Taylor & Francis Group

AUTHOR'S GUIDE TO PUBLISHING

Author-Produced Manuscripts

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WELCOME TO TAYLOR AND FRANCIS GROUP

This *Author's Guide to Publishing* was designed to answer your questions about manuscript preparation, software requirements, permissions, and other issues involved in transforming your manuscript into a finished book. We suggest you read it completely to get an overview of the production process, and then refer to it as needed as you write and organize your material. If you have questions not covered on these pages, help is only a telephone call away (see the information given below). In order to make the process of manuscript preparation easier for you, Taylor and Francis assigns a personal Project Coordinator to each project upon arrival of your signed contract. This Project Coordinator will contact you within 2 weeks of receiving your contract to introduce himself/herself and establish a dialogue. You may feel free to contact your Project Coordinator as often as you deem necessary during your manuscript preparation. Please note, however, that questions regarding marketing, content, promoting your book, etc., should still continue to be directed to your Acquiring Editor.

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MANUSCRIPT PREPARATION

MANUSCRIPT SIZE

The length of your manuscript was determined before you signed your contract and is specified in your contract. Taylor and Francis' management has approved the manuscript length and based all cost and revenue projections on it; therefore it is essential that you adhere to the agreed-upon length. If you determine that the number of pages of your manuscript will be 10% more or fewer than the number cited in your contract, contact your Acquiring Editor **immediately** so the best course of action can be determined. As a rough guideline for estimating the size of your finished book, two manuscript pages normally equal one printed page.

GENERAL GUIDELINES

Any book formatted by the author should be provided as a fully composed, paginated electronic file of the manuscript *with crop marks in position*, and all text, running heads, equations, tables, and artwork properly placed, ready for printing without further formatting or manipulation required. When your book is complete, please provide the final pages electronically (equipped with all equations, tables, and/or figures) as both application files and as **PostScript (.ps)** or **PDF (.pdf)** files accompanied by a printout at 100% made from the *final* .ps or .pdf file. *It is essential that your electronic files include the fonts and the proper links to the original art files.* Moreover, unless your book is going to have a color insert, all color must be removed from both text and figures before PostScripting and PDFing your files. **Note: The original electronic art files must be submitted in a separate folder.**

Here are some helpful "Do's" and "Don'ts" when preparing your manuscript.

DO'S

- Save each chapter as a clearly labeled separate file (i.e., Chapter 1.doc).
- Save each figure in its own separate and original electronic art file, equipped with correct file extension. All figure files must be clearly labeled and numbered consecutively (i.e., Figure 01x01, Figure 01x02, etc.).
- Justify both your left and right margins.
- Provide each page, other than front matter, chapter openers and blank pages with a running head:
    - Odd pages: Title of the chapter
      Page number on the far-right side
    - Even pages: Title of the book
      Page number on the far-left side
- Center figures, tables, and equations.
- Follow each figure with its relevant figure caption, making the caption 1-point size smaller than the font for the rest of the text.
- Embed your fonts within your text and figures.
- Include completed permission verification forms (to be discussed later in this *Guide)* and signed contributor agreements (for contributed works) for every chapter.

DON'TS

- Don't number your front matter (i.e., title page, table of contents, preface, etc.) However, if your application automatically numbers pages, please use Roman not Arabic numerals for front matter pages. Your Chapter 1 page opener, should be Page '1' of your manuscript.
- Don't make your text any wider or longer than the allotted live area. For books featuring a 6 1/8 x 9 1/4 trim size, that live area is 28 x 45 picas. For books featuring a 7 x 10 trim size, that live area is 33 x 51 picas. Note: If you are not familiar with measuring with picas and would like a template to use for the formatting of the live area of your manuscript, please contact your Project Coordinator.
- Don't include any color in either the text or the figures in your manuscript unless your book is featuring a color insert. If that is the case, please consult your Project Coordinator or Acquiring Editor as to how to proceed with the submission of the color insert.

REVISIONS

Your manuscript should be correct and complete when submitted. Revisions must be made **before** the manuscript is copy edited. If revisions are necessary, you must secure the approval of your Acquiring Editor before submitting them. The revised page or pages must be reprinted and sent to Taylor and Francis with a CD that includes the corrections**.** *Your printout must exactly match your electronic files.*

MANUSCRIPT PROCESSING STEPS

1. Author/editors submits sample chapter to Acquiring Editor or Project Coordinator 4 months prior to contracted submission for review (chapter should include text and artwork).
2. Author/editor then submits complete manuscript, artwork, disk(s) or CD(s), and necessary permission information to Acquiring Editor or Project Coordinator by deadline specified in contract.
3. Manuscript, artwork, electronic files, and permission documents are reviewed by the Acquiring Editor and Project Coordinator and, if correct and complete, are transmitted to the Production department.
4. Once in Production, the manuscript is assigned to a Project Editor who handles all publication details and ultimately transmits the material to the printer. He or she will be the author/editor's primary contact for issues related to content, format, and appearance of the finished book.
5. A Project Editor or outside professional freelancer proofreads the manuscript for grammatical errors, spelling errors, and consistencies in both text and appearance.
6. The corrected pages are sent to the author/editor so that he/she may make the corrections indicated by the proofreader (usually about 2 months after a manuscript has been submitted).
7. Author/editor returns the corrected page proofs so that the Project Editor may review them to see that all the corrections have been made as well as oversee the layout check and other pre-printing tasks.
8. The Project Editor will then return the pages to the author for final corrections and creation of postscript and pdf files with the distillers provided by Taylor and Francis.
9. Final version of manuscript is sent to printer.

SOFTWARE GUIDELINES

Manuscripts must be submitted electronically either on the Taylor & Francis FTP site or by compact disks (CDs). A hard copy printed from the machine used to create the files should be submitted with the files. These guidelines are intended to help you prepare your disks and manuscript, but should not be considered definitive because of continuing advances in publishing software. Please contact your Project Coordinator or Acquiring Editor with any software questions.

All CDs containing text or graphics should be labeled with the author's name, book title, chapter numbers, software used to create the file (including the version number), date of creation, and file format (PC or Mac). *It is essential that figures contained in graphics files be numbered consecutively with chapter number and figure number (i.e., Figure 01x01, Figure 01x02, etc.).* A content directory of each CD must also be submitted.

ACCEPTABLE SOFTWARE FOR AUTHOR-PRODUCED BOOKS

Please use a software version created within 2 years of the submission of your manuscript.

Mac	Windows (PC)
FrameMaker	**FrameMaker**
QuarkXpress	**InDesign**
InDesign	**LaTEX**

Note: Taylor and Francis has style files available for FrameMaker, InDesign, and LaTEX (version 2e). Please consult your Project Coordinator or Acquiring Editor if you are interested in obtaining these. No Microsoft products or WordPerfect versions may be used to prepare author-produced books.

ELECTRONIC ART GUIDELINES

In order to produce high-quality graphics for reproduction, original electronic line-art files should be created in **Adobe Illustrator** or **Macromedia Freehand** (vector graphic programs). Original electronic art files containing grayscales or photographs should be created in **Adobe PhotoShop**. ***Note:*** Vector graphic files provide the best results and are preferable to bit-mapped graphics (see below).

Vector Graphics Formats

A vector file creates an image as a collection of lines rather than as a pattern of individual pixels (bit-mapped graphics). Vector files are much easier to edit than bit-mapped graphics (objects can be individually selected, sized, moved, and otherwise manipulated) and are preferred for professional illustration purposes. Because they are scale and resolution independent, vector images can be enlarged without loss of sharpness. Acceptable vector file formats are listed below in order of preference:

> **Adobe Illustrator** (.ai) is the vector graphics program best suited for creating high-quality professional graphics.

PDF (portable document file) is a file format that allows a document to be transferred to another type of computer system without losing the original formatting. In order to print or view a .pdf file, the user should use **Adobe Acrobat Reader**, which is freeware.

EPS (encapsulated PostScript file) format is a high-resolution graphic image stored in the PostScript language. The .eps format allows users to transfer high-resolution graphics images between applications. The images can also be sized without sacrificing quality.

Two important things to note concerning the preparation of vector graphics:

- Every object must be grayscale. RGB or CMYK color objects will fail at the printer and result in delays and increased costs in Production.
- The thickness of every stroked line must be at least 0.5 points. This ensures that the lines do not appear broken or jagged. **Note:** If you are scaling your images when you bring them into your layout program, you must account for the difference when you check your line weights. For example, if your .eps file is 40 picas wide and your thinnest line is 0.75 points and you place the art as 20 picas wide, your thinnest line is now 0.38 points.

Bit-mapped Graphics Formats

A bit-mapped file forms an image as a pattern of pixels (square dots) and is limited in resolution (sharpness) to the maximum resolution of the screen on which it is displayed. Bit-mapped images are inferior to vector graphics for most applications because they tend to have aliasing (also called jaggies and stairstepping) which causes a staircase distortion due to the square shapes of the pixels. Enlarging bit-mapped images accentuates the distortion and jagged edges.

A bit-mapped graphic is stored as a group of bits that represent an image to be displayed on a computer screen. The image on the screen is composed of pixels (dots), similar to the dots in a photograph in a newspaper. Each bit in an image corresponds to one pixel in the screen, so the number of pixels that composes a monitor image determines the quality of the image. Because monitor screen resolution is only 72 dpi (dots per inch), and the resolution needed for printing is 300 dpi, a bit-mapped image limited to 72 dpi cannot be used to produce a quality image for printing.

Although their use is discouraged, the following bit-mapped graphics formats are listed in order of preference:

GIF (graphics interchange format) is a bit-mapped format that was developed to exchange graphics files over the Internet. Although .gif files are widely used, the .jpg format reduces graphics files to about one-third the size of a .gif file, leading to faster Internet transmission. GIF files are more efficient than JPEG files if an image contains many solid areas.

JPEG (Joint Photographics Expert Group) is a graphics format specifically designed for photographic images and other complex pictures such as realistic artwork. It is not well suited to line drawings, text, or simple cartoon illustrations.

TIFF (tagged image file format) is a bit-mapped graphics format commonly used for the scanning, storage, and interchange of grayscale graphic images. (**TIFF** may be the only format available for older programs, but most current programs can save images in other formats such as .jpg**,** .gif, .pdf, etc.)

If you must use bit-mapped graphics, here are two important things to note:

- Images must be in the grayscale mode (color space). RGB or CMYK color spaces will fail at the printer and will result in delays and increased costs in Production. **Note**: Files that appear gray on screen and print gray may still be described in a 3-color mode (RGB) or 4-color mode (CMYK). This is unacceptable and must be fixed.
- Images should also have a resolution of at least 300 dpi at the size they will appear on the page.

PhotoShop Instructions

PhotoShop (.ps) is a powerful tool if used correctly. It can scan photographs (continuous tones) and original art. PhotoShop files of photocopies, photos, or illustrations scanned from previously printed material are not acceptable.

- Do not add text to a PhotoShop file.
- All scans must be at 300 dpi resolution, saved as .tif or .jpg files.
- Line art and type cannot be scanned in PhotoShop. If an original illustration is not available and cannot be redrawn, it must be scanned at 8 times the continuous tone resolution ($8 \times 300 = 2400$ dpi). The process is very slow and generates huge files. The time required to scan such material will add to production time and could delay printing. For that reason, we discourage the use of material that must be scanned.
- Do not scan any illustration in bit-map mode, and do not convert it to .tif or any other format. The file must be created in a format we accept.
- Scanned black and white images should have a minimum highlight dot of 8% and a maximum shadow dot of 90%.
- Converting color illustrations to black and white is not as simple as converting color images to grayscales. Certain colors have similar values after conversion to black and white. The colors will be indistinguishable and will require adjustment of brightness and contrast to reproduce properly.

Postscript

PostScript is a page description language (PDL) that is capable of describing the entire appearance of a formatted page, including layout, fonts, graphics, and scanned images. Because a PostScript file is device independent, it can be printed on an imagesetter or any PostScript-compatible printer and will retain the original formatting. It does not provide compression, so files are quite large when stored in PostScript format. However, because there is no compression, PostScript is a high-quality, lossless format. Although used primarily for vector graphics, it contains a mechanism for storing bit-mapped images.

Halftones

A halftone is a printed reproduction of a photograph (or an illustration other than line art). It uses evenly spaced dots of varying sizes to simulate shades of gray. Dense patterns of larger dots produce dark shades, and less dense patterns of smaller dots create lighter shades.

Resolution

Resolution is the fineness of detail attained by a printer in producing an image. Resolution quality for printing is expressed in dpi (dots per inch), so the higher the resolution is, the higher the quality of the image will be. Artwork (electronic, original, or scanned) must have a resolution of 300 dpi at *final output size*. Although an image may look good when viewed on a computer screen (at resolution of only 72 dpi), it cannot be reproduced effectively for printing at such a low resolution.

COMMON PROBLEMS WITH AUTHOR-PRODUCED FILES

1. Your art file may appear to be black and white but may actually be in color.

If you have scanned your art, you should be aware that all scanners will automatically create a file in the color mode (RGB—red/green/blue). Even black and white figures will scan as color. The art will still appear to be black and white on your screen and will print black and white on any b/w printer, but it is in color. The easiest way around this is to convert to grayscale before you scan. The way to convert is as follows:

Go to your Scanner Mode dialog box and choose "grayscale tiff."

2. All print fonts must be embedded in your file before the book can be printed.

The embedding of fonts is an essential step when you are creating a PostScript file or a PDF. If this step is missed or not done correctly, the file cannot be printed. The way to embed fonts is as follows:

When creating the PostScript file, in the print dialog box, select "Embed all fonts" or "Unlimited downloadable fonts." ***(Do not** use "substitute fonts.")*

When creating the PDF, use Adobe Acrobat Distiller. In Distiller, go to job options, fonts, and select "Embed all fonts" and "Embed subsets 100%."

3. There are two different types of PDF files: one that can be used to print your book and one that is not usable.

Do not use Adobe PDF Writer. PDF Writer was designed for creating pages that can be read on a computer screen (72 dots per inch) but that do not have the resolution to be used to create a book. (2,400 dots per inch).

To correctly create a PDF for your book, you must use the Adobe Acrobat Distiller program. Note that Adobe Acrobat Distiller is a folder within the full Adobe Acrobat program. (Note: Taylor and Francis will provide a specific distiller setting for your manuscript. Please consult your Project Coordinator or Project Editor regarding this matter.)

4. When you create Postscript and/or PDF documents, please save them by chapter.

Please do *not* send your entire book in a single document. Documents should be submitted with a single PDF or PS document for each chapter in the book.

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WHAT NEEDS PERMISSION?

- A passage from a play, poem, or song
- A quote of 50 or more words from a periodical or journal
- A quote (or series of shorter quotes) totaling 400 words or more from a book
- Any table, diagram, figure, or illustration (line drawing or halftone)

DO I NEED PERMISSIONS FOR MY OWN MATERIAL?

If you are the author of material copyrighted by another party, you must get permission from that party to use the material in your current publication. We have included a sample permission letter (Page 12) to aid you in requesting permissions.

DO I NEED PERMISSION IF I ALTER A FIGURE?

The important issue in determining whether permission is needed for an altered figure is the amount of alteration. The change must be substantial if you want to avoid the legal requirement to obtain permissions. What constitutes "substantial" change is a murky legal area. Changing straight lines to arrows, relabeling a figure with letters instead of numbers, or reordering columns in a table does **not** constitute substantial change and can distort the meaning of the original material. The best approach for avoiding permission issues is to use original materials wherever possible.

FORM VS. CONTENT

Data cannot be copyrighted. Only the format in which it is published can be copyrighted. No permission is needed if data that appear in another text are converted to tabular form. If you are the first author to create a table comparing studies by four other scientists, you do not need permissions, but you should cite the studies as references.

PUBLIC DOMAIN NATURE OF GOVERNMENT MATERIAL

Most printed materials of the U.S., Canadian, and British governments do not require permissions because they are in the public domain and not protected by copyright. However, many government-sponsored agencies copyright their materials and their use requires permission. The best approach is to request permission unless you are certain it is not required.

DENIAL OF PERMISSION REQUEST

Permission requests are rarely denied, but they are frequently ignored, despite repeated attempts to secure them. Some follow-up may be necessary. If a permission cannot be obtained despite your best efforts, you can:

1. Delete the copyrighted material.
2. Find a substitute for the copyrighted material.
3. Substantially alter the material so permission is no longer required. Taylor and Francis strongly discourages this option.

SOURCE LINE ATTRIBUTING MATERIAL TO COPYRIGHT HOLDER

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SAMPLE PERMISSION LETTER

Page 12 is a self-explanatory permission request letter that covers use of copyrighted material in all future revisions and all media. If a copyright holder grants permission for one-time use only, additional permissions will be required for future editions of your work. Inclusion of clear information about your planned use of the material and accurate publication data will help the copyright holder respond promptly. You should retain copies of all permission request correspondence in your files.

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(Please print or type name)

_____
(Please sign and date)

_____
(Chapter number/Chapter title)

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INDEXING

Authors of author-produced books are required to provide the index for their manuscripts, unless otherwise specified in the contract. Authors are encouraged to read Taylor and Francis' *Indexing Instructions for Authors*, a booklet that explains the procedure of producing an index and discusses format, cross-referencing, capitalization, punctuation, and other issues involved. The instructions given in this booklet will measure up to the scientific community's exacting standards and enable your readers to quickly locate needed information. This booklet can be obtained from your Acquiring Editor or Project Coordinator.

TABLE OF CONTENTS HEADINGS

All subject heads used in your text should appear in outline form in the table of contents in one of the two styles below. Use the one that applies to your publication.

Roman Numeral Outline Format

I. MAJOR HEADING

A. FIRST LEVEL SUBHEAD
   1. Second level subhead
   2. Next second level subhead
      a. Third level subhead
B. FIRST LEVEL SUBHEAD

Decimal Outline Format

1. MAJOR HEADING
1.1 FIRST LEVEL SUBHEAD
   1.1.1 Second level subhead
   1.1.2 Next second level subhead
      1.1.2.1 Third level subhead
1.2 FIRST LEVEL SUBHEAD

IN-TEXT HEADINGS

In-text headings should follow the number/letter or decimal system you have chosen. Major headings should be input in all caps, centered. Leave one blank line above and below a major heading.

I. RECENT EPIDEMICS

First subheads should be input in all caps, flush left, with one blank line above the subhead.

A. BACTERIAL EPIDEMICS

Second subheads should be upper case/lower case (capitalize first word and any proper names), flush left, with one blank line above the subhead.

1. Tuberculosis

Third subheads should be italicized or underscored and treated the same way as second subheads.

a. Effectiveness of Preventative Measures

ABBREVIATIONS/ACRONYMS

Abbreviation/acronyms are acceptable in text if they are used universally in your discipline and your readers will easily understand them. They represent a quick way to convey statistical information and should be used consistently throughout a book (or chapter of a contributed book). A list of suggested abbreviations/acronyms is located on Page 22. Do not use the ampersand (&) as a substitute for "and" in text or tables. Please note that acronyms should be explained when first mentioned:

> The American Society for Testing and Materials (ASTM) issued specifications for the material in 1991, after its St. Louis conference. ASTM later revised the specifications…

TRADEMARKS

Trademarks must be acknowledged in text in one of two ways:

- Include the registered trademark symbol (®) and an asterisk in the text: The wide range of consumer uses of Teflon®* resulted indirectly from its use in the space program. Add a footnote (*Registered trademark of E.I. du Pont de Nemours & Company, Inc., Wilmington, Delaware).

- Place the registration information in parentheses in the text: The wide range of consumer uses of Teflon® (E.I. Du Pont de Nemours & Company, Inc., Wilmington, Delaware) resulted indirectly from its use in the space program.

Capitalize subsequent mentions of a trademarked name. You do not have to add the registration symbol to subsequent mentions. If you use a great number of trademarked names throughout your text, the best option may be including a listing at the end of the chapter or book.

EQUATIONS

Equations should be numbered consecutively in Arabic numbers within each chapter for all books. For example, the fourth equation in Chapter 3 should be numbered 3.4.

Review mathematical symbols (+, −, ≤, ≠, ≡, for example) to be sure they are correct. If a lengthy equation must be "wrapped" onto the next line, break it in a logical place. Do ***not*** extend an equation outside the live area and into the margin. Make sure superscript symbols appear above the line and subscript symbols appear below the line. All parentheses and brackets should be closed.

LISTINGS

Listings may be numbered, unnumbered, or bulleted. Punctuation should be consistent throughout a listing and follow grammar principles. The first word of each item should be capitalized. If a listing item is not a complete sentence, no punctuation is used. All items should be consistent.

Typical equilibrium parameters include:

1. Organic flow rate, ml/min
2. Aqueous flow rate, ml/min
3. Mixer peripheral velocity, fps

The following developments produced the greatest impacts on modern society:

- Henry Ford devised a method for mass producing automobiles.
- The Wright Brothers invented the airplane.
- Radio, television, and the computer allowed instant communication worldwide.

TABLES AND FIGURES

Every table and figure should be mentioned or described in text (Table 6.6 shows results of parking lot reconnaissance; Figure 2.3 illustrates a police line-up.). Tables and figures should be numbered consecutively within each chapter (like equations) for all books (Table 6.6, Figure 2.3). The table number and caption should appear above each table, without punctuation; the figure number and caption should appear below each figure, with punctuation.

Table 6.6 Number of cars in parking lot

	9 a.m.	**11 a.m.**	**1 p.m.**	**3 p.m.**	**5 p.m.**
Red	10	2	7	9	N/A
Blue	12	12	10	11	N/A
Green	6	7	4	6	N/A
Silver	4	3	4	3	4
White	14	14	13	14	11

Tables:

Include a heading for each column of data and align decimal points. A zero should precede the decimal point in a number less than one (0.25). Do not use ditto marks (″). Use N/A or an en-dash (–) to indicate data that are not available. Footnotes in table data should appear as superscript lower-case letters (11.4^{b}) if only a few items need footnotes.

If a reference citation in a table could be confused with data, enclose the reference in parentheses and insert it on the line with table data, as in 10×12^{7} (15). If you plan to include more than three references in a table, it may be advisable to devote a column to references. That will enhance clarity and eliminate the need for superscript numbers and parentheses.

Figures:

Clear, sharp electronic line art and original photographs can be reproduced well and will enhance the quality of your book. *No production process can improve unclear, smudged, bit-mapped, or poorly labeled figures*. Please examine each illustration critically to ensure that it meets Taylor and Francis' standards and readers' expectations.

SOURCE LINES FOR TABLES, PHOTOGRAPHS, AND FIGURES

Two of the most common source lines used for illustrations are shown below. A figure source line is enclosed in parentheses and included after the caption. Table source lines should not be enclosed in parentheses and should appear below the table body. Some copyright holders request specific wording of source lines as a condition to granting permission and their requests should be accommodated. Source lines can be included even if material is not subject to copyright (U.S. government publications, for example). For more detail, see the Permissions section.

Figure Source Line for Journal Article:

> (From Mueller, W.J., *Poult. Sci*., 40, 1562, 1961. With permission.)

Table Source Line for Book:

> *Source:* Bath, D.L., Dickinson, F.N., Tucker, H.A., and Appleman, R.D., *Dairy Cattle: Principles, Practices, Problems, Profits*, 3rd ed., Lea & Febiger, Philadelphia, 1985. With permission.

Add "Adapted from" or "Modified from" to your source line if you adapt or modify copyrighted material. Contact your Project Coordinator if you have questions about source lines.

REFERENCES

Taylor & Francis follows *Chicago Manual of Style, 15th edition* for reference style. However, as long as consistent style is maintained within any one work, logical variations on the CMS reference style are acceptable.

Books:

Authored book:

Woods, David D. and Erik Hollnagel. 2006. *Joint cognitive systems*. Boca Raton: Taylor & Francis.

In text: (Woods and Hollnagel 2006)

Chapter in multiauthored book:

Wiens, J. A. 1983. Avian community ecology: An iconoclastic view. In *Perspectives in ornithology*, ed. A. H. Brush, and G. A. Clark, 355–403. Cambridge: Cambridge Univ. Press.

Note: In Reference section, when there are more than six authors, first three are listed, followed by et al. In text, first author listed followed by et al.

Journals:

Terborgh, J. 1974. Preservation of natural diversity. *BioScience* 24:715-22.

Electronic journal:

Testa, B., and L. B. Kier. 2000. Emergence and dissolvence in the self-organisation of complex systems. *Entropy* 2, no. 1 (March): 1-25. http://www.mdpi.org/entropy/papers/e2010001.pdf.

Unpublished Documents:

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CROSS REFERENCING OF CHAPTERS IN CONTRIBUTED BOOKS

Authors of chapters in contributed books frequently refer to other authors' chapters in the same book. It is not necessary to include a source line or include the chapter on your reference list if you do so. Simply refer to the chapter number and include a short description:

> Chapter 15 discusses calcium metabolism in greater detail.

SUGGESTED ABBREVIATIONS

alternating current	AC	kilowatt	kW
American Chemical Society	ACS	lethal dose/fifty	LD_{50}
ampere	A	liter	l
approximately, about	ca	logarithm	log
barrel per day	bbl/day	lumen	lm
barrel	bbl	lumen per watt	lm/W
baud	Bd	measure of hydrogen activity	pH
becquerel	Bq	mega	M
bit per second	b/sec	megahertz	MHz
blood urea nitrogen	BUN	melting point	mp
British thermal unit	Btu	meter	m
candela	cd	micro	μ
catalytic rate constant	k_{cat}	micron	μm
Centers for Disease Control	CDC	mile (statute)	mi
centimeter	cm	millibar	mbar
coulomb	C	milliliter	ml
cubic centimeter (medical use)	cc	millimeter	mm
cubic centimeter (space volume)	cm^3	millimicron	nm
cubic feet per minute	ft^3	millivolt	mV
curie	Ci	minute (time)	min
cycle	c	molal	*m*
decibel	d	molar concentration	*M*
degree Celsius	°C	mole	mol
degree Fahrenheit	°F	nano	n
Department of Energy	DOE	nanosecond	ns
direct current	DC	National Institutes of Health	NIH
dyne	dyn	National Research Council	NRC
Electric Power Research Institute	EPRI	newton	N
electromagnetic unit	EMU	ohm	Ω
Environmental Protection Agency	EPA	ounce	oz
et alii (and others)	et al.	parts per billion	ppb
farad	F	parts per million	ppm
feet/foot	ft	pascal	Pa
feet per minute	ft/min	per os (orally)	p.o.
freezing point	fp	pint	pt
gallon	gal	pound	lb
gastrointestinal	GI	quart	qt
gigacycle per second	GHz	radian	rad
grain	gr	revolution per second	r/sec
gram	g	roentgen	R
hertz	Hz	second	s
hour	h	specific gravity	sp gr
inch	in.	square foot	ft^2
infrared	IR	standard deviation	SD
international unit	IU	tesla	T
intramuscular	i.m.	ultraviolet	UV
intraperitoneal	i.p.	United Kingdom	U.K.
intravenous	i.v.	United States	U.S.
ionization constant	K	United States Pharmacopeia	USP
Jet Propulsion Laboratory	JPL	volt	V
joule	J	watt	W
kelvin	K	weight per volume	w/v
kilo	k	weight percent	wt%
kilogram	kg	World Health Organization	WHO
kilometer	km	yard	yd

COMMON JOURNAL TITLE ABBREVIATIONS

Acta Math.
Adv. Agron.
Adv. Pharmacol. Chemother.
Adv. Protein Chem.
Adv. Quantum Electron.
Aeronautic. Eng. Rev.
Aerosp. Med.
Agri. Eng. J.
Ann. Intern. Med.
Ann. Med.
Ann. Phys.
Annu. Rev. Immunol.
Arch. Biochem. Biophys.
Arch. Biol. Sci.
Arch. Dermatol.
Arch. Mitrobiol.
Arch. Neurol.
Arch. Ophthalmol.
Arch. Pathol.
Arch. Surg.
Biochem. J.
Biochim. Biophys. Acta
Biol. Psychol.
Br. J. Stat. Psychol.
Br. Med. J.
Bull. Am. Phys. Soc.
Cardiovasc. Res.
Cardiovasc. Rev.
Chem. Eng. Progress
Chem. Eng. Sci.
Clin. Endocrinol.
Colloid Sci.
Comm. Pure Appl. Math.
Commun. Soil Sci. Plant Anal.
Crit. Rev. Anal. Chem.
Electr. Eng. Rev.
Eng. Geol.
Eng. Med.
Eng. News
Eng. Sci.
Environ. Pollution Manage.
Environ. Qual. Saf.
Enzyme Technol. Dig.
Excerpta Med.
Exp. Cell Res.
Exp. Med. Surg.
Fluid Dyn. Trans.
Geophys. Abstr.
Home Health Q.
IEEE Trans.
Ind. Med. Surg.
Inorg. Chem.
J. Am. Chem. Soc.
J. Appl. Bacteriol.
J. Appl. Phys.
J. AWWA
J. Biol. Chem.
J. Clin. Invest.
J. Differential Geometry
J. Electrochem. Soc.
J. Entomology
J. Environ. Health
J. Environ. Qual.
J. Exp. Med.
J. Fluid Mech.
J. Hazardous Materials
J. Infec. Dis.
J. Math. Mech.
J. Metall.
J. Natl. Cancer Inst.
J. Soil Sci.
J. Toxicol.
JAMA
Materials Sci. Res.
Matrix Tensor Q.
Methods Biochem. Anal.
Methods Exp. Phys.
Methods Forensic Sci.
Microbial Genet. Bull.
Microwave J.
Miner. Sci. Eng.
Monthly Labor Rev.
Nat. Phys. Sci.
Natl. Environ. J.
Ophthalmic Surg.
Opt. Laser Technol.
Opt. Spectra
Org. Mass Spectrom.
Org. Photochem.
Pollution Eng.
Polymer Rev.
Power Fuel Bull.
Power Plant Eng.
Power Plant. Technol.
Proc. IEEE
Proc. Soc. Exp. Biol. Med.
Soil Biol. Biochem.
Soil Sci. Am. Proc.
Solid State Electron.
Surf. Colloid Sci.
Surg. Gynecol. Obstet.
Trends Cell Biol.
Water Resour. Res.
Water Waste Treat.

INTERNATIONAL SYSTEM OF UNITS (SI)

The International System of Units, abbreviated as SI (from the French name *Le Système International d'Unités*), was established in 1960 by the 11th General Conference on Weights and Measures (CGPM) as the modern metric system of measurement. The core of the SI is the seven base units for the physical quantities length, mass, time, electric current, thermodynamic temperature, amount of substance, and luminous intensity. These base units are:

	SI base unit	
Base quantity	**Name**	**Symbol**
length	meter	m
mass	kilogram	kg
time	second	s
electric current	ampere	A
thermodynamic temperature	kelvin	K
amount of substance	mole	mol
luminous intensity	candela	cd

The SI base units are defined as follows:

meter: The meter is the length of the path travelled by light in vacuum during a time interval of 1/299 792 458 of a second.

kilogram: The kilogram is the unit of mass; it is equal to the mass of the international prototype of the kilogram.

second: The second is the duration of 9 192 631 770 periods of the radiation corresponding to the transition between the two hyperfine levels of the ground state of the cesium 133 atom.

ampere: The ampere is that constant current which, if maintained in two straight parallel conductors of infinite length, of negligible circular cross-section, and placed 1 meter apart in vacuum, would produce between these conductors a force equal to $2 \cdot 10^{-7}$ newton per meter of length.

kelvin: The kelvin, unit of thermodynamic temperature, is the fraction 1/273.16 of the thermodynamic temperature of the triple point of water.

mole: The mole is the amount of substance of a system which contains as many elementary entities as there are atoms in 0.012 kilogram of carbon 12. When the mole is used, the elementary entities must be specified and may be atoms, molecules, ions, electrons, other particles, or specified groups of such particles.

candela: The candela is the luminous intensity, in a given direction, of a source that emits monochromatic radiation of frequency $540 \cdot 10^{12}$ hertz and that has a radiant intensity in that direction of 1/683 watt per steradian.

SI derived units

Derived units are units which may be expressed in terms of base units by means of the mathematical symbols of multiplication and division (and, in the case of °C, subtraction). Certain derived units have been given special names and symbols, and these special names and symbols may themselves be used in combination with those for base and other derived units to express the units of other quantities. The next table lists some examples of derived units expressed directly in terms of base units:

	SI derived unit	
Physical quantity	**Name**	**Symbol**
area	square meter	m^2
volume	cubic meter	m^3
speed, velocity	meter per second	m/s
acceleration	meter per second squared	m/s^2
wave number	reciprocal meter	m^{-1}
density, mass density	kilogram per cubic meter	kg/m^3
specific volume	cubic meter per kilogram	m^3/kg
current density	ampere per square meter	A/m^2
magnetic field strength	ampere per meter	A/m
concentration (of amount of substance)	mole per cubic meter	mol/m^3
luminance	candela per square meter	cd/m^2
refractive index	(the number) one	1[(a)]

[(a)] The symbol "1" is generally omitted in combination with a numerical value.

For convenience, certain derived units, which are listed in the next table, have been given special names and symbols. These names and symbols may themselves be used to express other derived units. The special names and symbols are a compact form for the expression of units that are used frequently. The final column shows how the SI units concerned may be expressed in terms of SI base units. In this column, factors such as m^0, kg^0 ..., which are all equal to 1, are not shown explicitly.

			SI derived unit expressed in terms of:	
Physical quantity	**Name**	**Symbol**	**Other SI units**	**SI base units**
plane angle	radian[(a)]	rad	$m \cdot m^{-1} = 1$[(b)]	
solid angle	steradian[(a)]	sr[(c)]	$m^2 \cdot m^{-2} = 1$[(b)]	
frequency	hertz	Hz	s^{-1}	
force	newton	N	$m \cdot kg \cdot s^{-2}$	
pressure, stress	pascal	Pa	N/m^2	$m^{-1} \cdot kg \cdot s^{-2}$
energy, work, quantity of heat	joule	J	$N \cdot m$	$m^2 \cdot kg \cdot s^{-2}$
power, radiant flux	watt	W	J/s	$m^2 \cdot kg \cdot s^{-3}$
electric charge, quantity of electricity	coulomb	C	$s \cdot A$	
electric potential difference, electromotive force	volt	V	W/A	$m^2 \cdot kg \cdot s^{-3} \cdot A^{-1}$
capacitance	farad	F	C/V	$m^{-2} \cdot kg^{-1} \cdot s^4 \cdot A^2$
electric resistance	ohm	Ω	V/A	$m^2 \cdot kg \cdot s^{-3} \cdot A^{-2}$
electric conductance	siemens	S	A/V	$m^{-2} \cdot kg^{-1} \cdot s^3 \cdot A^2$
magnetic flux	weber	Wb	$V \cdot s$	$m^2 \cdot kg \cdot s^{-2} \cdot A^{-1}$

magnetic flux density	tesla	T	Wb/m^2	$kg \cdot s^{-2} \cdot A^{-1}$
inductance	henry	H	Wb/A	$m^2 \cdot kg \cdot s^{-2} \cdot A^{-2}$
Celsius temperature	degree Celsius[(d)]	°C		K
luminous flux	lumen	lm	$cd \cdot sr$[(c)]	$m^2 \cdot m^{-2} \cdot cd = cd$
illuminance	lux	lx	lm/m^2	$m^2 \cdot m^{-4} \cdot cd = m^{-2} \cdot cd$
activity (of a radionuclide)	becquerel	Bq		s^{-1}
absorbed dose, specific energy (imparted), kerma	gray	Gy	J/kg	$m^2 \cdot s^{-2}$
dose equivalent, ambient dose equivalent, directional dose equivalent, personal dose equivalent, organ equivalent dose	sievert	Sv	J/kg	$m^2 \cdot s^{-2}$
catalytic activity	katal	kat		$s^{-1} \cdot mol$

[(a)] The radian and steradian may be used with advantage in expressions for derived units to distinguish between quantities of different nature but the same dimension. Some examples of their use in forming derived units are given in the next table.

[(b)] In practice, the symbols rad and sr are used where appropriate, but the derived unit "1" is generally omitted in combination with a numerical value.

[(c)] In photometry, the name steradian and the symbol sr are usually retained in expressions for units.

[(d)] It is common practice to express a thermodynamic temperature, symbol T, in terms of its difference from the reference temperature T_0 = 273.15 K. The numerical value of a Celsius temperature t expressed in degrees Celsius is given by $t/°C = T/K-273.15$. The unit °C may be used in combination with SI prefixes, e.g., millidegree Celsius, m°C. Note that there should never be a space between the ° sign and the letter C, and that the symbol for kelvin is K, not °K.

The SI derived units with special names may be used in combinations to provide a convenient way to express more complex physical quantities. Examples are given in the next table:

	SI derived unit		
Physical Quantity	**Name**	**Symbol**	**As SI base units**
dynamic viscosity	pascal second	Pa · s	$m^{-1} \cdot kg \cdot s^{-1}$
moment of force	newton meter	N · m	$m^2 \cdot kg \cdot s^{-2}$
surface tension	newton per meter	N/m	$kg \cdot s^{-2}$
angular velocity	radian per second	rad/s	$m \cdot m^{-1} \cdot s^{-1} = s^{-1}$
angular acceleration	radian per second squared	rad/s^2	$m \cdot m^{-1} \cdot s^{-2} = s^{-2}$
heat flux density, irradiance	watt per square meter	W/m^2	$kg \cdot s^{-3}$
heat capacity, entropy	joule per kelvin	J/K	$m^{-3} \cdot kg \cdot s^{-2} \cdot K^{-1}$
specific heat capacity, specific entropy	joule per kilogram kelvin	$J/(kg \cdot K)$	$m^2 \cdot s^{-2} \cdot K^{-1}$
specific energy	joule per kilogram	J/kg	$m^2 \cdot s^{-2}$
thermal conductivity	watt per meter kelvin	$W/(m \cdot K)$	$m \cdot kg \cdot s^{-3} \cdot K^{-1}$
energy density	joule per cubic meter	J/m^3	$m^{-1} \cdot kg \cdot s^{-2}$
electric field strength	volt per meter	V/m	$m \cdot kg \cdot s^{-3} \cdot A^{-1}$
electric charge density	coulomb per cubic meter	C/m^3	$m^{-3} \cdot s \cdot A$
electric flux density	coulomb per square meter	C/m^2	$m^{-2} \cdot s \cdot A$
permittivity	farad per meter	F/m	$m^{-3} \cdot kg^{-1} \cdot s^4 \cdot A^2$
permeability	henry per meter	H/m	$m \cdot kg \cdot s^{-2} \cdot A^{-2}$
molar energy	joule per mole	J/mol	$m^2 \cdot kg \cdot s^{-2} \cdot mol^{-1}$
molar entropy, molar heat capacity	joule per mole kelvin	$J/(mol \cdot K)$	$m^2 \cdot kg \cdot s^{-2} \cdot K^{-1} \cdot mol^{-1}$
exposure (x and γ rays)	coulomb per kilogram	C/kg	$kg^{-1} \cdot s \cdot A$
absorbed dose rate	gray per second	Gy/s	$m^2 \cdot s^{-3}$
radiant intensity	watt per steradian	W/sr	$m^4 \cdot m^{-2} \cdot kg \cdot s^{-3} = m^2 \cdot kg \cdot s^{-3}$
radiance	watt per square meter steradian	$W/(m^2 \cdot sr)$	$m^2 \cdot m^{-2} \cdot kg \cdot s^{-3} = kg \cdot s^{-3}$
catalytic (activity) concentration	katal per cubic meter	kat/m^3	$m^{-3} \cdot s^{-1} \cdot mol$

In practice, with certain quantities preference is given to the use of certain special unit names, or combinations of unit names, in order to facilitate the distinction between different quantities having the same dimension. For example, the SI unit of frequency is designated the hertz, rather than the reciprocal second, and the SI unit of angular velocity is designated the radian per second rather than the reciprocal second (in this case retaining the word radian emphasizes that angular velocity is equal to 2π times the rotational frequency). Similarly the SI unit of moment of force is designated the newton meter rather than the joule.

In the field of ionizing radiation, the SI unit of activity is designated the becquerel rather than the reciprocal second, and the SI units of absorbed dose and dose equivalent the gray and sievert, respectively, rather than the joule per kilogram. In the field of catalysis, the SI unit of catalytic activity is designated the katal rather than the mole per second. The special names becquerel, gray, sievert, and katal were specifically introduced because of the dangers to human health which might arise from mistakes involving the units reciprocal second, joule per kilogram and mole per second.

Units for dimensionless quantities, quantities of dimension one

Certain quantities are defined as the ratios of two quantities of the same kind, and thus have a dimension which may be expressed by the number one. The unit of such quantities is necessarily a derived unit coherent with the other units of the SI and, since it is formed as the ratio of two identical SI units, the unit also may be expressed by the number one. Thus the SI unit of all quantities having the dimensional product one is the number one. Examples of such quantities are refractive index, relative permeability, and friction factor. Other quantities having the unit 1 include "characteristic numbers" like the Prandtl number and numbers which represent a count, such as a number of molecules, degeneracy (number of energy levels), and partition function in statistical thermodynamics. All of these quantities are described as being dimensionless, or of dimension one, and have the coherent SI unit 1. Their values are simply expressed as numbers and, in general, the unit 1 is not explicitly shown. In a few cases, however, a special name is given to this unit, mainly to avoid confusion between some compound derived units. This is the case for the radian, steradian and neper.

SI prefixes

The following prefixes have been approved by the CGPM for use with SI units. Only one prefix may be used before a unit. Thus 10^{-12} farad should be designated pF, not μμF.

Factor	Name	Symbol	Factor	Name	Symbol
10^{24}	yotta	Y	10^{-1}	deci	d
10^{21}	zetta	Z	10^{-2}	centi	c
10^{18}	exa	E	10^{-3}	milli	m
10^{15}	peta	P	10^{-6}	micro	μ
10^{12}	tera	T	10^{-9}	nano	n
10^{9}	giga	G	10^{-12}	pico	p
10^{6}	mega	M	10^{-15}	femto	f
10^{3}	kilo	k	10^{-18}	atto	a
10^{2}	hecto	h	10^{-21}	zepto	z
10^{1}	deka	da	10^{-24}	yocto	y

The kilogram

Among the base units of the International System, the unit of mass is the only one whose name, for historical reasons, contains a prefix. Names and symbols for decimal multiples and submultiples of the unit of mass are formed by attaching prefix names to the unit name "gram" and prefix symbols to the unit symbol "g".

Example : 10^{-6} kg = 1 mg (1 milligram) *but not* 1 μkg (1 microkilogram).

Units used with the SI

Many units that are not part of the SI are important and widely used in everyday life. The CGPM has adopted a classification of non-SI units: (1) units accepted for use with the SI (such as the traditional units of time and of angle); (2) units accepted for use with the SI whose values are obtained experimentally; and (3) other units currently accepted for use with the SI to satisfy the needs of special interests.

(1) Non-SI units accepted for use with the International System

Name	Symbol	Value in SI units
minute	min	1 min = 60 s
hour	h	1 h= 60 min = 3600 s
day	d	1 d = 24 h = 86 400 s
degree	°	1° = (π/180) rad
minute	’	1’ = (1/60)° = (π/10 800) rad
second	”	1” = (1/60)’ = (π/648 000) rad
liter	l, L	1L= 1 dm^3= 10^{-3} m^3
metric ton	t	1 t = 10^3 kg
neper[a]	Np	1 Np = 1
bel[b]	B	1 B = (1/2) ln 10 Np

[a] The neper is used to express values of such logarithmic quantities as field level, power level, sound pressure level, and logarithmic decrement. Natural logarithms are used to obtain the numerical values of quantities expressed in nepers. The neper is coherent with the SI, but is not yet adopted by the CGPM as an SI unit. In using the neper, it is important to specify the quantity.

[b] The bel is used to express values of such logarithmic quantities as field level, power level, sound-pressure level, and attenuation. Logarithms to base ten are used to obtain the numerical values of quantities expressed in bels. The submultiple decibel, dB, is commonly used.

(2) Non-SI units accepted for use with the International system, whose values in SI units are obtained experimentally

Name	Symbol	Value in SI Units
electronvolt[b]	eV	1 eV = 1.602 176 53(14) ·10^{-19} J[a]
dalton[c]	Da	1 Da = 1.660 538 86(28) · 10^{-27} kg[a]
unified atomic mass unit[c]	u	1 u = 1 Da
astronomical unit[d]	ua	1 ua = 1.495 978 706 91(06) · 10^{11} m[a]

[a] For the electronvolt and the dalton (unified atomic mass unit), values are quoted from the 2002 CODATA set of the Fundamental Physical Constants (p. 1-1 of this Handbook). The value given for the astronomical unit is quoted from the IERS Conventions 2003 (D.D. McCarthy and G. Petit, eds., IERS Technical Note 32, Frankfurt am Main: Verlag des Bundesamts für Kartographie und Geodäsie, 200). The value of ua in meters comes from the JPL ephemerides DE403 (Standish E.M. 1995, "Report of the IAU WGAS Sub-Group on Numerical Standards", in "Highlights of Astronomy", Appenlzer ed., pp 180-184, Kluwer Academic Publishers, Dordrecht). It has been determined in "TDB" units using Barycentric Dynamical Time TDB as a time coordinate for the barycentric system.

[b] The electronvolt is the kinetic energy acquired by an electron in passing through a potential difference of 1 V in vacuum.

[c] The Dalton and unified atomic mass unit are alternative names for the same unit, equal to 1/12 of the mass of an unbound atom of the nuclide ^{12}C, at rest and in its ground state. The dalton may be combined with SI prefixes to express the masses of large molecules in kilodalton, kDa, or megadalton, MDa.

[d] The astronomical unit is a unit of length approximately equal to the mean Earth-Sun distance. It is the radius of an unperturbed circular Newtonian orbit about the Sun of a particle having infinitesimal mass, moving with a mean motion of 0.017 202 098 95 radians/day (known as the Gaussian constant).

(3) Other non-SI units currently accepted for use with the International System

Name	Symbol	Value in SI Units
nautical mile		1 nautical mile = 1852 m
knot		1 nautical mile per hour = (1852/3600) m/s
are		1 a = 1 dam^2 = 10^2 m^2
hectare	ha	1 ha = 1 hm^2 = 10^4 m^2
bar	bar	1 bar = 0.1 MPa = 100 kPa = 10^5 Pa
ångström	Å	1 Å = 0.1 nm = 10^{-10} m
barn	b	1 b = 100 fm^2 = 10^{-28} m^2

Other non-SI units

The SI does not encourage the use of cgs units, but these are frequently found in old scientific texts. The following table gives the relation of some common cgs units to SI units.

Name	Symbol	Value in SI units
erg	erg	1 erg = 10^{-7} J
dyne	dyn	1 dyn = 10^{-5} N
poise	P	1P = 1dyn· s/cm^2 = 0.1 Pa·· s
stokes	St	1 St = 1 cm^2/s = 10^{-4} m^2/s
gauss	G	1G ≙ 10^{-4} T
oersted	Oe	1 Oe ≙ (1000/4π) A/m
maxwell	Mx	1Mx ≙ 10^{-8} Wb
stilb	sb	1 sb = 1 cd/cm^2 = 10^4 cd/m^2
phot	ph	1 ph = 10^4 lx
gal	Gal	1 Gal = 1 cm/s^2 = 10^{-2} m/s^2

Note: The symbol ≙ should be read as "corresponds to"; these units cannot strictly be equated because of the different dimensions of the electromagnetic cgs and the SI.

Examples of other non-SI units found in the older literature and their relation to the SI are given below. Use of these units in current texts is discouraged.

Name	Symbol	Value in SI units
curie	Ci	$1\ \text{Ci} = 3.7 \cdot 10^{10}\ \text{Bq}$
roentgen	R	$1\ \text{R} = 2.58 \cdot 10^{-4}\ \text{C/kg}$
rad	rad	$1\ \text{rad} = 1\ \text{cGy} = 10^{-2}\ \text{Gy}$
rem	rem	$1\ \text{rem} = 1\ \text{cSv} = 10^{-2}\ \text{Sv}$
X unit		$1\ \text{X unit} \approx 1.002 \cdot 10^{-4}\ \text{nm}$
gamma	γ	$1\ \gamma = 1\ \text{nT} = 10^{-9}\ \text{T}$
jansky	Jy	$1\ \text{Jy} = 10^{-26}\ \text{W} \cdot \text{m}^{-2} \cdot \text{Hz}^{-1}$
fermi		$1\ \text{fermi} = 1\ \text{fm} = 10^{-15}\ \text{m}$
metric carat		$1\ \text{metric carat} = 200\ \text{mg} = 2 \cdot 10^{-4}\ \text{kg}$
torr	Torr	$1\ \text{Torr} = (101325/760)\ \text{Pa}$
standard atmosphere	atm	$1\ \text{atm} = 101325\ \text{Pa}$
calorie[a]	cal	$1\ \text{cal} = 4.184\ \text{J}$
micron	μ	$1\ \mu = 1\ \mu\text{m} = 10^{-6}\ \text{m}$

[a] Several types of calorie have been used; the value given here is the so-called "thermochemical calorie".

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