MB, Eindhoven, The Netherlands (H.J.S.Dorren@tue.nl)

We discus strategies towards all-optical packet switched cross-connects. A key component is an all-optical packet switch. We discus a 1x2 all-optical packet switch, in which the headers are processed by using a SLALOM structure, and the header information is stored by using an all-optical flip-flop memory.

Introduction

Optical packet switched networks are emerging as a serious future candidate in the evolution of optical telecommunication networks. During the last years a number of strategies towards optically packet switched networks have been developed and demonstrated (see [1] and the references therein). All the approaches presented in [1] have in common that they are hybrid electro-optical packet switching methods; the optical packet header is (partly) processed electronically while the packet payload remains in optics.

In this paper we focus on optical packet switched cross-connects that have a generic node structure as presented in Figure 1. Node architectures for hybrid electro-optical packet switched cross-connects were presented in [1]. Figure 1 shows an example of such a node architecture [2]. In the switching fabric three important signal processing steps take place: synchronization of the packets, buffering of the packets and switching of the packets. In [2], it was shown that electronically controlled wavelength routing switches could carry out all these operations. In this paper, we present an all-optical packet switching concept that that can be employed for optical synchronisation, optical buffering and optical packet switching purposes. Our 1x2 all-optical packet switch can switch non-return to zero amplitude-modulated data bits [3]. The header information is implemented at effectively lower bit rate than the payload. The payload is Manchester encoded. All the steps with respect to the processing of the header bits are executed in the optical domain.

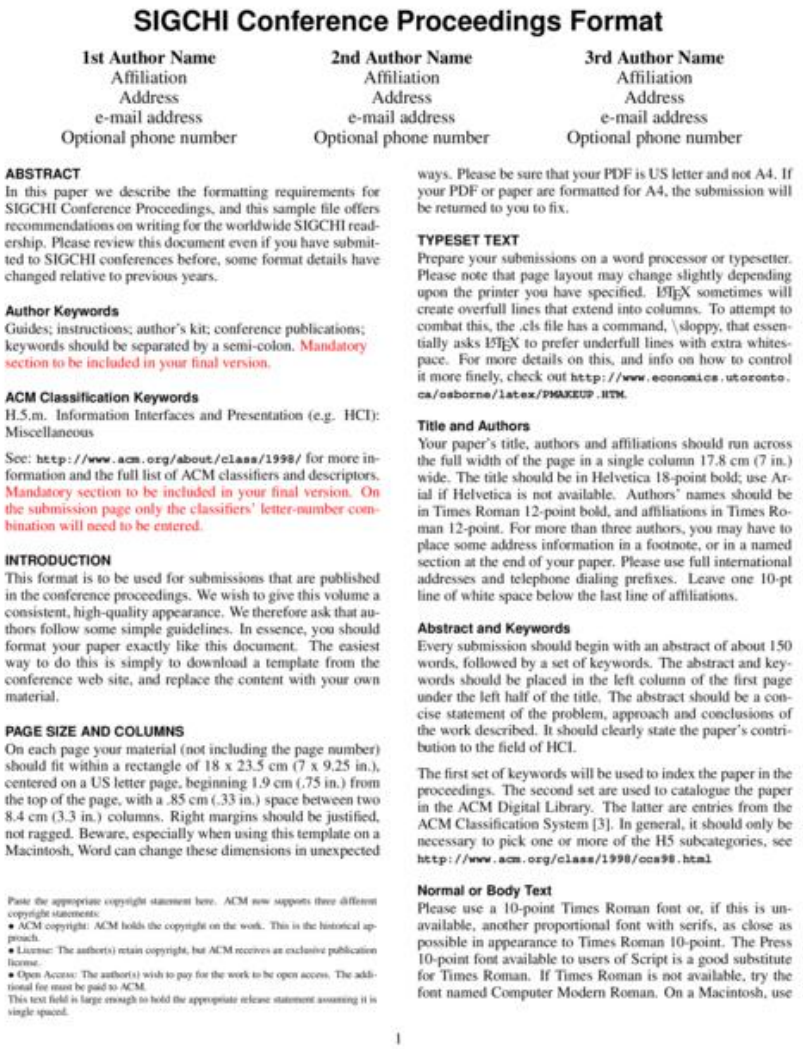
Figure 1: Generic node structure of an optical packet switched cross-connect

The main characteristics of a **Symposium Paper** are:

1. More mature than workshop papers
2. Are held independent of any conference session

Co-funded by the Erasmus+ Programme of the European Union

Part III: What is a Scientific Paper



SIGCHI Conference Proceedings Format

1st Author Name
Affiliation
Address
e-mail address
Optional phone number

2nd Author Name
Affiliation
Address
e-mail address
Optional phone number

3rd Author Name
Affiliation
Address
e-mail address
Optional phone number

ABSTRACT
In this paper we describe the formatting requirements for SIGCHI Conference Proceedings, and this sample file offers recommendations on writing for the worldwide SIGCHI readership. Please review this document even if you have submitted to SIGCHI conferences before, some format details have changed relative to previous years.

Author Keywords
Guides; instructions; author's kit; conference publications; keywords should be separated by a semi-colon. Mandatory section to be included in your final version.

ACM Classification Keywords
H.5.m. Information Interfaces and Presentation (e.g. HCI): Miscellaneous

See: http://www.acm.org/about/class/1998/ for more information and the full list of ACM classifiers and descriptors. Mandatory section to be included in your final version. On the submission page only the classifiers' letter-number combination will need to be entered.

INTRODUCTION
This format is to be used for submissions that are published in the conference proceedings. We wish to give this volume a consistent, high-quality appearance. We therefore ask that authors follow some simple guidelines. In essence, you should format your paper exactly like this document. The easiest way to do this is simply to download a template from the conference web site, and replace the content with your own material.

PAGE SIZE AND COLUMNS
On each page your material (not including the page number) should fit within a rectangle of 18 x 23.5 cm (7 x 9.25 in.), centered on a US letter page, beginning 1.9 cm (.75 in.) from the top of the page, with a .85 cm (.33 in.) space between two 8.4 cm (3.3 in.) columns. Right margins should be justified, not ragged. Beware, especially when using this template on a Macintosh, Word can change these dimensions in unexpected ways. Please be sure that your PDF is US letter and not A4. If your PDF or paper are formatted for A4, the submission will be returned to you to fix.

TYPESET TEXT
Prepare your submissions on a word processor or typesetter. Please note that page layout may change slightly depending upon the printer you have specified. LaTeX sometimes will create overfull lines that extend into columns. To attempt to combat this, the .cls file has a command, \sloppy, that essentially asks LaTeX to prefer underfull lines with extra whitespace. For more details on this, and info on how to control it more finely, check out http://www.economics.utoronto.ca/osborne/latex/PMAKEUP.HTM.

Title and Authors
Your paper's title, authors and affiliations should run across the full width of the page in a single column 17.8 cm (7 in.) wide. The title should be in Helvetica 18-point bold; use Arial if Helvetica is not available. Authors' names should be in Times Roman 12-point bold, and affiliations in Times Roman 12-point. For more than three authors, you may have to place some address information in a footnote, or in a named section at the end of your paper. Please use full international addresses and telephone dialing prefixes. Leave one 10-pt line of white space below the last line of affiliations.

Abstract and Keywords
Every submission should begin with an abstract of about 150 words, followed by a set of keywords. The abstract and keywords should be placed in the left column of the first page under the left half of the title. The abstract should be a concise statement of the problem, approach and conclusions of the work described. It should clearly state the paper's contribution to the field of HCI.

The first set of keywords will be used to index the paper in the proceedings. The second set are used to catalogue the paper in the ACM Digital Library. The latter are entries from the ACM Classification System [3]. In general, it should only be necessary to pick one or more of the H5 subcategories, see http://www.acm.org/class/1998/ccs98.html

Normal or Body Text
Please use a 10-point Times Roman font or, if this is unavailable, another proportional font with serifs, as close as possible in appearance to Times Roman 10-point. The Press 10-point font available to users of Script is a good substitute for Times Roman. If Times Roman is not available, try the font named Computer Modern Roman. On a Macintosh, use

Paste the appropriate copyright statement here. ACM now supports three different copyright statements:
• ACM copyright: ACM holds the copyright on the work. This is the historical approach.
• License: The author(s) retain copyright, but ACM receives an exclusive publication license.
• Open Access: The author(s) wish to pay for the work to be open access. The additional fee must be paid to ACM.
This text field is large enough to hold the appropriate release statement assuming it is single spaced.

1

The main characteristics of a **Conference Paper** are:

1. More mature and longer in size than symposium and workshop papers
2. It is considered as a publication within your CV
3. Included into the conference proceedings

Co-funded by the Erasmus+ Programme of the European Union

Part III: What is a Scientific Paper

Review

Inorganic and Hybrid Perovskite Based Laser Devices: A Review

Minas M. Stylianakis [1], Temur Maksudov [1,2], Apostolos Panagiotopoulos [1,2], George Kakavelakis [3] and Konstantinos Petridis [1,4,*]

1 Center of Materials Technology and Photonics & Electrical Engineering Department, Technological Educational Institute (TEI) of Crete, 71004 Heraklion, Crete, Greece; stylianakis@staff.teicrete.gr (M.M.S.); maksudov@staff.teicrete.gr (T.M.); appanagioto@staff.teicrete.gr (A.P.)
2 Department of Materials Science and Technology, University of Crete, Vassilika Voutes GR-700 13, 71004 Heraklion, Crete, Greece
3 Cambridge Graphene Centre, University of Cambridge, 9 JJ Thomson Avenue, Cambridge CB3 0FA, UK; gk415@cam.ac.uk
4 Department of Electronic Engineering, Technological Educational Institute (TEI) of Crete, 73132 Chania, Crete, Greece
* Correspondence: c.petridischania@gmail.com; Tel.: +30-28210-23041

Received: 20 January 2019; Accepted: 8 March 2019; Published: 14 March 2019

Abstract: Inorganic and organic-inorganic (hybrid) perovskite semiconductor materials have attracted worldwide scientific attention and research effort as the new wonder semiconductor material in optoelectronics. Their excellent physical and electronic properties have been exploited to boost the solar cells efficiency beyond 23% and captivate their potential as competitors to the dominant silicon solar cells technology. However, the fundamental principles in Physics, dictate that an excellent direct band gap material for photovoltaic applications must be also an excellent light emitter candidate. This has been realized for the case of perovskite-based light emitting diodes (LEDs) but much less for the case of the respective laser devices. Here, the strides, exclusively in lasing, made since 2014 are presented for the first time. The solution processability, low temperature crystallization, formation of nearly defect free, nanostructures, the long range ambipolar transport, the direct energy band gap, the high spectral emission tunability over the entire visible spectrum and the almost 100% external luminescence efficiency show perovskite semiconductors' potential to transform the nanophotonics sector. The operational principles, the various adopted material and laser configurations along the future challenges are reviewed and presented in this paper.

Keywords: inorganic perovskites; hybrid perovskites; stimulated emission; laser devices

The main characteristics of a **Journal Paper** are:

1. Reports the results of a completed experiment
2. It is the most awarded publication
3. It's quality is linked with (a) the references will receive; and (b) the impact factor of the journal will be published

Co-funded by the Erasmus+ Programme of the European Union

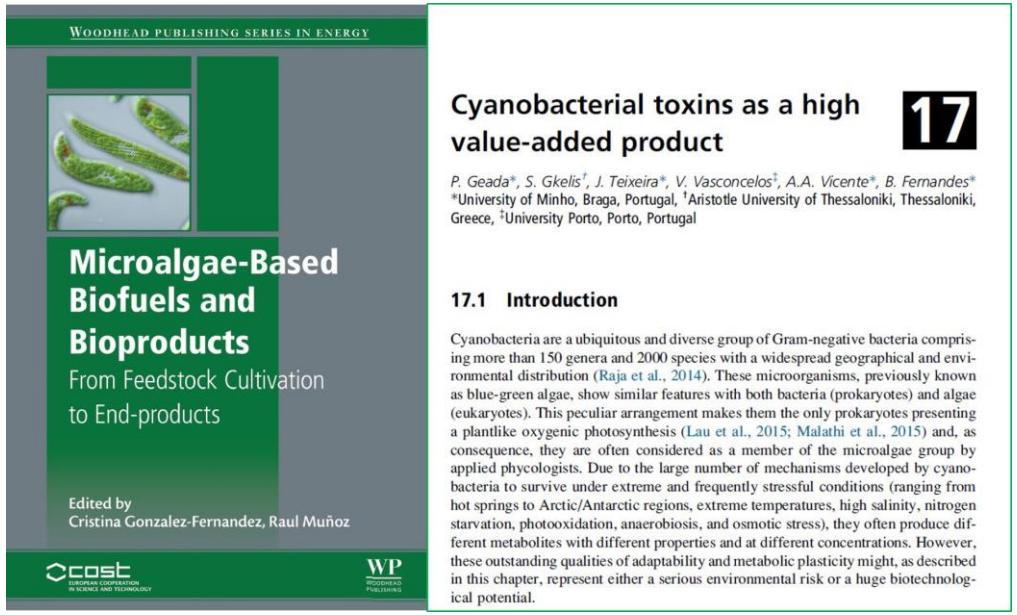
Part III: What is a Scientific Paper

Research papers can be categorised into three types:

1. **A research paper;** report of results extracted from a specific experiment and work
2. **A review paper;** review the results of a specific topic and to provide an overview of the current statue and at the same time to suggest future challenges and work to be done. It is harder to write since requires the understanding of other's people work and to have a strong feeling of the topic

Co-funded by the
Erasmus+ Programme
of the European Union

Part III: What is a Scientific Paper



Publish a **Book Chapter**:

1. A collection of papers
2. Similar maturity as a journal paper
3. A call for a book chapter is narrower than a journal

Co-funded by the Erasmus+ Programme of the European Union

Part III: What is a Scientific Paper?

- Title
- Authors and their affiliations
- Abstract
- Introduction
- Results
- Discussion
- Materials and Methods
- References
- Acknowledgments
- Figures and tables
- Supplementary Materials

Co-funded by the
Erasmus+ Programme
of the European Union

Part III: What is a Scientific Paper

The Title:

- As general as possible, while capturing the essence of the work
- It is used for searching this work by others; an impact to the citations the paper will receive
- The first letter of each word in the title is capitalized except of propositions
- Avoid the use of acronyms
- Do not overload the title; additional information can be placed in the **keywords**

Co-funded by the
Erasmus+ Programme
of the European Union

Part III: What is a Scientific Paper

Research News

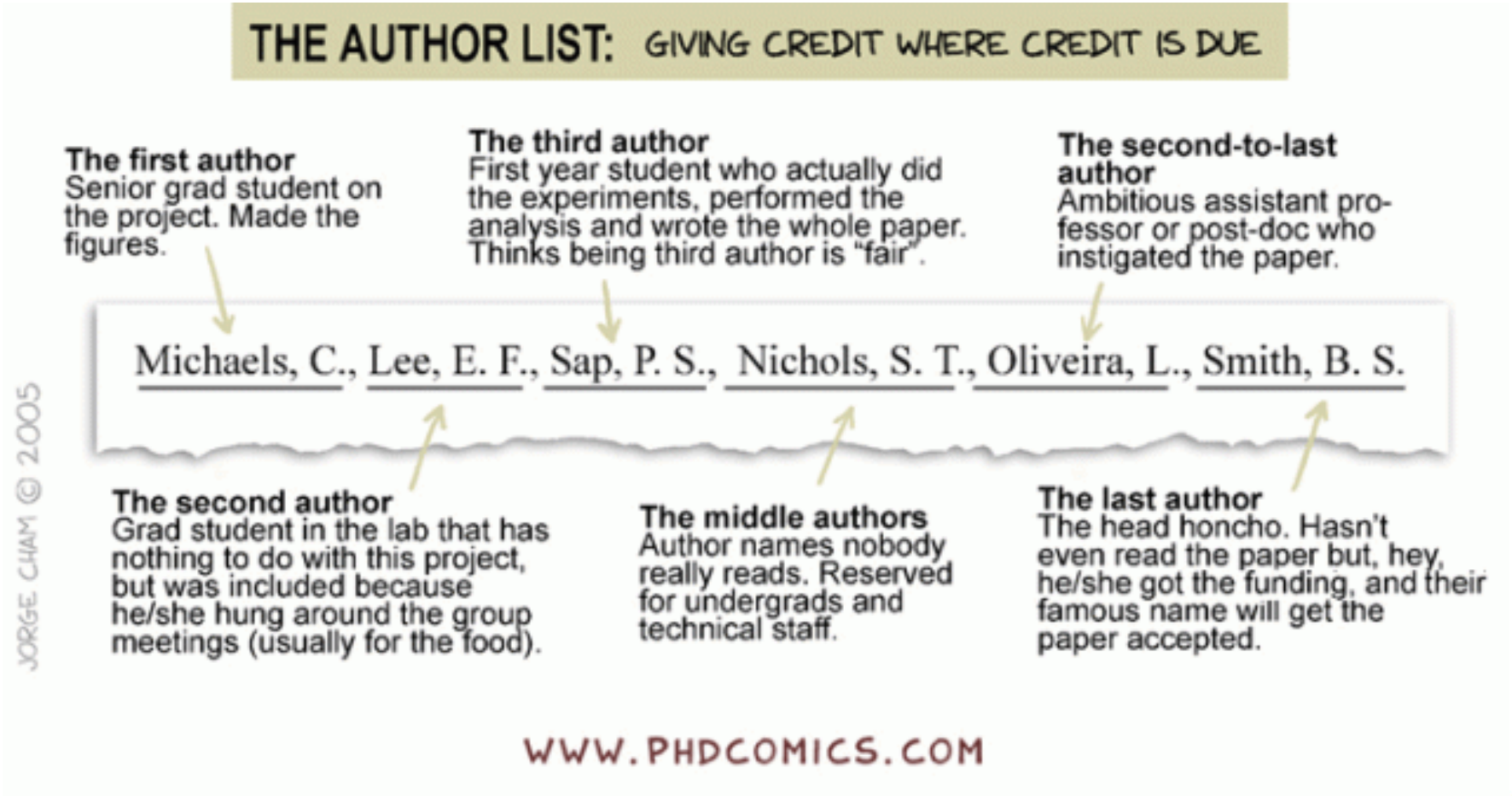
2D Materials Beyond Graphene for Metal Halide Perovskite Solar Cells

George Kakavelakis ✉, Emmanuel Kymakis, Kostantinos Petridis ✉

First published: 30 July 2018 | https://doi.org/10.1002/admi.201800339 | Cited by: 3

Co-funded by the Erasmus+ Programme of the European Union

Part III: What is a Scientific Paper



Co-funded by the
Erasmus+ Programme
of the European Union

Part III: What is a Scientific Paper

The Authorship & Its ordering:

- Different Groups have different traditions
- Early on Communication (especially when we have collaboration between different groups) is a key to avoid conflicts within the research team
- Define Clear Roles – The Author Roles
  - Usually the first one is the person that has run the project
  - Usually the last one is the person that has coordinated the project
  - There are cases that should be mentioned of equal contribution within a manuscript
- Some Journals require statements for each authors contribution
- Add a co-author or make an acknowledgement ?

Co-funded by the
Erasmus+ Programme
of the European Union

Part III: What is a Scientific Paper

The Authorship & Its ordering (II):

- To be an author or a co-author **you should at least have done two** of the following tasks:
  1. Do/Contribute to the experimental work
  2. Write & Edit the manuscript
  3. Have the idea and review the final draft
  4. Respond to the reviewers
  5. Fund the work
- **Make the question**: If I am going to exclude this person X from the authorship will I have the chance to publish this paper? If the answer is no then you have to include him or her
- **Use acknowledgements** to capture other contributions

Co-funded by the
Erasmus+ Programme
of the European Union

Part III: What is a Scientific Paper

- The role of the **corresponding author:**
  1. Submits the paper
  2. Communicates through the publication process
  3. Communication involves: (a) Revision, (b) Provide supplementary information, (c) Execute the proofreading
  4. The most experience from the co-authors is arranged as the correspondent one

Co-funded by the Erasmus+ Programme of the European Union

Part III: What is a Scientific Paper

- **Affiliation:**
  1. Department, School and University
  2. It is placed as a letter on the top right corner of the author
  3. A single author may be associated with multiple affiliations

Co-funded by the
Erasmus+ Programme
of the European Union

Part III: What is a Scientific Paper

Renaissance of graphene-related materials in photovoltaics due to the emergence of metal halide perovskite solar cells

Check for updates

Costantinos Petridis,*[ab] George Kakavelakis*[a] and Emmanuel Kymakis*[a]

Author affiliations

* Corresponding authors

[a] Center of Materials Technology and Photonics & Electrical Engineering Department, School of Applied Technology, Technological Educational Institute (TEI) of Crete, Heraklion, Greece

E-mail: c.petridischania@gmail.com, kakavelakis@staff.teicrete.gr, kymakis@staff.teicrete.gr

[b] Department of Electronic Engineering Technological Educational Institute (TEI) of Crete, Chania 73132, Greece

Co-funded by the Erasmus+ Programme of the European Union

Part III: What is a Scientific Paper

Keywords:

- Are used to classify and search the work
- Are used to enrich the provided title
- Single and compound words can be used
- About five to six keywords listed by alphabetic order are allowed
- The first letter of the first key word should be capital

Co-funded by the
Erasmus+ Programme
of the European Union

Part III: What is a Scientific Paper

The Anatomy of a Large-Scale Hypertextual Web Search Engine

Sergey Brin and Lawrence Page

Computer Science Department,
Stanford University, Stanford, CA 94305, USA
sergey@cs.stanford.edu and page@cs.stanford.edu

Abstract

In this paper, we present Google, a prototype of a large-scale search engine which makes heavy use of the structure present in hypertext. Google is designed to crawl and index the Web efficiently and produce much more satisfying search results than existing systems. The prototype with a full text and hyperlink database of at least 24 million pages is available at http://google.stanford.edu/ To engineer a search engine is a challenging task. Search engines index tens to hundreds of millions of web pages involving a comparable number of distinct terms. They answer tens of millions of queries every day. Despite the importance of large-scale search engines on the web, very little academic research has been done on them. Furthermore, due to rapid advance in technology and web proliferation, creating a web search engine today is very different from three years ago. This paper provides an in-depth description of our large-scale web search engine -- the first such detailed public description we know of to date. Apart from the problems of scaling traditional search techniques to data of this magnitude, there are new technical challenges involved with using the additional information present in hypertext to produce better search results. This paper addresses this question of how to build a practical large-scale system which can exploit the additional information present in hypertext. Also we look at the problem of how to effectively deal with uncontrolled hypertext collections where anyone can publish anything they want.

Keywords

World Wide Web, Search Engines, Information Retrieval, PageRank, Google

1. Introduction

(Note: There are two versions of this paper -- a longer full version and a shorter printed version. The full version is available on the web and the conference CD-ROM.)
The web creates new challenges for information retrieval. The amount of information on the web is growing rapidly, as well as the number of new users inexperienced in the art of web research. People are likely to surf the web using its link graph, often starting with high quality human maintained indices such as Yahoo! or with search engines. Human maintained lists cover popular topics effectively but are subjective, expensive to build and maintain, slow to improve, and cannot cover all esoteric topics. Automated search engines that rely on keyword matching usually return too many low quality matches. To make matters worse, some advertisers attempt to gain people's attention by taking measures meant to mislead automated search engines. We have built a large-scale search engine which addresses many of the problems of existing systems. It makes especially heavy use of the additional structure present in hypertext to provide much higher quality search results. We chose our system name, Google, because it is a common spelling of googol, or 10^{100} and fits well with our goal of building very large-scale search

Tips to select the most appropriate keywords:

1. Find keywords within your research question
2. General terms related to your work

Co-funded by the
Erasmus+ Programme
of the European Union

Part III: What is a Scientific Paper

REVIEW

ADVANCED MATERIALS

Photonics

www.advmat.de

Advanced Photonic Processes for Photovoltaic and Energy Storage Systems

*Maria Sygletou, Constantinos Petridis, Emmanuel Kymakis, and Emmanuel Stratakis**

Solar-energy harvesting through photovoltaic (PV) conversion is the most promising technology for long-term renewable energy production. At the same time, significant progress has been made in the development of energy-storage (ES) systems, which are essential components within the cycle of energy generation, transmission, and usage. Toward commercial applications, the enhancement of the performance and competitiveness of PV and ES systems requires the adoption of precise, but simple and low-cost manufacturing solutions, compatible with large-scale and high-throughput production lines. Photonic processes enable cost-efficient, noncontact, highly precise, and selective engineering of materials via photothermal, photochemical, or photophysical routes. Laser-based processes, in particular, provide access to a plethora of processing parameters that can be tuned with a remarkably high degree of precision to enable innovative processing routes that cannot be attained by conventional approaches. The focus here is on the application of advanced light-driven approaches for the fabrication, as well as the synthesis, of materials and components relevant to PV and ES systems. Besides presenting recent advances on recent achievements, the existing limitations are outlined and future possibilities and emerging prospects discussed.

1. Introduction

The realization of the significance of renewable energy sources in addressing continuously increasing global energy needs[1] has boosted the development of environmentally friendly, low-cost energy technologies. Among "green" energy resources, solar-energy harvesting through photovoltaic (PV) conversion is the most promising technology for long-term renewable energy production. Indeed, research and technology progress on the topic has demonstrated that solar energy can be efficiently converted to electricity and can be adopted to reduce the electricity-generation dependence on unsustainable fossil fuels. While silicon (Si) solar cells dominate the PV market, due to their high conversion efficiencies (up to 25%),[2,3] new hybrid PV technologies, such as dye-sensitized solar cells (DSSCs),[4] organic solar cells (OSCs),[5] and perovskite solar cells (PSCs),[6] schematically presented in Figure 1a–d, have attracted increasing academic and industrial interest. All these technologies benefit from simplicity and low cost, based on solution processing, and fabrication at room temperature[7–9] complemented with high efficiencies (over 20% for PSCs),[10] transparency, and flexibility.[11–13] OSCs and PSCs, in particular, are promising for cost-effective, lightweight solar-energy-conversion platforms, particularly for the supply of off-grid electricity, as well as for portable and wearable consumer electronics.[14] Nevertheless, further development of materials and processes are required to reach the standards required for their full commercialization and market adoption.

In parallel, significant progress has been made in the development of lithium-based rechargeable batteries for electric energy storage.[15] Indeed, energy storage (ES) is an essential process required during the cycle of energy generation, transmission, and usage. Although lithium-ion batteries are foreseen as high-capacity devices, able to store the electricity converted from sustainable energy sources,[16] the advent of wearable electronics has triggered the development of miniaturized ES devices exhibiting equivalent performance. In this context, besides the major lithium-ion battery technology, aluminum electrolytic capacitors and electrochemically isolated cells, i.e., micro-supercapacitors (MSCs), have emerged as novel components for energy storage and supply in future microelectronics.[16,17] Surface-mountable supercapacitors (SCs), schematically presented in Figure 1e,f, have become more popular due to their compact size, combined with higher capacity.[16] However, for their broader application, it is necessary to develop materials and processes that can help to further shrink their size. This is quite challenging, considering their intrinsic electrolytic characteristic and the related packaging difficulties.[17] Nanomaterial design has emerged as a promising solution to tackle miniaturization and other fundamental problems in conventional battery materials. As a result, the discoveries of novel electrodes based on nanomaterials, as well as new storage mechanisms at the nanoscale, have substantially improved battery performance.[18]

Dr. M. Sygletou, Dr. E. Stratakis
Institute of Electronic Structure and Laser
Foundation for Research and Technology – Hellas
Heraklion 71110, Crete, Greece
E-mail: stratak@iesl.forth.gr
Dr. C. Petridis, Prof. E. Kymakis
Center of Materials Technology and Photonics & Electrical Engineering
Department, School of Applied Technology
Technological Educational Institute (TEI) of Crete
Heraklion 71004, Crete, Greece
Dr. E. Stratakis
Department of Materials Science and Technology
University of Crete
Heraklion 71003, Crete, Greece

DOI: 10.1002/adma.201700035

Abstract:

- **The most read part** when people search for papers
- It is the **showcase** of your paper
- **An extra attention** is needed when you write the abstract; it starts with the motivation, followed by the problem description and that state of the arts and then the proposed approach for validation

Co-funded by the Erasmus+ Programme of the European Union

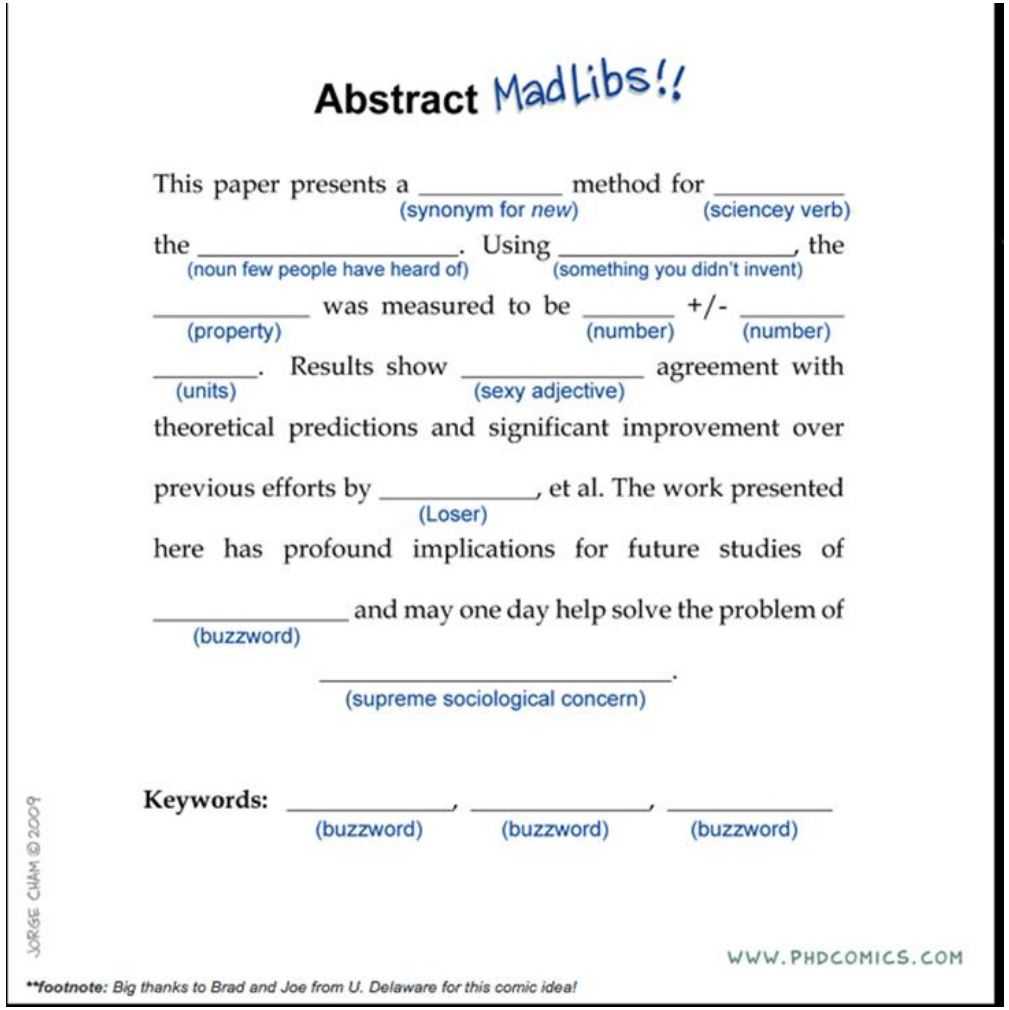
Part III: What is a Scientific Paper

How to Write an Abstract:

- It is essential because people will probably read just this section; e.g. the chief editor probably will be focused in this part before sending it for peer review
- Its' length depends on the journal; usually it has a short length (100 – 150 words)
- See other abstracts from previous publications in the journal of interest
- It helps you to plan your article
- To build your abstract please satisfy the MRCI framework
- It is the last part of the paper to write during the preparation of the manuscript

Co-funded by the Erasmus+ Programme of the European Union

Part III: What is a Scientific Paper



Abstract MadLibs!!

This paper presents a _____ method for _____
(synonym for *new*) (sciencey verb)
the _____. Using _____, the
(noun few people have heard of) (something you didn't invent)
_____ was measured to be _____ +/- _____
(property) (number) (number)
_____. Results show _____ agreement with
(units) (sexy adjective)
theoretical predictions and significant improvement over
previous efforts by _____, et al. The work presented
(Loser)
here has profound implications for future studies of
_____ and may one day help solve the problem of
(buzzword)
_____.
(supreme sociological concern)

Keywords: _____, _____, _____
(buzzword) (buzzword) (buzzword)

JORGE CHAM © 2009

WWW.PHDCOMICS.COM

***footnote:** Big thanks to Brad and Joe from U. Delaware for this comic idea!*

Co-funded by the
Erasmus+ Programme
of the European Union

Part III: What is a Scientific Paper

Introduction:

- Why did i do the work? What were the central motivations and hypotheses? What is the current situation (what is unknown)? **– It is the motivation of the paper**
- It is a balance between saying everything and keeping a mystery of your research
- An outline paragraph at the end of the introduction will be very helpful; explain what are you doing in each building block of the paper ("the paper is structured as follows..."

Co-funded by the
Erasmus+ Programme
of the European Union

Part III: What is a Scientific Paper

Introduction:

- It is one or two pages long
- Too short does not describe the paper detail enough; too long it might be not well organized

Co-funded by the
Erasmus+ Programme
of the European Union

Part III: What is a Scientific Paper

Introduction:

- **Useful expressions:**

1. To address this issue (problem, concern): Useful when introducing a solution or an approach for a problem
2. In this work (approach, method, technique): Useful when describing a solution
3. We present (describe, introduce) an approach for: Useful when describing a solution

Co-funded by the
Erasmus+ Programme
of the European Union

Part III: What is a Scientific Paper

The introduction section has the following structure:

1. Motivation
2. Research Problem
3. State of the Art / Related Work
4. Approach
5. Contribution
6. Paper Organization

Co-funded by the
Erasmus+ Programme
of the European Union

Part III: What is a Scientific Paper

The introduction section has the following structure:

1. Motivation
2. Research Problem
3. State of the Art / Related Work
4. Approach
5. Contribution
6. Paper Organization

Co-funded by the
Erasmus+ Programme
of the European Union

Part III: What is a Scientific Paper

Motivation:

1. Describes the domain of the work and the problems in the domain that motivate this work
2. We should write the motivation in a language that a novice in the domain can understand so that the paper to be of general interest

Co-funded by the
Erasmus+ Programme
of the European Union

Part III: What is a Scientific Paper

- To reveal the motivation of the paper an excellent **bibliographic research is required**
- **Tools for bibliographic Research:**
  1. Scopus
  2. Web of Science
  3. Google Scholar
  4. Research Gate
  5. Journal's or Editors Websites

Co-funded by the Erasmus+ Programme of the European Union

Part III: What is a Scientific Paper

The Literature Review:

1. Avoid to have a boring and confusing literature review
2. Write what is **significant and highly relevant** to your research question
3. The references backed up your argument !! You have a purpose…..
4. A balance should be kept: not be too exhaustive but also do not forget important works (e.g. the first work has been done in this field)
5. The literature review can be considered political act: you are choosing sites in the research community or even you dictate the potential peer reviewers of your work

Co-funded by the
Erasmus+ Programme
of the European Union

Part III: What is a Scientific Paper

The introduction section has the following structure:

1. Motivation
2. Research Problem
3. State of the Art / Related Work
4. Approach
5. Contribution
6. Paper Organization

Co-funded by the
Erasmus+ Programme
of the European Union

Part III: What is a Scientific Paper

Research Problem:

- Problem statement describe the problem being addressed in the paper
- The problem statement together with the motivation justifies **the significance of the work**

Co-funded by the
Erasmus+ Programme
of the European Union

Part III: What is a Scientific Paper

The introduction section has the following structure:

1. Motivation
2. Research Problem
3. State of the Art / Related Work
4. Approach
5. Contribution
6. Paper Organization

Co-funded by the
Erasmus+ Programme
of the European Union

Part III: What is a Scientific Paper

State of the Art:

- It should be made clear that either the problem has not been addressed or has not be properly addressed by other authors

Co-funded by the
Erasmus+ Programme
of the European Union

Part III: What is a Scientific Paper

The introduction section has the following structure:

1. Motivation
2. Research Problem
3. State of the Art / Related Work
4. Approach
5. Contribution
6. Paper Organization

Co-funded by the
Erasmus+ Programme
of the European Union

Part III: What is a Scientific Paper

Approach:

- An overview of the approach to deal with the set challenge is presented

Co-funded by the
Erasmus+ Programme
of the European Union

Part III: What is a Scientific Paper

The introduction section has the following structure:

1. Motivation
2. Research Problem
3. State of the Art / Related Work
4. Approach
5. Contribution
6. Paper Organization

Co-funded by the
Erasmus+ Programme
of the European Union

Part III: What is a Scientific Paper

Contribution:

- Provides a positive impression on the work and **increases reader's interests** in the work
- It is an opportunity to the author's to **recap their contributions**
- It should be described **intuitively and clearly**
- **Itemized description** are effective in highlighting contributions

Co-funded by the
Erasmus+ Programme
of the European Union

Part III: What is a Scientific Paper

The introduction section has the following structure:

1. Motivation
2. Research Problem
3. State of the Art / Related Work
4. Approach
5. Contribution
6. Paper Organization

Co-funded by the
Erasmus+ Programme
of the European Union

Part III: What is a Scientific Paper

Paper Organization:

- **Briefing** the sections of the paper; use one to two sentences for each section
- Use verbs such as: discuss, give, describe, present, demonstrate and conclude

Co-funded by the
Erasmus+ Programme
of the European Union

Part III: What is a Scientific Paper

Classroom Exercise:

Provide to the students an introduction and ask them to analyse it: find the different sections of the provided introduction

Co-funded by the
Erasmus+ Programme
of the European Union

Part III: What is a Scientific Paper

Results:

- What were the results?
- How are the compounds made and characterized?
- What was measured?
- Always **written in past tense**

Co-funded by the
Erasmus+ Programme
of the European Union

Part III: What is a Scientific Paper

Discussion:

- How your work has contributed to the literature; new knowledge build
- This is an extremely important building block; it is the part that you prove the relevance of your work

Co-funded by the
Erasmus+ Programme
of the European Union

Part III: What is a Scientific Paper

Conclusions:

- What does it all mean?
- What hypotheses were proved or disproved? What did I learn? What are the limits of your work and how do you plan to address them in the future
- Why does it make a difference ?
- When comparing with other studies, the most recent articles from the highest impact journals should be selected

Co-funded by the
Erasmus+ Programme
of the European Union

Part III: What is a Scientific Paper

Future Work – Challenges:

- What are the future challenges that this work or this domain still faces?
- It is nice to suggest solutions or methodologies to deal these challenges
- Such a section is important to exist in a scientific paper since generates the impact of the presented work – it is a topic and important research for someone to invest his or her time or funds

Co-funded by the
Erasmus+ Programme
of the European Union

Part III: What is a Scientific Paper

References:

- Should be complete and not exhaustive
- Cite the 1st works in the domain the paper presents
- Cite the pioneer's work
- Respect the format the journal or the conference dictates

Co-funded by the
Erasmus+ Programme
of the European Union

Part III: What is a Scientific Paper

Acknowledgements:

- Acknowledge the funding agencies
- Acknowledge Individuals

Co-funded by the
Erasmus+ Programme
of the European Union

Part III: What is a Scientific Paper

Figures and Tables:

- It is the part where the manuscript preparation should start
- It is the second most read part of a paper after its abstract
- Figures and Tables should be clear and of top scientific and artistic quality
- For the Table of Content (TOC) figure a professional should be hired; it is the depiction of the abstract
- Invest time to design nice figures and tables; great impact on the citations the paper will receive

Co-funded by the Erasmus+ Programme of the European Union

Part III: What is a Scientific Paper

Evaluation Questions for Lectures four & five

1. *What are the main characteristics of a technical paper ?*
2. *Name at least different categories of a technical paper*
3. *What are the main differences between a workshop publication and a journal publication*
4. *What are the main characteristics of a good review paper?*

Co-funded by the
Erasmus+ Programme
of the European Union

Part III: What is a Scientific Paper

Evaluation Questions for Lectures four & five

5. *What are the rules to include someone within the authors?*
6. *What is the role of the 1st and the last author?*
7. *Do you have your own examples to explain the role of co-authors in one of your papers?*
8. *What is the main objective of the keywords?*

Co-funded by the
Erasmus+ Programme
of the European Union

Part III: What is a Scientific Paper

Evaluation Questions for Lectures four & five

9. *Why abstract is important? What are the sections an abstract should consist?*
10. *What are the similarities and the differences between the abstract and the introduction ?*

Co-funded by the
Erasmus+ Programme
of the European Union