DESCRIPTION

Internet of Things; Engineering Cyber Physical Human Systems is a comprehensive journal encouraging cross collaboration between researchers, engineers and practitioners in the field of IoT & Cyber Physical Human Systems. The journal offers a unique platform to exchange scientific information on the entire breadth of technology, science, and societal applications of the IoT.

The journal will place a high priority on timely publication, and provide a home for high quality: Full Research papers Survey Papers Actual Open Software and Data Tutorials and best practices Case studies Whitepapers

Furthermore, IOT is interested in publishing topical Special Issues on any aspect of IOT. Please contact the Editor in Chief with a proposal for a Special Issue and a questionnaire for a Special Issue.

The scope of IoT comprises four main blocks to cover the entire spectrum of the field. From Research to Technology, from Applications to their Consequences for life and society.

Theory and fundamental research
Research that addresses the core underlying scientific principles dealing with the analysis and algorithmics of "IoT ecosystem" as a multicomponent system with complex and dynamic dependences at large-scale, such as: New formal methods research to create abstractions, formalisms and semantics at IoT layer. Research on the unique IoT challenges in security, reliability and privacy. High-level policy languages for specifying permissible communication patterns.

Software development, technology and engineering
Key enabling IoT technologies related to sensors, actuators and machine intelligence. Development and deployment IoT tools and platforms to ensure security, reliability and efficiency, such as: Device software development, such as minimal operating systems. Secure communication of IoT with other software layers from edge computing to the Cloud. IoT software designs, including addressing security at design phase. Best practices for IoT (software) development, test beds and quality assurance. Sensors and actuators

Applications of IoT
New Applications of connected products and/or connected business processes to create new business value and business models. We are looking for contributions, and lessons learned, from researchers applying IoT in various domains including but not limited to: Energy (smart grids, meters & appliances,

**Societal aspects of IoT**

Keeping humans in the loop is vital. Research in cyber-human systems that reflect human understanding and interaction with the physical world and (semi) autonomous systems. Societal, political and social impacts of the IoT. Ethics & (proposed) laws & regulations. Human Technology Interaction - at scale. Emerging standards and technology in human life. And of course hot issues, such as auditing, liability and social vulnerabilities.

**ABSTRACTING AND INDEXING**

INSPEC

**EDITORIAL BOARD**

**Editor-in-Chief**

F. Xhafa, Universitat Politecnica de Catalunya Department of Computer Science, Jordi Girona Salgado 1-3, E 08034, Barcelona, Spain

Parallel and distributed algorithms, massive data processing and collective intelligence, optimization, IoT and networking, P2P and Cloud computing, security and trustworthy computing, machine learning and data mining.

**International Advisory Board**

Solange Ghernaouti, University of Lausanne, Lausanne, Switzerland
Cybersecurity, Cybercrime, Cyberdefence, Cyberconflicts, Cyberpower and Cyberresilience

David de Roure, University of Oxford, Oxford, United Kingdom
Digital Humanities, Computational Musicology, Internet of Things, Cybersecurity, e-Science, Artificial Intelligence, Semantic Web

Yunchuan Sun, Beijing Normal University, Beijing, China
Big Data in Finance, Internet of Things, Semantic Link Networks, Knowledge-Enabled Computing, Event-linked Networks

Ian Thomas, Fujitsu RunMyProcess, Paris, UK
Cloud computing, Internet of things, e-services, Digital transformation, Corporate digital strategy

Albert Zomaya, The University of Sydney, Sydney, Australia
High Performance Computing & Networking

**Editorial Board**

Suayb Arslan, MEF University, Istanbul, Turkey
Cloud storage, Physical layer communication theory, Information and reliability theory, Estimation theory, Time series analysis, Error detection and correction coding, Source coding and data compression

Ali Imsal Awad, Lulea University of Technology, Luleå, Sweden

Leonard Barroli, Fukuoka Institute of Technology, Fukuoka, Japan
Telecommunications Networks (High-speed, Computer, Wireless, Ad-Hoc & Multiplexing Systems), Intelligent Algorithms (Fuzzy Logic, Genetic Algorithms, Neural Networks), Traffic Control Methods (Policing Mechanisms, Routing Algorithms, Congestion Control, Call Admission Control), Network Applications (Multimedia, Protocols, Quality of Service, Wireless, Agent-based) and Robotics (Humanoid, Mobile)

Luiz Fernando Bittencourt, State University of Campinas, Campinas, Brazil
Distributed systems and computer networks, Scheduling in grid/cloud computing systems and their underlying network infrastructure. Also interested in Virtualization, Future internet, Green computing and access networks
Guillermo Botella Juan, Complutense University of Madrid, Madrid, Spain
Integrated Circuits, Field-programmable gate arrays (FPGA), Graphics processing units (GPU), High Performance Computing (HPC), Signal and Image Processing, Bioinspired Systems

Glauco Carvalho, Sheridan College Institute of Technology and Advanced Learning, Oakville, Canada
Cybersecurity, Performance Modeling and Analysis, Optimization, Optimal Control, Network Games, Resource Allocation, Reinforcement Learning, Cloud Systems, 5G Ecosystems, Stochastic Modeling

Parag Chatterjee, University of the Republic Uruguay, Montevideo, Uruguay
Internet of Things (IoT) in healthcare, especially in cardiometabolic and chronic diseases

Silvia Chiusano, Polytechnic of Turin, Torino, Italy
Machine Learning, Big data analytics, Database systems, Analysis of medical data, Urban intelligence

Donatello Conte, University of Tours, Tours, France
Structural Pattern Recognition, Graph Matching, Video Surveillance Systems, Video Analysis, Image Quality Assessment, Affective Computing

Marilia Curado, University of Coimbra Department of Informatics Engineering, Networking, Network Resilience, Low Latency Communications, Energy Efficiency 5G, Internet of Things and communications in the Cloud.

Arta Dilo, Austriamicrosystems AG, Eindhoven, Netherlands
Mathematical modelling, Machine learning, Sensors, Uncertainty, Spatial analytics

Chen (Cherie) Ding, Ryerson University Department of Computer Science, Toronto, Canada
recommender systems, news recommendation, QoS-based cloud service selection, Quality of Services, data analytic services in the cloud, social network analysis, behavior analytics for social network, and service computing.

Gianluca Dini, University of Pisa, Pisa, Italy
Security, Distributed Systems, Operating Systems, Embedded Systems

Arjan Durresi, Indiana University Purdue University at Indianapolis, Indianapolis, United States of America
Networking, Architecture, Design (scalability, security, robustness, reliability, economic viability, manageability, security and trust) for Internet, wireless, optical and multimedia environments

Massimo Esposito, Institute for High Performance Computing and Networking National Research Council Branch of Naples, Napoli, Italy
eHealth, Decision Support Systems, Artificial Intelligence, Cognitive Systems, Knowledge Representation and Reasoning, Natural Language Processing

Yuan Gao, Tsinghua University, Beijing, China
Uncertainty Theory, Operations Research, Transportation Planning

George Ghinea, Brunel University Department of Computer Science, Uxbridge, Middlesex, United Kingdom
Multimedia, communication systems, teledicine, multi-modal interaction, ubiquitous and mobile computing, human-centred e-systems, mulsemadia –multiple sensorial media.

Aboul Ella Hassanien, Cairo University, Faculty of Computers and Artificial Intelligence, Department of Information Technology, Orman, Giza, Egypt

Peter Helinckx, University of Antwerp, Antwerp, Belgium
Distributed Embedded software, Real-time embedded software, Cloud computing, Internet of Things, Cyber Physical Systems and agent based simulation

Andrew Ip, University of Saskatchewan, Saskatoon, Canada
Radio Frequency Identification (RFID) and Supply Chain Technologies, Wireless Sensor Networks (WSNs), Decision Support Systems and Artificial Intelligence (AI), Big Data Analytics, Resilience Engineering

Angel A. Juan, Open University of Catalonia Faculty of Computer Science, Multimedia and Telecommunications, Barcelona, Spain
Data Analytics, Optimization-Simulation Algorithms (biased randomization, agile-optimization algorithms, simheuristics, and learnheuristics) in Computational Transportation & Logistics, Bioinformatics, and Computational Finance.

Anne Kayem, Hasso-Plattner Institute for Digital Engineering, Potsdam, Germany
Data privacy and security in Internet Technologies and Systems, Analysis and design of secure and privacy preserving data sharing algorithms, Implementation/testing of these algorithms including human mindsets and perception towards security/privacy solutions (human computer interaction, humans in/on the loop)

Manuele Kirsch Pinheiro, Paris Dauphine University Department of Computer Science, Paris, France
Pervasive Information Systems, Context-aware computing, Pervasive / Ubiquitous Computing, Service Oriented Architecture, Group Awareness, Computer Assisted Cooperative Work (CSCW)

Paul Krause, University of Surrey, Guildford, United Kingdom
Software engineering, Logic programming, Machine intelligence, Web science, Digital ecosystems

Nhien-An Le-Khac, University College Dublin School of Computer Science and Informatics, Dublin, Ireland

**Chengkuo Lee**, National University of Singapore, Singapore, Singapore
Micro-Electro-Mechanical Systems (MEMS), Nanoelectromechanical systems (NEMS), Micro sensor devices, IoT, Energy harvesting, Metamaterials and Biomedical applications.

**In Lee**, Western Illinois University Computer Sciences, Macomb, United States of America
IoT, E-commerce, Machine Learning, Big Data, Social Media

**Stephane Maag**, TELECOM SudParis, Evry, France
Specifying, measuring and testing conformance and interoperability of protocols and services. Active monitoring, evaluation and trust assessment in communicating systems. Application areas include distributed communicating networks, wireless ad hoc networks and their routing protocols, software systems and industrial projects. Methods include formal design and machine learning (AI).

**Zakaria Maamar**, Zayed University College of Technological Innovation, Dubai, United Arab Emirates

**Dakshnamoorthy Manivannan**, University of Kentucky, Lexington, United States of America

**Eugenio Martinelli**, University of Rome Tor Vergata, Roma, Italy
Sensors, Electronic interfaces, Pattern Recognition, Lab on a chip

**Petr Musilek**, University of Alberta, Edmonton, Canada
Intelligent Systems (AI), Energy &, , power infrastructure, Environment and weather, Modelling and forecasting

**Marek Ogiela**, AGH University of Science and Technology, Krakow, Poland
Pattern recognition, Cognitive image analysis and semantic understanding, Biomedical engineering (medical image understanding and semantic analysis) and Cryptography (secret splitting and sharing, secure information management)

**Francesco Palmieri**, University of Salerno, Fisciano, Italy
High performance networking protocols and architectures, Routing algorithms and network security

**Benoit Parrein**, University of Nantes, Nantes, France
Computer networks, Distributed storage, Internet of Things, Fog networking, Error control coding

**Vampsi Paruchuri**, University of Central Arkansas, Conway, United States of America

**Euripides Petrakis**, Technical University of Crete, Chania, Greece

**Danda B. Rawat**, Howard University, Washington, United States of America
Cybersecurity and wireless networking for emerging networked systems including cyber-physical systems (energy, transportation, water, UAV), Smart cities, Software defined systems and vehicular network security and privacy

**Giovanni Russello**, The University of Auckland Department of Computer Science, Auckland, New Zealand
Security, privacy and confidentiality, mobile computing, cloud services, policy-based and privacy enforcement frameworks, scalable trust-management systems, autonomic middleware for distributed systems.

**Jan-Willem Strijbos**, University of Groningen, Groningen, Netherlands
Technology-Enhanced Learning (TEL), (Computer-Supported) Collaborative Learning (CS)CL, Instructional design, Content analysis of discourse, (Peer) assessment and feedback, Dialogues, Communities of learners, Communities of practice

**Javid Taheri**, Karlstad University, Karlstad, Sweden
High Performance Computing, Cloud Computing, Optimization, Artificial Intelligence

**Rafael Tolosana-Calasanz**, University of Zaragoza, Zaragoza, Spain
Distributed and Parallel Systems, Scientific Workflows and Petri nets

**Miguel Wister**, Universidad Juárez Autónoma de Tabasco (UJAT), Tabasco, Mexico
Wireless Communications Network, Performance Evaluation, Ad Hoc Networks, Mobile Ad Hoc Networks

**Janusz Wojtusiak**, George Mason University, Fairfax, United States of America
Health informatics, Machine learning, Evolutionary computation, Intelligent evolutionary design, Knowledge mining, Health data analytics and artificial intelligence in clinical decision support and knowledge discovery in medical data, and a wide range of applications of these fields in health care

**Isaac Woungang**, Ryerson University, Toronto, Canada
Network security, Radio resource management in next generation networks, IoT and cloud systems

**Chenglei Yang**, Shandong University, Jinan, China
Assessment and Feedback, Technology-Enhanced Learning (TEL), (Computer-Supported) Collaborative Learning (CS)CL, Peer assessment, Peer feedback, Feedback dialogues, Communities of learners/communities of practice, Instructional design, Analysis methods for (CS)CL, Content analysis of discourse

**Jiguo Yu**, Qufu Normal University, Qufu, China
Wireless networks and communications, Distributed algorithms, Privacy-aware computing, Internet-of-things, Graph theory

**Yuan Zhang**, Southwest University College of Electronic and Information Engineering, Chongqing, China
Medical AI, Biomedical Signal Processing, Biomedical Images for Intelligent Diagnosis, Wearable Health, Mobile computing and mHealth

**Sébastien Ziegler**, Mandat International, Geneva, Switzerland
Internet protocols, IPV6, Internet of things, Telecommunications, International cooperation (UN ECOSOC, the UN Department of Public Information, UNCTAD, IoT Forum, the Internet Society)
GUIDE FOR AUTHORS

Submission checklist
You can use this list to carry out a final check of your submission before you send it to the journal for review. Please check the relevant section in this Guide for Authors for more details.

Ensure that the following items are present:

One author has been designated as the corresponding author with contact details:
• E-mail address
• Full postal address

All necessary files have been uploaded:
Manuscript:
• Include keywords
• All figures (include relevant captions)
• All tables (including titles, description, footnotes)
• Ensure all figure and table citations in the text match the files provided
• Indicate clearly if color should be used for any figures in print
Graphical Abstracts / Highlights files (where applicable)
Supplemental files (where applicable)

Further considerations
• Manuscript has been ‘spell checked’ and ‘grammar checked’
• All references mentioned in the Reference List are cited in the text, and vice versa
• Permission has been obtained for use of copyrighted material from other sources (including the Internet)
• A competing interests statement is provided, even if the authors have no competing interests to declare
• Journal policies detailed in this guide have been reviewed
• Referee suggestions and contact details provided, based on journal requirements

For further information, visit our Support Center.

BEFORE YOU BEGIN

Ethics in publishing
Please see our information pages on Ethics in publishing and Ethical guidelines for journal publication.

Declaration of competing interest
All authors must disclose any financial and personal relationships with other people or organizations that could inappropriately influence (bias) their work. Examples of potential conflicts of interest include employment, consultancies, stock ownership, honoraria, paid expert testimony, patent applications/registrations, and grants or other funding. Authors should complete the declaration of competing interest statement using this template and upload to the submission system at the Attach/Upload Files step. Note: Please do not convert the .docx template to another file type. Author signatures are not required. If there are no interests to declare, please choose the first option in the template. More information.

Submission declaration
Submission of an article implies that the work described has not been published previously (except in the form of an abstract, a published lecture or academic thesis, see 'Multiple, redundant or concurrent publication' for more information), that it is not under consideration for publication elsewhere, that its publication is approved by all authors and tacitly or explicitly by the responsible authorities where the work was carried out, and that, if accepted, it will not be published elsewhere in the same form, in English or in any other language, including electronically without the written consent of the copyright-holder.

Preprints
Please note that preprints can be shared anywhere at any time, in line with Elsevier's sharing policy. Sharing your preprints e.g. on a preprint server will not count as prior publication (see 'Multiple, redundant or concurrent publication' for more information).
Use of inclusive language
Inclusive language acknowledges diversity, conveys respect to all people, is sensitive to differences, and promotes equal opportunities. Content should make no assumptions about the beliefs or commitments of any reader; contain nothing which might imply that one individual is superior to another on the grounds of age, gender, race, ethnicity, culture, sexual orientation, disability or health condition; and use inclusive language throughout. Authors should ensure that writing is free from bias, stereotypes, slang, reference to dominant culture and/or cultural assumptions. We advise to seek gender neutrality by using plural nouns ("clinicians, patients/clients") as default/wherever possible to avoid using "he, she," or "he/she." We recommend avoiding the use of descriptors that refer to personal attributes such as age, gender, race, ethnicity, culture, sexual orientation, disability or health condition unless they are relevant and valid. These guidelines are meant as a point of reference to help identify appropriate language but are by no means exhaustive or definitive.

Changes to authorship
Authors are expected to consider carefully the list and order of authors before submitting their manuscript and provide the definitive list of authors at the time of the original submission. Any addition, deletion or rearrangement of author names in the authorship list should be made only before the manuscript has been accepted and only if approved by the journal Editor. To request such a change, the Editor must receive the following from the corresponding author: (a) the reason for the change in author list and (b) written confirmation (e-mail, letter) from all authors that they agree with the addition, removal or rearrangement. In the case of addition or removal of authors, this includes confirmation from the author being added or removed. Only in exceptional circumstances will the Editor consider the addition, deletion or rearrangement of authors after the manuscript has been accepted. While the Editor considers the request, publication of the manuscript will be suspended. If the manuscript has already been published in an online issue, any requests approved by the Editor will result in a corrigendum.

Copyright
Upon acceptance of an article, authors will be asked to complete a 'Journal Publishing Agreement' (see more information on this). An e-mail will be sent to the corresponding author confirming receipt of the manuscript together with a 'Journal Publishing Agreement' form or a link to the online version of this agreement.

Subscribers may reproduce tables of contents or prepare lists of articles including abstracts for internal circulation within their institutions. Permission of the Publisher is required for resale or distribution outside the institution and for all other derivative works, including compilations and translations. If excerpts from other copyrighted works are included, the author(s) must obtain written permission from the copyright owners and credit the source(s) in the article. Elsevier has preprinted forms for use by authors in these cases.

For gold open access articles: Upon acceptance of an article, authors will be asked to complete a 'License Agreement' (more information). Permitted third party reuse of gold open access articles is determined by the author's choice of user license.

Author rights
As an author you (or your employer or institution) have certain rights to reuse your work. More information.

Elsevier supports responsible sharing
Find out how you can share your research published in Elsevier journals.

Role of the funding source
You are requested to identify who provided financial support for the conduct of the research and/or preparation of the article and to briefly describe the role of the sponsor(s), if any, in study design; in the collection, analysis and interpretation of data; in the writing of the report; and in the decision to submit the article for publication. If the funding source(s) had no such involvement then this should be stated.

Open access
Please visit our Open Access page for more information.
Elsevier Researcher Academy

Researcher Academy is a free e-learning platform designed to support early and mid-career researchers throughout their research journey. The "Learn" environment at Researcher Academy offers several interactive modules, webinars, downloadable guides and resources to guide you through the process of writing for research and going through peer review. Feel free to use these free resources to improve your submission and navigate the publication process with ease.

Language (usage and editing services)

Please write your text in good English (American or British usage is accepted, but not a mixture of these). Authors who feel their English language manuscript may require editing to eliminate possible grammatical or spelling errors and to conform to correct scientific English may wish to use the English Language Editing service available from Elsevier's Author Services.

Submission

Our online submission system guides you stepwise through the process of entering your article details and uploading your files. The system converts your article files to a single PDF file used in the peer-review process. Editable files (e.g., Word, LaTeX) are required to typeset your article for final publication. All correspondence, including notification of the Editor's decision and requests for revision, is sent by e-mail.

Original Software Publications

The Software Track of Internet of Things publishes Original Software Publications (OSP) to disseminate exiting and useful software in the areas of neural networks and learning systems, including, but not restricted to, architectures, learning methods, analysis of network dynamics, theories of learning, self-organization, biological neural network modelling, sensorimotor transformations and interdisciplinary topics with artificial intelligence, artificial life, cognitive science, computational learning theory, fuzzy logic, genetic algorithms, information theory, machine learning, neurobiology and pattern recognition. We encourage high-quality original software submissions which contain non-trivial contributions in the above areas related to the implementations of algorithms, toolboxes, and real systems. The software must adhere to a recognized legal license, such as OSI approved licenses. Importantly, the software will be a full publication that is able to capture your software updates as and once they are released. To fully acknowledge the author's/developers software work your software will be fully citable as an Original Software Publication, archived and indexed and available as a complete online "body of work" for other researchers and practitioners to discover.

See the detailed Submission instructions, and more information about the process for academically publishing your Software: here

When preparing your manuscript, please make sure that you strictly adhere to the OSP Template for Original Software Publications and Software Update Template for updates to your Software.

The open access publication fee for Original Software Publications included in the Software Track of this journal is $500, excluding taxes. Software Updates referring to published Original Software Publications will be made open access free of charge.

PREPARATION

Peer Review

Review process

The decision to publish a paper is based on editorial assessment and independent, external, peer review.

Initially all papers are assessed by the Editor. The prime purpose is to decide whether to send a paper for peer review and to give a rapid decision on those that are not. Papers which do not meet basic standards, or are unlikely to be published irrespective of a positive peer review (for example because their novel contribution is insufficient or the relevance to the discipline is unclear) may be rejected at this point in order to avoid delays to authors who may wish to seek publication elsewhere.

Occasionally a paper will be returned to the author with requests for revisions in order to assist the editors in deciding whether or not send it out for review.
Manuscripts going forward to the review process are further reviewed by a member of the journals international scientific Editorial Board, who then coordinate independent, external peer review.

Manuscripts are reviewed by a minimum of two independent reviewers, although the baseline is three reviewers. We take every reasonable step to ensure author identity is concealed during the review process but it is up to authors to ensure that their details of prior publications etc. do not reveal their identity. Authors who reveal their identity in the manuscript will be deemed to have declined anonymity and the review will be single blind (i.e. authors do not know reviewers' identities).

Occasionally, for some article types, such as Invited Surveys and Review papers, the process is for the Editor to directly coordinate the independent, external peer review process themselves.

Most papers that are finally accepted for publication will have been through the double blind review process a minimum of two times, during initial submission and revisions. Only detailed review reports will be considered. Should a report be submitted that does not meet the journals requirement for detailed feedback, another review will be sought. In some cases this might cause additional delay to authors.

The Editorial Board member handling the manuscript makes an editorial decision based on the independent reviewer reports and their conclusions, and forwards their recommendation to the Editor. The Editor is responsible for the final decision regarding acceptance or rejection of all articles. The Editor's decision is final. More information on types of peer review.

**Use of word processing software**

It is important that the file be saved in the native format of the word processor used. The text should be in single-column format. Keep the layout of the text as simple as possible. Most formatting codes will be removed and replaced on processing the article. In particular, do not use the word processor's options to justify text or to hyphenate words. However, do use bold face, italics, subscripts, superscripts etc. When preparing tables, if you are using a table grid, use only one grid for each individual table and not a grid for each row. If no grid is used, use tabs, not spaces, to align columns. The electronic text should be prepared in a way very similar to that of conventional manuscripts (see also the Guide to Publishing with Elsevier). Note that source files of figures, tables and text graphics will be required whether or not you embed your figures in the text. See also the section on Electronic artwork.

To avoid unnecessary errors you are strongly advised to use the 'spell-check' and 'grammar-check' functions of your word processor.

**LaTeX**

You are recommended to use the Elsevier article class `elsarticle.cls` to prepare your manuscript and BibTeX to generate your bibliography.

Our LaTeX site has detailed submission instructions, templates and other information.

**Article structure**

*Subdivision - numbered sections*

Divide your article into clearly defined and numbered sections. Subsections should be numbered 1.1 (then 1.1.1, 1.1.2, ...), 1.2, etc. (the abstract is not included in section numbering). Use this numbering also for internal cross-referencing: do not just refer to 'the text'. Any subsection may be given a brief heading. Each heading should appear on its own separate line.

*Introduction*

State the objectives of the work and provide an adequate background, avoiding a detailed literature survey or a summary of the results.

*Material and methods*

Provide sufficient details to allow the work to be reproduced by an independent researcher. Methods that are already published should be summarized, and indicated by a reference. If quoting directly from a previously published method, use quotation marks and also cite the source. Any modifications to existing methods should also be described.
**Theory/calculation**
A Theory section should extend, not repeat, the background to the article already dealt with in the Introduction and lay the foundation for further work. In contrast, a Calculation section represents a practical development from a theoretical basis.

**Results**
Results should be clear and concise.

**Discussion**
This should explore the significance of the results of the work, not repeat them. A combined Results and Discussion section is often appropriate. Avoid extensive citations and discussion of published literature.

**Conclusions**
The main conclusions of the study may be presented in a short Conclusions section, which may stand alone or form a subsection of a Discussion or Results and Discussion section.

**Appendices**
If there is more than one appendix, they should be identified as A, B, etc. Formulae and equations in appendices should be given separate numbering: Eq. (A.1), Eq. (A.2), etc.; in a subsequent appendix, Eq. (B.1) and so on. Similarly for tables and figures: Table A.1; Fig. A.1, etc.

**Essential title page information**
- **Title.** Concise and informative. Titles are often used in information-retrieval systems. Avoid abbreviations and formulae where possible.
- **Author names and affiliations.** Please clearly indicate the given name(s) and family name(s) of each author and check that all names are accurately spelled. You can add your name between parentheses in your own script behind the English transliteration. Present the authors' affiliation addresses (where the actual work was done) below the names. Indicate all affiliations with a lower-case superscript letter immediately after the author's name and in front of the appropriate address. Provide the full postal address of each affiliation, including the country name and, if available, the e-mail address of each author.
- **Corresponding author.** Clearly indicate who will handle correspondence at all stages of refereeing and publication, also post-publication. This responsibility includes answering any future queries about Methodology and Materials. Ensure that the e-mail address is given and that contact details are kept up to date by the corresponding author.
- **Present/permanent address.** If an author has moved since the work described in the article was done, or was visiting at the time, a 'Present address' (or 'Permanent address') may be indicated as a footnote to that author's name. The address at which the author actually did the work must be retained as the main, affiliation address. Superscript Arabic numerals are used for such footnotes.

**Highlights**
Highlights are optional yet highly encouraged for this journal, as they increase the discoverability of your article via search engines. They consist of a short collection of bullet points that capture the novel results of your research as well as new methods that were used during the study (if any). Please have a look at the examples here: example Highlights.

Highlights should be submitted in a separate editable file in the online submission system. Please use 'Highlights' in the file name and include 3 to 5 bullet points (maximum 85 characters, including spaces, per bullet point).

**Abstract**
A concise and factual abstract is required. The abstract should state briefly the purpose of the research, the principal results and major conclusions. An abstract is often presented separately from the article, so it must be able to stand alone. For this reason, References should be avoided, but if essential, then cite the author(s) and year(s). Also, non-standard or uncommon abbreviations should be avoided, but if essential they must be defined at their first mention in the abstract itself.

**Graphical abstract**
Although a graphical abstract is optional, its use is encouraged as it draws more attention to the online article. The graphical abstract should summarize the contents of the article in a concise, pictorial form designed to capture the attention of a wide readership. Graphical abstracts should be submitted as a separate file in the online submission system. Image size: Please provide an image with a minimum
of 531 × 1328 pixels (h × w) or proportionally more. The image should be readable at a size of 5 × 13 cm using a regular screen resolution of 96 dpi. Preferred file types: TIFF, EPS, PDF or MS Office files. You can view Example Graphical Abstracts on our information site. Authors can make use of Elsevier’s Illustration Services to ensure the best presentation of their images and in accordance with all technical requirements.

**Keywords**
Immediately after the abstract, provide a maximum of 6 keywords, using American spelling and avoiding general and plural terms and multiple concepts (avoid, for example, 'and', 'of'). Be sparing with abbreviations: only abbreviations firmly established in the field may be eligible. These keywords will be used for indexing purposes.

**Abbreviations**
Define abbreviations that are not standard in this field in a footnote to be placed on the first page of the article. Such abbreviations that are unavoidable in the abstract must be defined at their first mention there, as well as in the footnote. Ensure consistency of abbreviations throughout the article.

**Acknowledgements**
Collate acknowledgements in a separate section at the end of the article before the references and do not, therefore, include them on the title page, as a footnote to the title or otherwise. List here those individuals who provided help during the research (e.g., providing language help, writing assistance or proof reading the article, etc.).

**Formatting of funding sources**
List funding sources in this standard way to facilitate compliance to funder's requirements:

Funding: This work was supported by the National Institutes of Health [grant numbers xxxx, yyyy]; the Bill & Melinda Gates Foundation, Seattle, WA [grant number zzzz]; and the United States Institutes of Peace [grant number aaaa].

It is not necessary to include detailed descriptions on the program or type of grants and awards. When funding is from a block grant or other resources available to a university, college, or other research institution, submit the name of the institute or organization that provided the funding.

If no funding has been provided for the research, please include the following sentence:

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

**Units**
Follow internationally accepted rules and conventions: use the international system of units (SI). If other units are mentioned, please give their equivalent in SI.

**Math formulae**
Please submit math equations as editable text and not as images. Present simple formulae in line with normal text where possible and use the solidus (/) instead of a horizontal line for small fractional terms, e.g., X/Y. In principle, variables are to be presented in italics. Powers of e are often more conveniently denoted by exp. Number consecutively any equations that have to be displayed separately from the text (if referred to explicitly in the text).

**Footnotes**
Footnotes should be used sparingly. Number them consecutively throughout the article. Many word processors can build footnotes into the text, and this feature may be used. Otherwise, please indicate the position of footnotes in the text and list the footnotes themselves separately at the end of the article. Do not include footnotes in the Reference list.

**Artwork**

**Electronic artwork**

**General points**
- Make sure you use uniform lettering and sizing of your original artwork.
- Embed the used fonts if the application provides that option.
- Aim to use the following fonts in your illustrations: Arial, Courier, Times New Roman, Symbol, or use fonts that look similar.
- Number the illustrations according to their sequence in the text.
• Use a logical naming convention for your artwork files.
• Provide captions to illustrations separately.
• Size the illustrations close to the desired dimensions of the published version.
• Submit each illustration as a separate file.
• Ensure that color images are accessible to all, including those with impaired color vision.

A detailed guide on electronic artwork is available. **You are urged to visit this site; some excerpts from the detailed information are given here.**

**Formats**
If your electronic artwork is created in a Microsoft Office application (Word, PowerPoint, Excel) then please supply 'as is' in the native document format. Regardless of the application used other than Microsoft Office, when your electronic artwork is finalized, please 'Save as' or convert the images to one of the following formats (note the resolution requirements for line drawings, halftones, and line/halftone combinations given below):
- EPS (or PDF): Vector drawings, embed all used fonts.
- TIFF (or JPEG): Color or grayscale photographs (halftones), keep to a minimum of 300 dpi.
- TIFF (or JPEG): Bitmapped (pure black & white pixels) line drawings, keep to a minimum of 1000 dpi.
- TIFF (or JPEG): Combinations bitmapped line/half-tone (color or grayscale), keep to a minimum of 500 dpi.

**Please do not:**
• Supply files that are optimized for screen use (e.g., GIF, BMP, PICT, WPG); these typically have a low number of pixels and limited set of colors;
• Supply files that are too low in resolution;
• Submit graphics that are disproportionately large for the content.

**Color artwork**
Please make sure that artwork files are in an acceptable format (TIFF (or JPEG), EPS (or PDF), or MS Office files) and with the correct resolution. If, together with your accepted article, you submit usable color figures then Elsevier will ensure, at no additional charge, that these figures will appear in color online (e.g., ScienceDirect and other sites) regardless of whether or not these illustrations are reproduced in color in the printed version. **For color reproduction in print, you will receive information regarding the costs from Elsevier after receipt of your accepted article.** Please indicate your preference for color: in print or online only. Further information on the preparation of electronic artwork.

**Figure captions**
Ensure that each illustration has a caption. Supply captions separately, not attached to the figure. A caption should comprise a brief title (not on the figure itself) and a description of the illustration. Keep text in the illustrations themselves to a minimum but explain all symbols and abbreviations used.

**Tables**
Please submit tables as editable text and not as images. Tables can be placed either next to the relevant text in the article, or on separate page(s) at the end. Number tables consecutively in accordance with their appearance in the text and place any table notes below the table body. Be sparing in the use of tables and ensure that the data presented in them do not duplicate results described elsewhere in the article. Please avoid using vertical rules and shading in table cells.

**References**

**Citation in text**
Please ensure that every reference cited in the text is also present in the reference list (and vice versa). Any references cited in the abstract must be given in full. Unpublished results and personal communications are not recommended in the reference list, but may be mentioned in the text. If these references are included in the reference list they should follow the standard reference style of the journal and should include a substitution of the publication date with either 'Unpublished results' or 'Personal communication'. Citation of a reference as 'in press' implies that the item has been accepted for publication.

**Reference links**
Increased discoverability of research and high quality peer review are ensured by online links to the sources cited. In order to allow us to create links to abstracting and indexing services, such as Scopus, CrossRef and PubMed, please ensure that data provided in the references are correct. Please
note that incorrect surnames, journal/book titles, publication year and pagination may prevent link creation. When copying references, please be careful as they may already contain errors. Use of the DOI is highly encouraged.

A DOI is guaranteed never to change, so you can use it as a permanent link to any electronic article. An example of a citation using DOI for an article not yet in an issue is: VanDecar J.C., Russo R.M., James D.E., Ambhe W.B., Franke M. (2003). Aseismic continuation of the Lesser Antilles slab beneath northeastern Venezuela. Journal of Geophysical Research, https://doi.org/10.1029/2001JB000884. Please note the format of such citations should be in the same style as all other references in the paper.

Web references
As a minimum, the full URL should be given and the date when the reference was last accessed. Any further information, if known (DOI, author names, dates, reference to a source publication, etc.), should also be given. Web references can be listed separately (e.g., after the reference list) under a different heading if desired, or can be included in the reference list.

Data references
This journal encourages you to cite underlying or relevant datasets in your manuscript by citing them in your text and including a data reference in your Reference List. Data references should include the following elements: author name(s), dataset title, data repository, version (where available), year, and global persistent identifier. Add [dataset] immediately before the reference so we can properly identify it as a data reference. The [dataset] identifier will not appear in your published article.

Reference to software
We recommend that software (including computational code, scripts, models, notebooks and libraries) should be cited in the same way as other sources of information to support proper attribution and credit, reproducibility, collaboration and reuse, and encourage building on the work of others to further research. To facilitate this, useful information is provided in this article on the essentials of software citation by FORCE 11, of which Elsevier is a member. A reference to software should always include the following elements: creator(s) e.g. the authors or project that developed the software, software title, software repository, version (where available), year, and global persistent identifier.

References in a special issue
Please ensure that the words 'this issue' are added to any references in the list (and any citations in the text) to other articles in the same Special Issue.

Reference management software
Most Elsevier journals have their reference template available in many of the most popular reference management software products. These include all products that support Citation Style Language styles, such as Mendeley. Using citation plug-ins from these products, authors only need to select the appropriate journal template when preparing their article, after which citations and bibliographies will be automatically formatted in the journal's style. If no template is yet available for this journal, please follow the format of the sample references and citations as shown in this Guide. If you use reference management software, please ensure that you remove all field codes before submitting the electronic manuscript. More information on how to remove field codes from different reference management software.

Reference formatting
There are no strict requirements on reference formatting at submission. References can be in any style or format as long as the style is consistent. Where applicable, author(s) name(s), journal title/book title, chapter title/article title, year of publication, volume number/book chapter and the article number or pagination must be present. Use of DOI is highly encouraged. The reference style used by the journal will be applied to the accepted article by Elsevier at the proof stage. Note that missing data will be highlighted at proof stage for the author to correct. If you do wish to format the references yourself they should be arranged according to the following examples:

Reference style
Text: Indicate references by number(s) in square brackets in line with the text. The actual authors can be referred to, but the reference number(s) must always be given.
Example: '..... as demonstrated [3,6]. Barnaby and Jones [8] obtained a different result ....'
List: Number the references (numbers in square brackets) in the list in the order in which they appear in the text.
Examples:
Reference to a journal publication:
If you do not wish to use the PDF annotations function, you may list the corrections (including replies to the Query Form) and return them to Elsevier in an e-mail. Please list your corrections quoting line number. If, for any reason, this is not possible, then mark the corrections and any other comments (including replies to the Query Form) on a printout of your proof and scan the pages and return via e-mail. Please use this proof only for checking the typesetting, editing, completeness and correctness of the text, tables and figures. Significant changes to the article as accepted for publication will only be considered at this stage with permission from the Editor. We will do everything possible to get your article published quickly and accurately. It is important to ensure that all corrections are sent back to us in one communication: please check carefully before replying, as inclusion of any subsequent corrections cannot be guaranteed. Proofreading is solely your responsibility.

**Offprints**
The corresponding author, at no cost, will be provided with a PDF file of the article via e-mail (the PDF file is a watermarked version of the published article and includes a cover sheet with the journal cover image and a disclaimer outlining the terms and conditions of use). For an extra charge, paper offprints can be ordered via the offprint order form which is sent once the article is accepted for publication. Both corresponding and co-authors may order offprints at any time via Elsevier's Author Services.

**AUTHOR INQUIRIES**
Visit the Elsevier Support Center to find the answers you need. Here you will find everything from Frequently Asked Questions to ways to get in touch. You can also check the status of your submitted article or find out when your accepted article will be published.

© Copyright 2018 Elsevier | https://www.elsevier.com