EUKARYOTIC CELL

2010 INSTRUCTIONS TO AUTHORS*

SCOPE

_Eukaryotic Cell_ (EC) publishes reports of basic research on eukaryotic microorganisms such as yeasts, fungi, algae, protozoa, and social amoebae. Topics include but are not limited to basic biology; molecular and cellular biology; mechanisms, and control, of developmental pathways; structure and form inherent in basic biological processes; cellular architecture; metabolic physiology; comparative genomics, biochemistry, and evolution; ecology; and population dynamics.

The journal will consider manuscripts reporting results from the use of genome-, transcriptome-, or proteome-wide screening approaches when the experiments address a specific question or working hypothesis and when the results are used to illuminate mechanisms of gene regulation or interactions of signal transduction pathways via additional experiments. Studies that only catalog differences and similarities between genotypes or responses to stimuli are not likely to be reviewed favorably.

In addition, EC will consider manuscripts dealing with the viruses of these organisms and their organelles and with interactions with other living systems, where the focus is clearly on the eukaryotic cell.

Questions about these guidelines may be directed to the editor in chief.

ASM publishes a number of different journals covering various aspects of microbiology. Each journal has a prescribed scope that must be considered in determining the most appropriate journal for each manuscript. If transfer to another ASM journal is recommended by an editor, the corresponding author will be contacted.

**Note that a manuscript rejected by one ASM journal on scientific grounds or on the basis of its general suitability for publication is considered rejected by all other ASM journals.**

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The Council Policy Committee (CPC) of the American Society for Microbiology affirms the long-standing position of the Society that microbiologists will work for the proper and beneficent application of science and will call to the attention of the public or the appropriate authorities misuses of microbiology or of information derived from microbiology. ASM members are obligated to discourage any use of microbiology contrary to the welfare of humankind, including the use of microbes as biological weapons. Bioterrorism violates the fundamental principles expressed in the Code of Ethics of the Society and is abhorrent to ASM and its members.

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*Instructions to Authors are published annually in the January issue. A separate html version, which is updated throughout the year, is at [http://ec.asm.org/misc/ifora.dtl](http://ec.asm.org/misc/ifora.dtl).*
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- A conference report or symposium proceedings
- A technical bulletin or company white paper
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When isolates are derived from patients in clinical studies, do not identify them by using the patients’ initials, even as part of a strain designation. Change the initials to numerals or use randomly chosen letters. Do not give hospital unit numbers; if a designation is needed, use only the last two digits of the unit. (Note: established designations of some viruses and cell lines, although they consist of initials, are acceptable [e.g., JC virus, BK virus, and HeLa cells].

**Nucleotide and Amino Acid Sequences**

Newly determined nucleotide and/or amino acid sequence data must be deposited and GenBank/EMBL/DDBJ accession numbers must be included in the manuscript no later than the modification stage of the review process. It is expected that the sequence data will be released to the public no later than the publication (online posting) date of the accepted manuscript. The accession numbers should be included in a separate paragraph at the end of the Materials and Methods section for full-length papers or at the end of the text for Notes. If conclusions in a manuscript are based on the analysis of sequences and a GenBank/EMBL/DDBJ accession number is not provided at the time of the review, authors should provide the sequence data as supplemental material.

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See “Presentation of Nucleic Acid Sequences” for nucleic acid sequence formatting instructions.

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To comply with recommendations from the International Nucleotide Sequence Database (INSD) Collaborators and to avoid conflicts in gene identification, researchers should implement the following two fundamental guidelines as standards for utilization of locus tags in genome analysis, annotation, submission, reporting, and publication. (i) Locus tag prefixes are systematic gene identifiers for all of the replicons of a genome and as such should be associated with a single genome project submission. (ii) New genome projects must be
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SUBMISSION, REVIEW, AND PUBLICATION PROCESSES

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Authors who are unsure of proper English usage should have their manuscripts checked by someone proficient in the English language.

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Full-length papers should include the elements described in this section.

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Abstract. Limit the abstract to 250 words or fewer and concisely summarize the basic content of the paper without presenting extensive experimental details. Avoid abbreviations and references, and do not include diagrams. When it is essential to include a reference, use the same format as shown for the References section but omit the article title. Because the abstract will be published separately by abstracting services, it must be complete and understandable without reference to the text.

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A method or strain, etc., used in only one of several experiments reported in the paper may be described in the Results section or very briefly (one or two sentences) in a table footnote or figure legend. It is expected that the sources from whom the strains were obtained will be identified.

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graphs illustrating other methods commonly used to derive kinetic or physical constants (e.g., reduced-viscosity plots and plots used to determine sedimentation velocity) need not be shown except in unusual circumstances. Limit photographs (particularly photomicrographs and electron micrographs) to those that are absolutely necessary to show the experimental findings. Number figures and tables in the order in which they are cited in the text, and be sure to cite all figures and tables.

Discussion. The Discussion should provide an interpretation of the results in relation to previously published work and to the experimental system at hand and should not contain extensive repetition of the Results section or reiteration of the introduction. In short papers, the Results and Discussion sections may be combined.

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Appendixes. Appendixes that contain additional material to aid the reader are permitted. Titles, authors, and reference sections that are distinct from those of the primary article are not allowed. If it is not feasible to list the author(s) of the appendix in the byline or the Acknowledgments section of the primary article, rewrite the appendix so that it can be considered for publication as an independent article, either full-length or Note style. Equations, tables, and figures should be labeled with the letter “A” preceding the numeral to distinguish them from those cited in the main body of the text.

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Follow the styles shown in the examples below for print references.

1. Alexander, T. W., L. J. Yanke, E. Topp, M. E. Olson, R. R. Read, D. W. Morck, and T. A. McAllister. 2008. Effect of subtherapeutic administration of antibiotics on the prevalence of antibiotic-resistant *Escherichia coli* bacteria in feedlot cattle. Appl. Environ. Microbiol. 74:4405–4416.

2. Cox, C. S., B. R. Brown, and J. C. Smith. J. Gen. Genet., in press.* {Article title is optional; journal title is mandatory.}

3. da Costa, M. S., M. F. Nobre, and F. A. Rainey. 2001. Genus I. Thermus Brock and Freeze 1969, 295^J^ emend. Nobre, Trüper and da Costa 1996b, 605, p. 404–414. In D. R. Boone, R. W. Castenholz, and G. M. Garrity (ed.), Bergey’s manual of systematic bacteriology, 2nd ed., vol. 1. Springer, New York, NY.

4. Elder, B. L., and S. E. Sharp. 2003. Cumitech 39, Competency assessment in the clinical laboratory. Coordinating ed., S. E. Sharp. ASM Press, Washington, DC.

5. Falagas, M. E., and S. K. Kasiakou. 2006. Use of international units when dosing colistin will help decrease confusion related to various formulations of the drug around the world. Antimicrob. Agents Chemother. 50:2274–2275. (Letter.) {“Letter” or “Letter to the editor” is allowed but not required at the end of such an entry.}

6. Fitzgerald, G., and D. Shaw. In A. E. Waters (ed.), Clinical microbiology, in press. EFH Publishing Co., Boston, MA.* {Chapter title is optional.}

7. Forman, M. S., and A. Valsamakis. 2003. Specimen collection, transport, and processing: virology, p. 1227–1241. In P. R. Murray, E. J. Baron, M. A. Pfaller, J. H. Jorgensen, and R. H. Yolken (ed.), Manual of clinical microbiology, 8th ed. ASM Press, Washington, DC.

8. Garcia, C. O., S. Paira, R. Burgos, J. Molina, J. F. Molina, and C. Calvo. 1996. Detection of salmonella DNA in synovial membrane and synovial fluid from Latin American patients. Arthritis Rheum. 39(Suppl.): S185. {Meeting abstract published in journal supplement.}

9. Green, P. N., D. Hood, and C. S. Dow. 1984. Taxonomic status of some methylotrophic bacteria, p. 251–254. In R. L. Crawford and R. S. Hanson (ed.), Microbial growth on C1 compounds. Proceedings of the 4th International Symposium. American Society for Microbiology, Washington, DC.

10. Odell, J. C. April 1970. Process for batch cultivating. U.S. patent 484,363,770. {Include the name of the
patented item/ process if possible; the patent number is mandatory.)

11. O’Malley, D. R. 1998. Ph.D. thesis. University of California, Los Angeles, CA. {Title is optional.}

12. Rotimi, V. O., N. O. Salako, E. M. Mohaddas, and L. P. Philip. 2005. Abstr. 45th Intersci. Conf. Antimicrob. Agents Chemother., abstr. D-1658. {Abstract title is optional.}

13. Smith, D., C. Johnson, M. Maier, and J. J. Maurer. 2005. Distribution of fimbrial, phage and plasmid associated virulence genes among poultry Salmonella enterica serovars, abstr. P-038. p. 445. Abstr. 105th Gen. Meet. Am. Soc. Microbiol. American Society for Microbiology, Washington, DC. {Abstract title is optional.}

14. Stratagene. 2006. Yeast DNA isolation system: instruction manual. Stratagene, La Jolla, CA. {Use the company name as the author if none is provided for a company publication.}

*A reference to an in-press ASM publication should state the control number (e.g., EC000577-10) if it is a journal article or the name of the publication if it is a book.

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1. Charlier, D., and N. Glansdorff. September 2004, posting date. Chapter 3.6.1.10, Biosynthesis of arginine and polyamines. In R. Curtiss III et al. (ed.), EcoSal—Escherichia coli and Salmonella: cellular and molecular biology. ASM Press, Washington, DC. http://www.ecosal.org/. {Note that each chapter has its own posting date.}

2. Dionne, M. S., and D. S. Schneider. 2002. Screening the fruitfly immune system. Genome Biol. 3:REVIEWS1010. http://genomcbiology.com/2002/3/4/reviews/1010.

3. Smith, F. X., H. J. Merianos, A. T. Brunger, and D. M. Engelman. 2001. Polar residues drive association of polyleucine transmembrane helices. Proc. Natl. Acad. Sci. U. S. A. 98:2250–2255. doi:10.1073/pnas.041593698.

4. Winnick, S., D. O. Lucas, A. L. Hartman, and D. Toll. 2005. How do you improve compliance? Pediatrics 115:e718–e724.

Note: a posting or accession date is required for any online reference that is periodically updated or changed.

(ii) References cited in the text. References to unpublished data, manuscripts submitted for publication, unpublished conference presentations (e.g., a report or poster that has not appeared in published conference proceedings), personal communications, patent applications and patents pending, computer software, data-bases, and websites (home pages) should be made parenthetically in the text as follows.

... similar results (R. B. Layton and C. C. Weathers, unpublished data).

... system was used (J. L. McInerney, A. F. Holden, and P. N. Brighton, submitted for publication).

... as described previously (M. G. Gordon and F. L. Rattner, presented at the Fourth Symposium on Food Microbiology, Overton, IL, 13 to 15 June 1989). {For nonpublished abstracts and posters, etc.}

... this new process (V. R. Smoll, 20 June 1999, Australian Patent Office). {For non-U.S. patent applications, give the date of publication of the application.}

... available in the GenBank database (http://www.ncbi.nlm.nih.gov/Genbank/index.html).

... using ABC software (version 2.2; Department of Microbiology, State University [http://www.state.micro.edu]).

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Wang, G. G., M. P. Pasillas, and M. P. Kamps. 15 May 2006. Persistent transactivation by Meis1 replaces Hox function in myeloid leukemogenesis models: evidence for co-occupancy of Meis1-Pbx and Hox-Pbx complexes on promoters of leukemia-associated genes. Mol. Cell. Biol. doi:10.1128/MCB.00586-06.

Other journals may use different styles for their publish-ahead-of-print manuscripts, but citation entries must include the following information: author name(s), posting date, title, journal title, and volume and page numbers and/or DOI. The following is an example:

Zhou, F. X., H. J. Merianos, A. T. Brunger, and D. M. Engelman. 13 February 2001, posting date. Polar residues drive association of polyleucine...
transmembrane helices. Proc. Natl. Acad. Sci. U. S. A.
dot:10.1073/pnas.041593698.

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The Note format is intended for the presentation of brief observations that do not warrant full-length papers. Submit Notes in the same way as full-length papers. They receive the same review, they are not published more rapidly than full-length papers, and they are not considered preliminary communications.

Each Note must have an abstract of no more than 50 words. Do not use section headings in the body of the Note; combine methods, results, and discussion in a single section. Paragraph lead-ins are permissible. The text should be kept to a minimum and if possible should not exceed 1,000 words; the number of figures and tables should also be kept to a minimum. Materials and methods should be described in the text, not in the figure legends or table footnotes. Present acknowledgments as in full-length papers, but do not use a heading. The References section is identical to that of full-length papers.

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**Illustrations**

*Image manipulation.* Computer-generated images may be processed only minimally. Processing (e.g., changing contrast, brightness, or color balance) is acceptable only if applied to all parts of the image, as well as to the controls, equally, and descriptions of all such adjustments and the tools used (both hardware and software) must be provided in the manuscript. Unprocessed data and files must be retained by the authors and be provided to the editor on request.

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For reprints, ASM’s print provider will automatically create CMYK versions of color illustrations from the RGB files. The CMYK color space is used to capture scientific data, and it can display a wider range of colors (especially bright fluorescent hues) than the CMYK (cyan, magenta, yellow, black) color space used by print devices that put ink (or toner) on paper. For reprints, ASM’s print provider will automatically create CMYK versions of color illustrations from the RGB files. The CMYK color space is used to capture scientific data, and it can display a wider range of colors (especially bright fluorescent hues) than the CMYK (cyan, magenta, yellow, black) color space used by print devices that put ink (or toner) on paper. For reprints, ASM’s print provider will automatically create CMYK versions of color illustrations from the RGB files. 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Drawings

Submit graphs, charts, complicated chemical or mathematical formulas, diagrams, and other drawings as finished products not requiring additional artwork or typesetting. All elements, including letters, numbers, and symbols, must be easily readable, and both axes of a graph must be labeled.

When creating line art, please use the following guidelines:

(i) All art must be submitted at its intended publication size. For acceptable dimensions, see “Size,” above.

(ii) Avoid using screens (i.e., shading) in line art. It can be difficult and time-consuming to reproduce these images without moiré patterns. Various pattern backgrounds are preferable to screens as long as the fill patterns are not imported from another application. If you must use images containing screens,

(a) Generate the image at line screens of 85 lines per inch or lower.

(b) When applying multiple shades of gray, differentiate the gray levels by at least 20%.

(c) Never use levels of gray below 5% or above 95% as they are likely to fade out or become totally black when output.

(iii) Use thick, solid lines that are no finer than 1 point in thickness.

(iv) No type should be smaller than 6 points at the final publication size.

(v) Avoid layering type directly over shaded or textured areas.

(vi) Avoid the use of reversed type (white lettering on a black background).

(vii) Avoid heavy letters, which tend to close up, and unusual symbols, which the printer may not be able to reproduce in the legend.

(viii) If colors are used, avoid using similar shades of the same color and avoid very light colors.

In figure ordinate and abscissa scales (as well as table column headings), avoid the ambiguous use of numbers with exponents. Usually, it is preferable to use the appropriate Système International d’Unités (SI) symbols ($\mu$ for $10^{-6}$, m for $10^{-3}$, k for $10^3$, and M for $10^6$, etc.). A complete listing of SI symbols can be found in the International Union of Pure and Applied Chemistry (IUPAC) publication Quantities, Units and Symbols in Physical Chemistry (RSC Publishing, Cambridge, United Kingdom, 2007); an abbreviated list is available at http://old.iupac.org/reports/1993/homann/index.html. Thus, representation of 20,000 cpm on a figure ordinate should be made by the number 20 accompanied by the label kcpm.

Where powers of 10 must be used, the journal requires that the exponent power be associated with the number shown. In representing 20,000 cells per ml, the numeral on the ordinate would be “2” and the label would be “$10^4$ cells per ml” (not “cells per ml $\times 10^4$”). Likewise, an enzyme activity of 0.06 U/ml would be shown as 6 accompanied by the label $10^{-2}$ U/ml. The preferred designation would be 60 mU/ml (milliunits per milliliter).
TABLE 2. Specific activity of β-galactosidase produced from an integrated YIFBP1 promoter-lacZ fusion in Y. lipolytica grown in different carbon sourcesa

| Strain and relevant genotype | Glucose | Glycerol | Ethanol | Acetate |
|-----------------------------|--------|---------|---------|---------|
|                             | YNB    | YP      | YNB     | YP      | YNB | YP | YNB | YP |
| RJM007 YIFBP1               | 36 ± 5 | 14 ± 4  | 47 ± 4  | 12 ± 1  | 85 ± 6 | 36 ± 3 | 70 ± 5 | 23 ± 5 |
| RJM008 Ylfbp1::URA3         | 97 ± 13| 33 ± 2  | 94 ± 15 | 23 ± 5  | 297 ± 15 | 182 ± 6 | 372 ± 13 | 189 ± 10 |

a Y. lipolytica strains RJM007 and RJM008, wild type and Ylfbp1::URA3, respectively, bearing a fusion of the YIFBP1 promoter to E. coli lacZ integrated into the chromosomal YLEU2 locus (see Materials and Methods) were cultured in minimal or rich medium with the indicated carbon sources, and β-galactosidase was assayed as described in Materials and Methods. Results are the mean values ± the standard errors of the means of the results from four independent cultures.

Presentation of Nucleic Acid Sequences

Long nucleic acid sequences must be presented as figures in the following format to conserve space. Print the sequence in lines of approximately 100 to 120 nucleotides in a nonproportional (monospace) font that is easily legible when published with a line length of 6 inches (ca. 15.2 cm). If possible, lines of nucleic acid sequence should be further subdivided into blocks of 10 or 20 nucleotides by spaces within the sequence or by marks above it. Uppercase and lowercase letters may be used to designate the exon-intron structure or transcribed regions, etc., if the lowercase letters remain legible at a 6-inch (ca. 15.2-cm) line length. Number the sequence line by line; place numerals, representing the first base of each line, to the left of the lines. Minimize spacing between lines of sequence, leaving room only for annotation of the sequence. Annotation may include boldface, underlining, brackets, and boxes, etc. Encoded amino acid sequences may be presented, if necessary, immediately above or below the first nucleotide of each codon, by using the single-letter amino acid symbols. Comparisons of multiple nucleic acid sequences should conform as nearly as possible to the same format.

Figure Legends

On initial submission, to assist review, the legend should be incorporated in the image file and appear beneath the figure. At the modification stage, figure legends must be provided as text files separate from the image file.

Legends should provide enough information so that the figure is understandable without frequent reference to the text. However, detailed experimental methods must be described in the Materials and Methods section, not in a figure legend. A method that is unique to one of several experiments may be reported in a legend only if the discussion is very brief (one or two sentences). Define all symbols used in the figure and define all abbreviations that are not used in the text.

Tables

Tables that contain artwork, chemical structures, or shading must be submitted as illustrations in an acceptable format at the modification stage. The preferred format for regular tables is Microsoft Word; however, WordPerfect and Acrobat PDF are also acceptable. Note that a straight Excel file is not currently an acceptable format. Excel files must be either embedded in a Word or WordPerfect document or converted to PDF before being uploaded. If your modified manuscript contains PDF tables, select “for reviewing purposes only” at the beginning of the file upload process.

Tables should be formatted as follows. Arrange the data so that columns of like material read down, not across. The headings should be sufficiently clear so that the meaning of the data is understandable without reference to the text. See the “Abbreviations” section of these Instructions for those that should be used in tables. Explanatory footnotes are acceptable, but more-extensive table “legends” are not. Footnotes should not include detailed descriptions of the experiment. Tables must include enough information to warrant table format; those with fewer than six pieces of data will be incorporated into the text by the copy editor. Table 2 from Eukaryot. Cell 7:1742–1749, 2008, is an example of a well-constructed table.

Cover Photographs and Drawings

EC publishes photographs and drawings on the front cover. Invitations are issued to authors whose manuscripts are returned for modification or whose manuscripts have been accepted for publication in EC; material should be related to the work presented in the EC manuscript. Unsolicited photos will also be considered. No material submitted for consideration will be returned to the author. Authors will be notified only if their cover art is selected. Copyright for the chosen material must be transferred to ASM. A short description of the cover material will be included. Technical specifications for submission are available from the cover editor, C. C. Wang (ccwang@ecl.ucsf.edu).

NOMENCLATURE

Chemical and Biochemical Nomenclature

The recognized authority for the names of chemical compounds is Chemical Abstracts (CAS; http://www.cas.org/) and its indexes. The Merck Index, 14th ed. (Merck & Co., Inc., Whitehouse Station, NJ, 2006), is also an excellent source. For guidelines to the use of biochemical terminology, consult Biochemical Nomenclature and Related...
Nomenclature of Mice

For mouse strain and genetic nomenclature, ASM encourages authors to refer to the guidelines set forth by the International Committee on Standardized Genetic Nomenclature for Mice, available on the Mouse Genome Database home page at http://www.informatics.jax.org/ and in Genetic Variants and Strains of the Laboratory Mouse, 3rd ed. (M. F. Lyon et al., ed., Oxford University Press, Oxford, England, 1996).

Nomenclature of Microorganisms

Binary names, consisting of a generic name and a specific epithet (e.g., Saccharomyces cerevisiae), must be used for all microorganisms. Names of categories at or above the genus level may be used alone, but specific and subspecific epithets may not. A specific epithet must be preceded by a generic name, written out in full the first time it is used in a paper. Thereafter, the generic name should be abbreviated to the initial capital letter and any proper (trivial) name in parentheses at first use in the abstract and text. Use the EC number when one has been assigned. Authors of papers describing enzymological studies should review the standards of the STRENGA Commission for information required for adequate description of experimental conditions and for reporting enzyme activity data (http://www.strenda.org/documents.html).

Genetic Nomenclature

To facilitate accurate communication, it is important that standard genetic nomenclature be used whenever possible and that deviations or proposals for new naming systems be endorsed by an appropriate authoritative body. Review and/or publication of submitted manuscripts that contain new or nonstandard nomenclature may be delayed by the editor or the Journals Department so that they may be reviewed by the Genetics and Genomics Committee of the ASM Publications Board.

Before submission of manuscripts, authors may direct questions on genetic nomenclature to the committee’s chairman: Maria Costanzo (maria@genome.stanford.edu). Such a consultation should be mentioned in the manuscript submission letter.

Eukaryotes. The nomenclature used for the genetics of lower eukaryotic microorganisms has not been as well formalized as that for bacteria and bacteriophages. Gen-
Conventions for naming genes. It is recommended that (entirely) new genes be given names that are mnemonics of their function, avoiding names that are already assigned and earlier or alternative gene names, irrespective of the organism for which such assignments have been made. Similarly, it is recommended that, whenever possible, orthologous genes present in different organisms receive the same name. When homology is not apparent or the function of a new gene has not been established, the GenBank locus tag may be used to designate the gene; it should not be italicized.

Locus tags. Locus tags are systematic, unique identifiers that are assigned to each gene in GenBank. All genes mentioned in a manuscript should be traceable to their sequences by the reader, and locus tags may be used for this purpose in manuscripts to identify uncharacterized genes. Authors should check GenBank to make sure that they are using the correct, up-to-date format for locus tags (e.g., uppercase versus lowercase letters and presence or absence of an underscore, etc.). Locus tag formats vary between different organisms and also may be updated for a given organism, so it is im-
important to check GenBank at the time of manuscript preparation.

“Homology” versus “similarity.” For use of terms that describe relationships between genes, consult the articles by Theissen (Nature 415:741, 2002) and Fitch (Trends Genet. 16:227–231, 2000). “Homology” implies a relationship between genes that have a common evolutionary origin; partial homology is not recognized. When sequence comparisons are discussed, it is more appropriate to use the term “percent sequence similarity” or “percent sequence identity,” as appropriate.

“Mutant” versus “mutation.” Keep in mind the distinction between a mutation (an alteration of the primary sequence of the genetic material) and a mutant (a strain carrying one or more mutations). One may speak about the mapping of a mutation, but one cannot map a mutant. Likewise, a mutant has no genetic locus, only a phenotype.

Transposable elements, plasmids, and restriction enzymes. Nomenclature of transposable elements (insertion sequences, transposons, and phage Mu, etc.) should follow the recommendations of Campbell et al. (Gene 5:197–206, 1979), with the modifications referred to in the Instructions to Authors in the Journal of Bacteriology.

The system of designating transposon insertions at sites where there are no known loci, e.g., zef 123::Tn5, has been described by Chumley et al. (Genetics 91:639–655, 1979). Use the nomenclature recommendations of Novick et al. (Bacteriol. Rev. 40:168–189, 1976) for plasmids and plasmid-specified activities, of Low (Bacteriol. Rev. 36:587–607, 1972) for F factors, and of Roberts et al. (Nucleic Acids Res. 31:1805–1812, 2003) for restriction enzymes, DNA methyltransferases, homingendonucleases, and their genes. The nomenclature for recombinant DNA molecules constructed in vitro follows the nomenclature for insertions in general. DNA inserted into recombinant DNA molecules should be described by using the gene symbols and conventions for the organism from which the DNA was obtained.

ABBREVIATIONS AND CONVENTIONS

Verb Tense

ASM strongly recommends that for clarity you use the past tense to narrate particular events in the past, including the procedures, observations, and data of the study that you are reporting. Use the present tense for your own general conclusions, the conclusions of previous researchers, and generally accepted facts. Thus, most of the abstract, Materials and Methods, and Results will be in the past tense, and most of the introduction and some of the Discussion will be in the present tense.

Be aware that it may be necessary to vary the tense in a single sentence. For example, it is correct to say “White (30) demonstrated that XYZ cells grow at pH 6.8,” “Figure 2 shows that ABC cells failed to grow at room temperature,” and “Air was removed from the chamber and the mice died, which proves that mice require air.” In reporting statistics and calculations, it is correct to say “The values for the ABC cells are statistically significant, indicating that the drug inhibited . . . .”

For an in-depth discussion of tense in scientific writing, see p. 191–193 in How To Write and Publish a Scientific Paper, 6th ed.

Abbreviations

General. Abbreviations should be used as an aid to the reader, rather than as a convenience for the author, and therefore their use should be limited. Abbreviations other than those recommended by the IUPAC-IUB (Biochemical Nomenclature and Related Documents, 1992) should be used only when a case can be made for necessity, such as in tables and figures.

It is often possible to use pronouns or to paraphrase a long word after its first use (e.g., “the drug” or “the substrate”). Standard chemical symbols and trivial names or their symbols (folate, Ala, and Leu, etc.) may also be used.

Define each abbreviation and introduce it in parentheses the first time it is used; e.g., “cultures were grown in Eagle minimal essential medium (MEM).” Generally, eliminate abbreviations that are not used at least three times in the text (including tables and figure legends).

Not requiring introduction. In addition to abbreviations for Système International d’Unités (SI) units of measurement, other common units (e.g., bp, kb, and Da), and chemical symbols for the elements, the following should be used without definition in the title, abstract, text, figure legends, and tables: DNA (deoxyribonucleic acid); cDNA (complementary DNA); RNA (ribonucleic acid); cRNA (complementary RNA); RNase (ribonuclease); DNase (deoxyribonuclease); rRNA (ribosomal RNA); mRNA (messenger RNA); tRNA (transfer RNA); AMP, ADP, ATP, dAMP, ddATP, and GTP, etc. (for the respective 5’ phosphates of adenosine and other nucleosides) (add 2’, 3’, or 5’, when needed for contrast); ATPase and dGTPase, etc. (adenosine triphosphatase and deoxyguanosine triphosphatase, etc.); NAD (nicotinamide adenine dinucleotide); NAD+ (nicotinamide adenine dinucleotide, oxidized); NADH (nicotinamide adenine dinucleotide, reduced); NADP (nicotinamide adenine dinucleotide phosphate); NADPH (nicotinamide adenine dinucleotide phosphate, reduced); NADP+ (nicotinamide adenine dinucleotide phosphate, oxidized); poly(A) and poly(dT), etc. (polyadenylic acid and polydeoxythymidylic acid, etc.); oligo(dT), etc. (oligo(deoxythymidylic acid, etc.); UV (ultraviolet); PFU (plaque-forming units); CFU (colony-forming units); MIC (minimal inhibitory concentration); Tris [tris(hydroxymethyl)aminomethane]; DEAE (diethylaminoethyl); EDTA (ethyl-
enediaminetetraacetic acid); EGTA [ethylene glycol-bis
(β-aminoethyl ether)-N,N′,N″,N‴-tetraacetic acid]; HEPES
(N-2-hydroxyethylpiperazine-N′-2-ethanesulfonic acid);
PCR (polymerase chain reaction); and AIDS (acquired
immunodeficiency syndrome). Abbreviations for cell lines
(e.g., HeLa) also need not be defined.

The following abbreviations should be used without
definition in tables:

| Abbreviation | Definition                  |
|--------------|-----------------------------|
| amt (amount) | SE (standard error)         |
| approx (approximately) | SEM (standard error of the mean) |
| avg (average) | sp act (specific activity) |
| concn (concentration) | sp gr (specific gravity) |
| diam (diameter) | temp (temperature) |
| exptl (experimental) | tr (trace) |
| expt (experiment) | vol (volume) |
| ht (height) | vs (versus) |
| mo (month) | wk (week) |
| mol wt (molecular weight) | wt (weight) |
| no. (number) | yr (year) |
| prepn (preparation) |                |
| SD (standard deviation) |                |

### Reporting Numerical Data

Standard metric units are used for reporting length,
weight, and volume. For these units and for molarity, use
the prefixes m, μ, n, and p for 10⁻³, 10⁻⁶, 10⁻⁹, and 10⁻¹², respectively. Likewise, use the prefix k for 10³.
Avoid compound prefixes such as μm or μμ. Use μg/ml
or μg/g in place of the ambiguous ppm. Units of tem-
perature are presented as follows: 37°C or 324 K.

When fractions are used to express units such as enzy-
matic activities, it is preferable to use whole units, such as
“g” or “min,” in the denominator instead of fractional or
multiple units, such as μg or 10 min. For example, “μmol/
min” is preferable to “nmol/10 min,” and “μmol/g” is pref-
erable to “nmol/μg.” It is also preferable that an unambig-
ous form such as exponential notation be used; for exam-
ple, “μmol g⁻¹ min⁻¹” is preferable to “μmol/g/min.” Al-
ways report numerical data in the appropriate SI units.

For a review of some common errors associated with
statistical analyses and reports, plus guidelines on how to
avoid them, see the article by Olsen (Infect. Immun. 71:
6689–6692, 2003).

For a review of basic statistical considerations for vi-
rology experiments, see the article by Richardson and
Overbaugh (J. Virol. 79:669–676, 2005).

### Isotopically Labeled Compounds

For simple molecules, isotopic labeling is indicated in
the chemical formula (e.g., ¹⁴CO₂, ³H₂O, and H₂³⁵SO₄).
Brackets are not used when the isotopic symbol is at-
tached to the name of a compound that in its natural
state does not contain the element (e.g., ³₂S-ATP) or to
a word which is not a specific chemical name (e.g., ¹³¹I-
labeled protein, ¹⁴C-amino acids, and ³H-ligands).

For specific chemicals, the symbol for the isotope in-
trroduced is placed in square brackets directly preceding
the part of the name that describes the labeled entity.
Note that configuration symbols and modifiers precede
the isotopic symbol. The following examples illustrate
correct usage:

- [¹⁴C]urea
- L-[methyl-¹⁴C]methionine
- [2,3-³H]serine
- [α-¹⁴C]lysine
- [γ-³²P]ATP
- UDP-[U-¹⁴C]glucose
- E. coli [³²P]DNA
- fructose 1,6-[³²P]bisphosphate

EC follows the same conventions for isotopic labeling
as the Journal of Biological Chemistry, and more-detailed
information can be found in the instructions to authors
of that journal (first issue of each year).