

INSTRUCTIONS FOR THE PREPARATION OF MANUSCRIPTS

For the Annual Reviews of:

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Revised February 2020

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Use italics for

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- In chemical names, *p*, *o*, *m*, *n*, *cis*, *sec*, *sic*, *trans*, *syn*
- Genes, genotypes, loci, markers, mutants, alleles, operons
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- Names of taxa of rank higher than genus
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Examples on the next pages show how these components will be laid out in your article.

ARTICLE COMPONENTS

Sidebar: highlight a related topic (text only; up to 200 words)

EXCIMERS, EXCIPLEXES, AND EXCITONS

As discussed elsewhere (3, 115), it is sometimes mistakenly assumed that an electronically excited nucleobase encounters a second nucleobase. An excimer state with strong charge transfer character (70) independent of how it is formed in aromatic crystals and photopolymers (70) in which diffusion is not observed. Excimers in this case can be formed from different initial DNA exciplexes can also be called interbase charge transfer states (65), keeping configuration interaction with the excitonic state formed by the interaction between bases.

that pico- and nanosecond timescale emission is seen in resolved emission experiments could not determine whether major or a minor decay channel. Crespo-Hernández et al. show that most excited states in single-stranded DNA are This established that most relaxation occurs faster than emission experiments (69) and slower than the femtosecond monomers (Section 2.1).

Crespo-Hernández et al. (60) assigned the long-lived oligonucleotides to intratranded excimers in which excitations (see the sidebar). This conclusion is supported by the excellent between the long-time transient absorption signals for site resolved emission signals measured by Plessow et al. (69) for emission spectra from the 15-mer (69) clearly show the best a hallmark of excimer/exciple states (70). In fact, excimer/ in DNA photophysics, having been observed in DNA di- in the 1960s (71).

Transient absorption experiments in other laboratories lived excited states in DNA oligomers (61, 62). Kwok et al. (dA)₂₀ by femtosecond transient absorption and the femtosecond. On the basis of red-shifted emission signals that absorption signals, these authors also assigned the long-lived they proposed that two distinct excimers are formed with lifetime is in reasonable agreement with the (dA)_n lifetime (60). Kwok et al. (61) assign the long-lived component to a that it involves more than two bases as opposed to the localized on just two bases. Experimental evidence that spans more than two bases was never presented. Kwok's localized excitation progressively delocalizes with time is a chromophoric system. Experiments by Takaya et al. (65) the long-lived states in adenine tracts are localized on just

Excimer/exciple: an excited electronic state with substantial charge transfer character involving two identical (excimer) or different (exciple) molecules

3.3. Base Pairing Does Not Quench the Long-Lived Excited States in DNA Strands Joined by Hydrogen Bonds

Base pairing in solvated DNA is usually accompanied by a gate excited states in DNA strands joined by hydrogen bonds

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Terms and Definitions: highlight major terms and abbreviations used in text (as many as 20, 20 words each)

First-level heading (unnumbered or numbered)

1. INTRODUCTION

Photolesion: a stable photoproduct formed in DNA or RNA usually by photochemical modification of one or two bases by UV light

Electronic excitation of DNA by solar ultraviolet (UV) light can produce harmful photoproducts such as the thymine dimer. Excitation is efficient because of the substantial UV-absorption cross sections of the DNA nucleobases: adenine, guanine, cytosine, and thymine (Figure 1). The vast majority of excitations do not initiate photochemical reactions as evidenced by the quantum yields of photolysis formation, which are generally much less than 1%. The altered structures and base-pairing properties of photoproducts can interfere with the work of polymerases and disrupt normal cellular processing of DNA. This interference can lead to mutations, genomic instability, and carcinogenesis (1). In organisms exposed to solar UV light, DNA constantly accrues photochemical damage that must be continually repaired. Disruption of the equilibrium between damage and

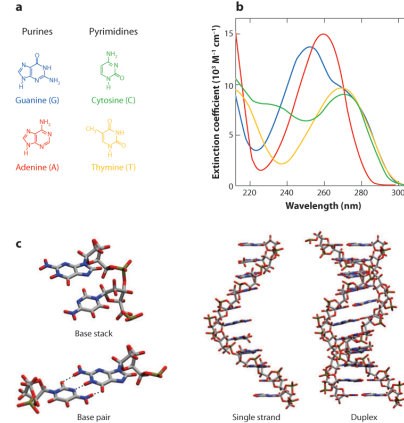


Figure 1 (a) Chemical structures and (b) UV absorption spectra of the DNA bases. (c) Basic assemblies of nucleobases. Structures were drawn using the VMD software (116).

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Figure (see Author Graphics Guide for instructions)

Second-level heading (unnumbered or numbered)

3.3. Stellar Sources of Presolar Grains and Astrophysical Constraints from Presolar Grains

Every presolar stardust grain is a solid piece of stellar matter that condensed at time in a specific star. Because the actual parent stars have been dead for eons, measured isotopic compositions with astronomical observations and prediction models are required to identify the type of stellar source (or class of isotopically similar grains). Analysis and interpretation of presolar iterative approach; once a stellar source for a grain is identified on the basis of one ratios, additional isotopic data can be used to refine models and improve understanding within that type of star, or alternatively in some cases, these data indicate that assignment of source was incorrect. The origin of some types of presolar grain of SiC grains with ¹³C/¹²C ratios lower than 10 is still unresolved, largely of the theoretical understanding of potential sources. The classification and source presolar O-rich grains and SiC grains are illustrated in Figures 4b and 5, respect of isotopic compositions for materials that formed in the Solar System are indicative of the radically anomalous nature of the presolar grains. These plots are analogous to the Hertzsprung-Russell diagram used to classify stars and identify associated with different physical properties and stages of evolution. Examples of provide new astrophysical information about their sources are discussed below.

3.3.1. Asymptotic giant branch stardust. As seen in Figures 4b and 5, a major and C-rich presolar grains in extraterrestrial materials (excluding the ambiguous are believed to have originated in asymptotic giant branch (AGB) stars, low- to mid (1–8 M_⊙) stars in very late stages of evolution. The AGB phase follows the main star star is fueled by core hydrogen (H) burning, the Red Giant phase when the envelope is modified by the first dredge-up, mixing of deep material that experienced p and the brief phase of core He burning. AGB stars are powered by alternating and He shells that overlay an electron-degenerate core of C and O, which will a white dwarf remnant. These stars have large convective envelopes and strong driven by condensation of dust in the cooling outer portions. Periodic mixing dredge-up from the deep burning shells changes the envelope composition, synthesized material, including ¹³C and heavy elements made by the s-process capture (Käppeler et al. 1990). Thus, although most or all stars start out with rich, the third dredge-up gradually increases the C/O ratio until it exceeds unit has a profound effect on dust chemistry: When C/O < 1, diagnostic infrared indicate O-rich phases such as silicates and oxides are present, whereas in AGB 1, observations indicate the presence of phases such as SiC and elemental C.

Because AGB stars are the primary producers of C and s-process elements in also prodigious producers of dust to the interstellar medium (ISM) (Kemper et are of great astrophysical importance, and presolar grain studies provide important on a range of relevant astrophysical issues. For example, whereas most presolar

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Third-level heading (unnumbered or numbered)

Table 1 Summary of retail price changes

Definition of restructured	Status	Average retail price (USD)			Percent change	
		1997	2007	2012	1997–2007	2007–2012
Power in the Public Interest definition	Not restructured	5.89	7.44	8.72	0.21	0.15
	Restructured	8.96	12.53	12.35	0.29	–0.01
At least 40% independent power producers in 2012	Not restructured	5.67	7.23	8.57	0.22	0.16
	Restructured	8.83	11.99	11.95	0.26	0.00

Retail price data are from US Energy Information Administration (EIA) form 861, which reports sales and revenues by utility.

Table (see page 12 for instructions)

first measure is the one used in a study by Showalter (2007) for Power in the Public Interest that is cited in the *New York Times* article (Johnston 2007). This definition excludes from the restructured category states such as Illinois and Pennsylvania, which by 2012 have almost all of their energy provided from nonutility sources. As an alternative measure, we assign states to the restructured category if they had more than 40% of their energy provided by nonutility sources in 2012.¹⁶

From Table 1, one can see that at this level of analysis, the definition of restructured makes only a small difference. The time period examined, however, makes an enormous difference as rates in restructured states increased at a pace nearly 50% higher than those in nonrestructured states between 1997 and 2007 but have actually declined slightly since 2007. Average rates in states that did not restructure have continued to increase since 2007, although at a slightly lower pace than between 1998 and 2007. Overall, there is almost no difference in the change in average rates for the two groups over the full sample from 1998 to 2012.

Figure 6 illustrates the annual levels of rates in restructured and nonrestructured states using our generation-based definition, along with the national average citygate natural gas price. Restructured states experienced higher rates during the 1990s, a major factor in their election to adopt restructuring. The gap between traditionally regulated and restructured states narrows around 1998, reflecting the impact of legislation that required immediate rate reductions to accompany restructuring in several states. Since that time, rates in restructured states more closely follow the trajectory of gas prices up during the early 2000s and back down since then.

To further test this relationship among natural gas prices, restructuring, and electricity rates, we estimate the following regression on state-level annual changes in electricity prices and citygate natural gas prices:

$$\Delta \text{Elec}_{i,t} = \alpha + \beta_1 \text{FractionPP}_{i,t} + \beta_2 \Delta \text{NG}_{i,t} + \beta_3 \text{FractionPP}_{i,t} \times \Delta \text{NG}_{i,t} \quad 1.$$

where $\Delta \text{Elec}_{i,t} = \ln(\text{Rate}_{i,t}) - \ln(\text{Rate}_{i,t-1})$ and $\Delta \text{NG}_{i,t} = \ln(\text{NG}_{i,t}) - \ln(\text{NG}_{i,t-1})$ are the annual changes in log state average electricity rates and log state average

Equation (numbered when referred to in text)

¹⁶The *New York Times* article lists the restructured states as California, Connecticut, Delaware, Maine, Maryland, Massachusetts, Michigan, Montana, New Hampshire, New Jersey, New York, Rhode Island, and Texas and the District of Columbia (Johnston 2007). Our generation-based definition puts California, Connecticut, Delaware, Illinois, Maine, Maryland, Massachusetts, Montana, New Hampshire, New Jersey, New York, Ohio, and Pennsylvania into the restructured category.

Footnote

ARTICLE COMPONENTS (CONTINUED)

Summary Points list: highlight the central points of your review (as many as 8); items should be in complete sentences

Future Issues list: note where research may be headed (as many as 8); items should be in complete sentences or questions

SUMMARY POINTS

1. DNA- and RNA-associated autoantigens activate autoreactive B cells in vitro through a mechanism that depends on the BCR and TLR9 and TLR7, respectively. The response to RNA autoantigens is enhanced by type I IFN, presumably through upregulation of TLR7.
2. DNA- and RNA-containing ICs activate DCs through a mechanism that depends on uptake through FcγRs and TLR9 and/or TLR7. IC-activated pDCs produce high levels of IFN-α that can promote the activity of many of the effector mechanisms associated with SLE and other systemic autoimmune diseases.
3. TLR9 deficiency in vivo leads to decreased anti-dsDNA antibody production, but effects on end organ disease and survival are variable. TLR9^{-/-} 56R FcγRII^{-/-} mice do not make pathogenic IgG2a and IgG2b anti-DNA autoantibodies; TLR9^{-/-} lpr and Ab15 mice develop increased autoantibody titers for RNA-associated autoantigens and develop more severe clinical features of SLE.
4. TLR7 deficiency in vivo leads to decreased titers of RNA-reactive autoantibodies. TLR7^{-/-} lpr mice develop clinical features of SLE that are slightly less severe than the TLR7^{+/-} control group.
5. The Yaa mutation results from duplication of a 4 Kb segment of the X chromosome that includes TLR7. FcγR^{-/-} Yaa mice and Sle1.Yaa mice make elevated titers of IgG autoantibodies reactive with RNA autoantigens and develop more severe features of SLE than their non-Yaa littermates.

FUTURE ISSUES

1. How will the combined effects of TLR7 and TLR9 deficiency influence disease manifestations in both lpr and non-lpr models of SLE and what will be the effect of TLR7/9 blockade on human disease?
2. Do gene products other than TLR7 contribute to the Yaa phenotypes?
3. How do DNA-/RNA-containing ICs affect FcγR⁺ TLR7⁺ and/or TLR9⁺ cell populations other than pDCs? Will RNA-containing ICs activate FcγR/TLR8-expressing cells and what will be the consequences of this activation?
4. What other PRRs are used by autoantigens to elicit immune system activation?

DISCLOSURE STATEMENT

U.S. patent application 10/487,885 entitled Method and Composition for Treating Immune Complex-Associated Disorders and corresponding foreign applications have been licensed and provide royalty income.

ACKNOWLEDGMENTS

We apologize in advance to all the investigators whose research could not be appropriately cited owing to space limitations. We extend a special thanks to our many collaborators for thoughtful

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Reference style and reference annotations: explain the special importance of selected references from Literature Cited (as many as 10)

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59. Linnmer A, Sacher T, Alferink J, Kreschmar M, Schonrich G, et al. 1998. Failure to induce organ-specific autoimmunity by breaking of tolerance: importance of the microenvironment. *Eur. J. Immunol.* 28:395-406
60. Chen CH, Xiao LM, Chang Y, Wu W, Goldbach C, et al. 2006. In vivo immune modulatory activity of hepatic stellate cells in mice. *Hepatology* 44:1171-81
61. Berg M, Wingender G, Djandji D, Hegenbarth S, Momburg F, et al. 2006. Cross-presentation of antigens from apoptotic tumor cells by liver sinusoidal endothelial cells leads to tumor-specific CD8⁺ T cell tolerance. *Eur. J. Immunol.* 36:2960-70
62. Dhali L, Schürch A, Grochmann R, Hegenbarth S, Chen L, Knolle PA. 2008. Tolerogenic maturation of liver sinusoidal endothelial cells promotes B7-1/homolog 1-dependent CD8⁺ T cell tolerance. *Hepatology* 47:296-305
63. Yoneyama H, Masuno K, Zhang Y, Mouri M, Fukuta M, et al. 2001. Regulation by chemokines of circulating dendritic cell precursors, and the formation of portal tract-associated lymphoid tissue, in a granulomatous liver disease. *J. Exp. Med.* 193:33-49
64. Yoneyama H, Ichida T. 2005. Recruitment of dendritic cells to pathological niches in inflamed liver. *Med. Mol. Morphol.* 38:136-41
65. Grant AJ, Goodard S, Ahmed-Choudhury J, Reynolds G, Jackson DG, et al. 2002. Hepatic expression of secondary lymphoid chemokine (CCL21) promotes the development of portal-associated lymphoid tissue in chronic inflammatory liver disease. *Am. J. Pathol.* 160:1445-55
66. Di Carlo E, Magnasco S, D'Amico T, Tenaglia R, Sorrentino C. 2007. The prostate-associated lymphoid tissue (PALT) is linked to the expression of homing chemokines CXCL13 and CCL21. *Prostate* 67:1070-80
67. Moensson JA, McNulty JA. 2006. Characterization of lymphocyte subsets over a 24-hour period in Pinea-Associated Lymphoid Tissue (PALT) in the chicken. *BMC Immunol.* 7:1
68. The lack of effective T cell immunity to HCV is linked to the "exhausted" phenotype.
69. Griener NH, Lechner F, Jung MC, Diepolder H, Gerlach T, et al. 2001. Sustained dysfunction of antiviral CD8⁺ T lymphocytes after infection with hepatitis C virus. *J. Virol.* 75:5550-58
70. Day CL, Kaufmann DE, Kiegelis P, Brown JA, Mooney ES, et al. 2006. PD-1 expression on HIV-specific T cells is associated with T-cell exhaustion and disease progression. *Nature* 443:350-54
71. Barber DL, Wherry EJ, Masopust D, Zhu B, Allison JP, et al. 2006. Restoring function in exhausted CD8 T cells during chronic viral infection. *Nature* 439:682-87
72. Godkin A, Jeangneer N, Thuras M, Openshaw P, Thomas H. 2001. Characterization of novel HLA-DR11-restricted HCV epitopes reveals both qualitative and quantitative differences in HCV-specific CD4⁺ T cell responses in chronically infected and nonviremic patients. *Eur. J. Immunol.* 31:1438-46
73. Wiedenmeyer H, He XS, Nascimbene M, Davis AR, Greenberg HB, et al. 2002. Impaired effector function of hepatitis C virus-specific CD8⁺ T cells in chronic hepatitis C virus infection. *J. Immunol.* 169:1447-58
74. Puig M, Mihalik K, Tilton JC, Williams O, Merchinsky M, et al. 2006. CD4⁺ immune escape and subsequent T-cell failure following chimpanzee immunization against hepatitis C virus. *Hepatology* 44:736-45
75. Janßen EM, Droin NM, Lemmens EE, Pinkowski MJ, Bensing SJ, et al. 2005. CD4⁺ T-cell help controls CD8⁺ T-cell memory via TRAIL-mediated activation-induced cell death. *Nature* 434:88-93
76. Iwai Y, Terawaki S, Ikegawa M, Okazaki T, Honjo T. 2003. PD-1 inhibits antiviral immunity at the effector phase in the liver. *J. Exp. Med.* 198:39-50
77. Dong H, Zhu G, Tamada K, Flies DR, van Deursen JM, Chen L. 2004. B7-1H1 determines accumulation and deletion of intrahepatic CD8⁺ T lymphocytes. *Immunity* 20:327-36
78. Bertolino P, Trescol-Biemont MC, Rabourdin-Combe C. 1998. Hepatocytes induce functional activation of CD8⁺ T lymphocytes but fail to promote survival. *Eur. J. Immunol.* 28:213-16
79. Lauer GM. 2005. Hepatitis C virus-specific CD8⁺ T cells restricted by donor HLA alleles following liver transplantation. *Liver Transpl.* 11:848-50
80. Bowen DG, Zen M, Holz L, Davis T, McCaughan GW, Bertolino P. 2004. The site of primary T cell activation is a determinant of the balance between intrahepatic tolerance and immunity. *J. Clin. Invest.* 114:701-12

162 Origin

100. Weisbroth SH, Wang R, Scher S. 1973. *Caterera lucata*: immune response in myiasis of domestic rabbits. *Exp. Parasitol.* 34:22-31
101. Wolf M, Batzli GO. 2001. Increased prevalence of bot flies (*Caterera fontinella*) on white-footed mice (*Peromyscus leucopus*) near forest edges. *Can. J. Zool.* 79:106-9
102. Wolfe LS. 1959. Observations on the histopathological changes caused by the larvae of *Hypoderma bovis* (L.) and *Hypoderma lineatum* (de Vill.) (Diptera: Oestridae) in tissues of cattle. *Can. J. Anim. Sci.* 39:144-57
103. Wood DM. 1987. Oestridae. In *Manual of Neotropical Diptera*, Vol. 2, ed. JF McAlpine, pp. 1147-58. Ottawa: Agriculture Canada
104. Zimmer C. 2000. *Parasite Rex: Inside the Bizarre World of Nature's Most Dangerous Creatures*. New York: The Free Press, 298 pp.
105. Zuleta GA, Vignas ML. 1990. Bot fly parasitism (*Rogniohebra bonariensis*) (Diptera, Catersbridae) in the Pampean grassland mouse (*Akodon azarae*) in Argentina. *J. Wildl. Dis.* 26:11-17

102. In-depth study of the histopathology of *Hypoderma larval migration and waste development in cattle*.

RELATED RESOURCES

- Borgsteede C. 2005. *The Art of Being a Parasite*. Transl. D Simberloff. Chicago: Univ. of Chicago Press, 291 pp. (From French)
- Borgsteede FHM. 1996. The effects of parasites on wildlife. *Vet. Q.* 18:S138-40
- Proctor HG. 2003. Feather mites (Acari: Astigmatina): ecology, behavior, and evolution. *Annu. Rev. Entomol.* 48:185-209
- Schmidt GD, Roberts LS. 2000. *Foundations of Parasitology*. Boston: McGraw Hill, 670 pp. 6th ed.
- Scholl PJ. 1993. Biology and control of cattle grubs. *Annu. Rev. Entomol.* 39:53-70
- Scott ME. 1988. The impact of infection and disease on animal populations: implications for conservation biology. *Conserv. Biol.* 2:40-56
- Steedman D. 1976. Effects of external and internal arthropod parasites on domestic livestock production. *Annu. Rev. Entomol.* 21:155-78

36 Slender

ARTICLE COMPONENTS: TABLES

A one-line title for each table should enable the reader to understand the table without referring to the text.

Provide a brief heading for each column; type headings in lowercase letters, capitalizing the first word only. If subheadings are used, draw a horizontal line under the main heading to extend above all relevant subheadings.

Units of measure should be indicated in parentheses after the appropriate heading rather than in the body of the table, e.g., Temperature (°C).

Table 1 Values of muscle-fiber length and muscle physiological cross-section area reported in the literature

Muscle	Muscle-fiber length (cm)				Muscle PCSA ^c (cm ²)			
	Wickiewicz ^a	Friederich ^a	Ward ^a	Tate ^b	Wickiewicz ^a	Friederich ^a	Ward ^a	Tate ^d
Gluteus maximus (superior)	NA ^e	10.8	NA	NA	NA	17.4	NA	NA
Gluteus maximus (middle)	NA	13.0	NA	NA	NA	14.6	NA	NA
Gluteus maximus (inferior)	NA	13.9	NA	NA	NA	14.1	NA	NA
Gluteus medius (anterior)	NA	4.7	NA	NA	NA	19.0	NA	NA
Gluteus medius (middle)	NA	6.8	NA	NA	NA	13.3	NA	NA
Gluteus medius (posterior)	NA	6.0	NA	NA	NA	15.4	NA	NA
Vastus medialis	7.0	7.8	9.7	NA	21.1	41.2	20.6	46.1
Vastus intermedius	6.8	7.6	9.9	NA	22.3	49.6	16.7	54.3
Vastus lateralis	6.6	8.0	9.9	NA	30.6	40.4	35.1	69.9
Soleus	2.0	3.0	4.4	NA	58.0	122.2	51.8	NA
Gastrocnemius (lateral)	5.1	6.1	5.9	NA	NA	11.5	9.7	23.9
Gastrocnemius (medial)	3.5	3.9	5.1	NA	32.4	33.8	21.1	43.7

^aData reported by Wickiewicz (51), Friederich (49), and Ward (50) were obtained by dissection of cadaver specimens.

^bData reported by Tate (59) were obtained from magnetic resonance imaging performed on living subjects. Muscle-fiber lengths were not measured by Tate (59).

^cAbbreviation: PCSA, physiological cross-sectional area.

^dMuscle PCSA was calculated using muscle-fiber lengths reported by Ward (50).

^eAbbreviation: NA, not applicable.

Include additional information in footnotes keyed to the title, heading, or entry of the table as appropriate, a, b, c, etc.

Abbreviate longer headings to conserve space and explain the abbreviations in a footnote.

GRAPHIC COMPONENTS

Annual Reviews strongly encourages the effective use of figures and tables. Article page allotments include space used for figures and tables. Thus, information presented graphically should be referenced, but not repeated, in the text. Figures and tables you submit with your article will appear in both typeset and HTML versions of your article.

The digital methods for creating and sending your figures are treated in the Annual Reviews [Author Graphics Guide](#).

TABLES

Only material requiring several columns and several entries should be submitted in tabular form (incorporate other material into the text). Tables should fit within an Annual Reviews page width (6.33 in; approximately 15 cm). Submit editable electronic files for all tables.

All tables will be formatted according to house style. Please adhere to the following guidelines when preparing your tables.

BODY OF TABLE Align entries under the appropriate heading or subheading. Make sure your table clearly indicates the vertical alignment of headings and data. Type longer entries in block style, leaving extra space between entries. Align numbers on the decimal; if numerical data are mixed, center entries in the column. Write out repeated entries or merge cells; do not use ditto marks. Use ND (no data or not determined), NA (not applicable or not available), and NT (not tested) as needed; do not use a dash or leave a cell blank.

FOOTNOTES Footnotes should be at the bottom of the table; label each with a superscript lowercase letter (a, b, c, etc.) keyed to the title, heading, or entry on the table. Begin the lettering anew for each table. If a footnote applies to more than one table, key it to the title of subsequent tables. Include references in the body of the table rather than as footnotes.

ACCEPTABLE FILE TYPES Table files must be compatible with Microsoft Word [.doc(x) or .rtf] or Excel [.xls(x)]. Mathematically complex tables may be submitted in LaTeX.

The illustration on the previous page is a guide for laying out the title, columns, rows, and footnotes for a table.

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Please refer to the [Author Graphics Guide](#) for details on the preparation of illustrations.

Figures should be well-designed drawings or well-chosen photographs that illustrate key points in your article or that present relevant data in an economical way. Annual Reviews Illustration Editors will work with you to enhance your figures' legibility, color, style, and consistency. Modified figures will be sent to you for approval before publication.

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CHEMICAL STRUCTURES Complex equations and chemical structures that cannot be typeset in one or two lines are considered art (see p. 21). If possible, such equations should be submitted in math-friendly software applications such as LaTeX or MathType. Submit complex chemical structures as editable vector graphics.

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LITERATURE CITED

Here, you will find general guidelines for citing sources in your Annual Reviews article. In Appendix A of this handbook, numerous examples illustrate how to list various types of sources (books, articles, websites, conference papers, etc.) in your Literature Cited section.

- Each reference in the Literature Cited section must be mentioned in text, figure captions, or tables.

NUMBERED REFERENCES

Among Annual Reviews with numbered citations, three bibliographic styles are in use:

- alphabetized, article titles included (Style 1);
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Biochemistry
Biomedical Data Science
Biomedical Engineering

Chemical and Biomolecular Engineering
Control, Robotics, and Autonomous Systems
Environment and Resources
Immunology
Materials Research
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Pharmacology and Toxicology
Physical Chemistry
Physiology
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Condensed Matter Physics
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Anthropology; Astronomy and Astrophysics; Cancer Biology; Cell and Developmental Biology; Clinical Psychology; Criminology; Developmental Psychology; Earth and Planetary Sciences; Ecology, Evolution, and Systematics; Economics; Financial Economics; Fluid Mechanics; Food Science and Technology; Law and Social Science; Linguistics; Marine Science; Neuroscience; Organizational Psychology and Organizational Behavior; Political Science; Psychology; Resource Economics; Sociology; Statistics and Its Application; and Vision Science. For these journals, please download, or obtain from your Production Editor, the appropriate Author Instruction Handbook.

CITATIONS IN TEXT

- Most reference numbers in text should appear in parentheses with a space between each item. Do not use square brackets or superscript numbers to denote reference numbers.

Later in situ studies also supported these results (1, 4, 7).

Similar results were obtained in yeast (23) and flies (99). White (87) tested...

- When a reference number is directly mentioned as part of a long phrase or complete sentence and referring to the author names is undesirable for some reason, adding the word “Reference” may be appropriate for clarity.

(as described, for example, in Reference 77, albeit in a different context)

Figure adapted from Reference 61 with permission.

- If a word or short phrase appears in parentheses with a reference number, neither additional parentheses around the reference number nor the word Reference are needed.

(e.g., 54–56)

(24; see also 45)

(see 48, 49)

(reviewed in 93)

- Use an ampersand to indicate authorship for two authors. For three or more authors, generally use the first author’s surname followed by “et al.” If you would prefer to mention an author other than the first (e.g., because the work in question is more closely associated with the last author), use that author’s name followed by “and colleagues,” “and coworkers,” or “and associates.” Usage such as “the Shastri group” is also acceptable.

White & Gray (52) experimented...
Smith et al. (18) tested the theory.
Zhang and colleagues (95) found...
The Shastri group (6) demonstrated...

- In multiple citations, references should appear in numerical sequence.
- Use semicolons to separate unlike elements within the parentheses.

...(35; J.S. Smith, unpublished information).

...(14, 36, 85; see also 7, 10, 21).

- If a direct quotation is included, provide the page number(s) of the quotation.

Mouton (141) writes compellingly of “the reward of the struggle” (p. 87).

- References to specific webpages or other specific online material should be included in the Literature Cited and cited by number (rather than by placing the URL in the main text or a footnote). For general mentions of the website of an organization, online database resource, etc., the URL can be placed in parentheses in the main text. For more details, see the section on website citations below.

- References to unpublished observations, personal communications, papers in preparation, papers submitted but not yet accepted for publication, etc., should be enclosed in parentheses in text. List all authors up to six (for seven or more authors, list five followed by et al.) and include their first initials. Except for *Physical Chemistry*, do not list these citations as references in the Literature Cited section. *Entomology* does not permit the citation of unpublished works.

(V.M. Kaspi, unpublished data)

(R.S. Jones, G.K. Banks & M. Smith, manuscript in preparation)

(S.A. Goldman, M. Nedergaard, M.S. Windrem, W. Gran, D.B. Holdridge, et al., manuscript in review)

CITATIONS IN BIBLIOGRAPHY

- Do not list references as footnotes to the text.
- Do not use Microsoft Word’s Footnotes or Endnotes functions for citing/listing references.
- Set line spacing to 2 throughout the Literature Cited section.
- Do not indent the first line of each entry.
- For each author, use last name first, then initials, no periods.

- Responsibility for the accuracy of the bibliographic references rests entirely with the author.

For alphabetized literature cited format (Style 1, above), alphabetize by last name of author, then

by initials, by last names of coauthors, and finally by year. Alphabetize compound surnames by the first word, e.g., list under “de,” “van,” “von,” etc. Number the alphabetized list consecutively.

181. Zeiger E. 1990. Article title.
182. Zeiger E, Armond P, Melis A. 1981. Article title.
183. Zeiger E, Bloom AJ, Hepler PK. 1990. Article title.
184. Zeiger E, Field C, de Vitry C. 1988. Article title.
185. Zeiger E, Field C, Mooney HA. 1981. Article title.
186. Zeiger E, Hepler PK. 1991. Article title.
187. Zeiger E, Hepler PK. 1993. Article title.

Use italics for the book or journal title (see Appendix A for examples). Do not abbreviate book titles. Abbreviate titles of journals, proceedings, symposia, and serial compendia according to the *ISSN List of Title Word Abbreviations (LTWA)*, published by the International Organization for Standardization. (Go to <http://www.issn.org/services/online-services/access-to-the-ltwa/> for general information on using the guide, and scroll down to the “View the LTWA” section for the online guide.) Do not abbreviate one-word journal titles.

BIBLIOGRAPHIC STYLE

Most cited sources can be formatted using the general guidelines below. For exceptions or special cases (websites, conference papers, errata, abstracts, etc.), see Appendix A at the end of this handbook.

List numbered references in the Literature Cited with numerals and period, without parentheses. Include the following information (in this order):

1. Name(s) of author(s), last name first, followed by initials without periods. Include both (or all) initials for each author whenever they were included in the original article or book. Do not leave space between initials. Do not use a comma between surnames and initials—use commas only to separate different authors’ names. If a given reference has seven or more

authors, list the first five, then type “et al.” in the bibliography. (But in text, use et al. for three or more authors.) If a reference has six or fewer authors, list them all.

EXCEPTIONS: For *Nuclear and Particle Science*, list all authors up to four; for more than four list first author, then et al. For *Medicine* list first three authors, then et al.

2. Year of publication of the article or book, followed by a period, with no parentheses. If the article has recently been accepted for publication and is actually in press, list it in the Literature Cited section. Provide journal title and expected year of publication, plus volume and pages when known.

EXCEPTION: For *Nuclear and Particle Science*, place the year in parentheses at the end of the reference.

3. Title of article or chapter (see above for the policy of individual Annual Reviews journals regarding whether to include titles of articles or chapters).

4. Title of journal (abbreviated unless only one word) or book (not abbreviated unless part of a periodical series), e.g., *J. Immunol.*

5. For a book reference, name(s) of editor(s).

6. Volume number, then a colon and inclusive page numbers; if there is no volume number, inclusive page numbers preceded by a comma and “pp.” Do not repeat hundreds digit unless needed, e.g., 3–10, 71–77, 100–9, 331–35, 1002–3, 1198–202, 1536–38. The issue number can be included in parentheses immediately following the volume if necessary, e.g., 10(4):123–30.

EXCEPTION: For *Nuclear and Particle Science* you need list only the first page of a chapter or article. For example: 10(4):123.

7. For a book reference, place of publication, name of publisher, and edition, if necessary. For example: New York: Sage (do not put a period at the end of the reference).

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Sample: Brown J, Smith R, Jones CE.

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If you have any difficulty setting up your EndNote system, please go to <http://www.endnote.com/support>.

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GENERAL GUIDELINES When you cite a specific source that is housed online, you should include it in the Literature Cited section. Entries in the Literature Cited section should contain as many items from the following list as are relevant and available.

- Name of the author, editor, compiler, or translator of the web-based item (if available and relevant), followed by any appropriate abbreviations, such as ed.
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- Version number (if not part of the title) or, for a journal, the volume, issue, or other identifying number
- Date of electronic publication or posting or latest update, whichever is most recent (if the resource is still being updated)
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- URL

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29. US Food Drug Admin. 2004. *Innovation or stagnation: challenge and opportunity on the critical path to new medical products*. White Pap., US Food Drug Admin., Washington, DC. <http://www.fda.gov/oc/initiatives/criticalpath/whitepaper.html>
15. Clin. Data Interchange Stand. Consort. (CDISC). 2007. *CDISC and industry collaborative group lead FDA critical path initiative opportunity for data collection standards*. Press Release 33, CDISC, May 15. <http://www.cdisc.org/news/PR33cdiscdashprojectfinal.pdf>

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25. Calif. Energy Comm. 2016. *Hydroelectric power in California*. California Energy Commission. <http://www.energy.ca.gov/hydroelectric>

103. Taussig M. 2015. Seeds of time.
Flatbread Society.
<http://www.flatbreadsociety.net/stories/30/seeds-of-time>

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11. Kennedy E, Dodd C, Clinton HR. 2005. *Letter to US Dep. Labor*, Apr. 12.
<http://www.nationalpartnership.org/site/DocServer/FMLASenateLettertoDOL.pdf?docID=963>

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You may wish to host material on unstable websites as Supplemental Material (see p. 15). Also, URLs can be included in the Related Resources section of your review (see p. 9).

NOMENCLATURE

GENERAL NOMENCLATURE

The primary nomenclature manual for Annual Reviews is *Scientific Style and Format: The CSE Manual for Authors, Editors, and Publishers* (8th edition). Other authoritative references are listed below.

BACTERIOLOGICAL NAMES Use the *List of Bacterial Names with Standing in Nomenclature* (<http://www.bacterio.cict.fr>) and the *Approved Lists of Bacterial Names* as guides for validly published scientific names of bacteria and archaea. Use *Bergey's Manual of Determinative Bacteriology* and *Index Bergeyana* as guides for names of unknown bacteria.

INORGANIC, ORGANIC, AND BIOCHEMICAL NOMENCLATURE We accept all abbreviations, symbols, and trivial names in the rules of the IUPAC-IUB.

DRUGS Use nonproprietary (generic) names for drugs. When the name is relatively unfamiliar, follow its first use with the trade name. *Entomology, Medicine, Nutrition, Pathology: Mechanisms of Disease, and Pharmacology and Toxicology* require the use of ® as a superscript on first use of a trade name.

EXCEPTION: In *Psychology*, the terms adrenaline and noradrenaline (not capitalized) are permissible in place of epinephrine and norepinephrine.

GENETICS The 8th edition of *Scientific Style and Format* covers all organisms for which they have been able to obtain rules and guidelines (<http://www.councilscienceeditors.org/publications/resources.cfm>). Also see the section on italics in this handbook.

GENUS-SPECIES SCIENTIFIC NAMES Spell out the full generic and specific names on first use: e.g., *Escherichia coli*. Thereafter, the genus name should be abbreviated to the first letter (*E. coli*). If the name appears frequently and may be confused with another genus whose first letter is

the same, spell both names out every four or five pages.

INSECTS Use common and scientific names approved by the Entomological Society of America (<http://www.entsoc.org/common-names>) whenever possible. Authors from non-North American countries may use common names current in their countries. In general, do not capitalize the first letter of a common name unless a proper name is included.

ABBREVIATIONS AND SYMBOLS

Use abbreviations and symbols sparingly and only if terms are repeated frequently. Define all but the obvious standard symbols and abbreviations when they first appear in text (a list of standard abbreviations and units is provided in Appendix B on p. 26). Avoid using nonstandard abbreviations in titles and headings.

Chemical and graphic formulas may be used (see next section) and are set in roman type. Use U³⁺ rather than U⁺⁺⁺. Atomic weights of isotopes are to be indicated by superscripts preceding the element symbol: ¹⁴C, [¹⁴C]urea.

Use abbreviations of units of measure only when preceded by a numeral: 38 mm (but, a few millimeters).

Use the same abbreviations for units of measure when singular and plural, without periods or apostrophes except in special cases noted in Appendix B. Verbs must agree in number with the quantity: 1 mm is, 3 mm are.... Use a space between the numeral and the unit of measure, except with degree, percent, and Svedberg (5°C, 10%, 6S).

Spell out genus names upon first usage: The name may be abbreviated to its first letter afterward when used in combination with the species name. Never abbreviate generic names when used alone; also, do not abbreviate the species name when a subspecies is designated. For example, use *B. thuringiensis israelensis*, not *B. t. israelensis*.

EQUATIONS AND FORMULAS

SOFTWARE

If preparing your manuscript in Microsoft Word, you may use either MathType or the Word Equation Editor to create your equations. Word equations will be converted to MathType as part of the manuscript formatting and copyediting step.

LAYOUT

Equations and formulas should be in complete sentence form; include punctuation after displayed equations/formulas.

Set out long equations/formulas on a separate line or lines.

Number displayed equations/formulas if referred to later in the text. Use a single sequence of Arabic numerals, placed to the right of the equation/formula.

Complicated chemical formulas that cannot be typeset on one or two lines must be submitted as graphics (see section on figures); assemble these at the end of the text, preferably grouped together on one page.

Avoid the vertical placing of side chains. Use the following format, indented from the left margin:



REFERRING TO EQUATIONS

Refer to all numbered equations as Equation 1, Equation 2, etc.; do not use parentheses around the number (to avoid confusion with reference citations) or designators other than “Equation” (such as “System 3” or “Problem 1”).

SPECIAL CHARACTERS

Use the multiplication ex (\times) in numerical and vector products only. In all other cases, use the multiplication (centered) dot.

Use the slash to mean “per”; write km/s, not km s^{-1} . In arrays, use brackets to indicate a determinant and vertical lines for a matrix.

Observe the following order for brackets: $\{[()]\}$; do not use parentheses within parentheses.

Use boldface roman rather than arrows for vectors. Use italics for variables, but subscript labels that are not themselves variables should be in roman. Numerals, symbols for chemical elements, and functions such as ln, exp, and cos should not be italicized.

Define uncommon symbols on first use for the nonspecialist.

Distinguish superscripts to superscripts and subscripts to subscripts from double superscripts and double subscripts (e.g., e^{a^2} versus e^{a^2} , n_{H_3} versus n_{H_3}).

Align subscripts with superscripts when appropriate to do so.

SUBMITTING YOUR MANUSCRIPT FILES

ONLINE SUBMISSION INSTRUCTIONS

We encourage invited authors to submit their manuscripts online. Your Production Editor will send you the URL in advance of your manuscript due date.

HELPFUL NOTES FOR ONLINE SUBMISSION

- If possible, please compress each file using, for example, WinZip, StuffIt, or GZip software. Then upload.
- Whenever uploading more than five files, compress all contents into a single folder and then upload.
- Always include a PDF file of your final manuscript, including figures and tables, in addition to separate, editable files.
- If uploading revisions, please again include a PDF file of revised text, figures, and/or tables.

EMAIL AND FTP SUBMISSION OPTIONS

- Files may be attached to an email message and sent directly to your Production Editor.
- Manuscript files must be compatible with Microsoft Word's ".doc(x)" or ".rtf" format. Mathematically complex articles may be submitted in LaTeX.
- A PDF of the final submitted version, including all figures and tables, must accompany all submissions (but does not take the place of editable text and figure files).
- An FTP upload is also an option. Please contact your Production Editor for more information.

APPENDIX A: LITERATURE CITED EXAMPLES

References appear as follows (note patterns of abbreviation, capitalization, spacing, and punctuation):

ABSTRACT

108. Josen LA, Tollis TM, Anthony A. 1993. Finding solutions to sequences. *Fed. Proc.* 32(3):855 (Abstr.)

ARTICLE IN A JOURNAL WITH TITLE OF ARTICLE

24. Roberts DF. 2001. A demographic study of a Dinka village. *Hum. Biol.* 28:323-49
101. Wilmington SR, Matouschek A. 2016. An inducible system for rapid degradation of specific cellular proteins using proteasome adaptors. *PLOS ONE* 11:e0152679

ARTICLE IN A JOURNAL WITHOUT TITLE OF ARTICLE

9. Berson SA, Balow RS. 1999. *Am. J. Med.* 50:623-29

[use only for *Astronomy and Astrophysics*, *Condensed Matter Physics*, and *Nuclear and Particle Science*]

ARTICLE IN A JOURNAL IN PRESS

43. Park IJK, Wang L, Williams DR, Alegría M. 2017. Coping with racism: moderators of the discrimination-adjustment link among Mexican-origin adolescents. *Child Dev.* In press. <https://doi.org/10.1111/cdev.12856>
44. Brown MS, Radhakrishnan A, Goldstein JL. 2018. Retrospective on cholesterol homeostasis: the central role of Scap. *Annu. Rev. Biochem.* 87:In press. <https://doi.org/10.1146/annurev-biochem-062917-011852>

ARTICLE IN A JOURNAL WITH AN ERRATUM

18. Wilson P. 2001. Title of article. *J. Mol. Biol.* 229:1175-83. Erratum. 2001. *J. Mol. Biol.* 238:639

BOOK REFERENCE: WHOLE BOOK CITED

77. Seaver W. 1995. *Luck's Lady: The Theory of Probability*. Garden City, NY: Doubleday
78. Bronson D, Gerber RA, eds. 2003. *Handbook of Biochemistry*, Vols. 1, 2. San Francisco: Freeman. 2nd ed.
79. Lerner RM, ed. 2003. *Handbook of Child Psychology*, Vol. 1: *Theoretical Models of Human Development*. New York: Wiley

BOOK REFERENCE: INDIVIDUAL CHAPTER CITED

21. Bornstein L. 2002. Recombination in bacteria. In *Human Genetics*, Vol. 1, ed. R Johnston, E Smith, pp. 65-73. London/New York: Macmillan
37. New MI, Schram P. 2000. Congenital adrenal hyperplasia. In *Current Diagnosis*, ed. RB Conn, WZ Borer, JW Snyder, pp. 50-75. Philadelphia: Saunders

BULLETIN

132. Price GK, Lin W, Falck-Zepeda J. 2003. *Distribution of market benefits from adopting biotech crops*. Tech. Bull. 1906, US Dep. Agric., Washington, DC

DATABASE

22. Natl. Cancer Inst. 2012. *Adult primary liver cancer treatment*. PDQ: NCI's Comprehensive Cancer Database, Bethesda, MD, updated Feb. 23.
<http://cancer.gov/cancertopics/pdq/treatment/adult-primary-liver/HealthProfessional>
71. World Bank. 2012. *Little Green Data Book*. Washington, DC: World Bank.
<https://openknowledge.worldbank.org/handle/10986/12266>

MAGAZINE/NEWSPAPER/RADIO ARTICLE

120. Jones A. 2004. Title of article. *New York Times*, Jan. 15, p. A6
125. Ledge J. 1999. Spanish Signs. Atlanta, GA, *WABE Radio Broadcast*, Mar. 15
[do not repeat year if year is the same]

NO AUTHOR ASCERTAINABLE

Begin reference with name of editor, compiler, or sponsoring body, if known. Otherwise begin with title of article, chapter, journal, or book, followed by year. Do not use "anonymous."

PAGE SPAN WITH LETTERS

- 11:W50-55
11:125S-28S

PAPER PRESENTED AT A MEETING OR CONFERENCE

104. Andrade RG. 1990. *Culture shared and unique*. Paper presented at the 69th Annual Meeting of the American Anthropological Association, San Diego, Nov. 3-6

PATENT

115. Crane P, Lackmeyer G, Longyear J, Melconian A, Steward D. 2006.
Electronically scanning direction finding antenna system. US Patent 6,987,489

PREPRINT AND WORKING PAPER

- Chiang E, Laughlin G. 2012. The minimum-mass extrasolar nebula. arXiv:1211.1673
[astro-ph.EP]
- Pasaniuc B, Price AL. 2016. Dissecting the genetics of complex traits using summary association statistics. bioRxiv 072934.
<https://doi.org/10.1101/072934>
- Chase-Dunn C. 2016. *Social movements and collective behavior in premodern polities*. Work. Pap. 110, Inst. Res. World Syst., Univ. Calif., Riverside.
<http://irows.ucr.edu/papers/irows110/irows110.htm>

PROCEEDINGS

126. Diftler MA, Mehling JS, Abdallah ME, Radford NA, Bridgwater LB, et al. 2011. Robonaut 2—the first humanoid robot in space. In *2011 IEEE International Conference on Robotics and Automation*, pp. 2178–83. Piscataway, NJ: IEEE
127. Holder J. 2009. Galactic binary systems. In *Proceedings of the 2009 Fermi Symposium, Washington, DC, Nov. 2–5*. eConf Proceedings C091122.
<http://www.slac.stanford.edu/econf/C0911022>

REPORT

145. New RL, Oldur S. 2001. *Propulsion jet streams*. NASA Tech. Rep. 32-1529, Jet Propuls. Lab., Pasadena, CA

SUPPLEMENT

If suppl. is part of journal title:

155. Martin RN, Barrett AH. 2001. *Ap. J. Suppl.* 36:1–51

If suppl. is not part of journal title:

176. Taylor CA. 1995. *J. Microbiol.* 11(Suppl. 2):5–10

THESIS OR DISSERTATION

190. Cafiso DS. 1997. *Electrical and ion selective properties of photoreceptor membranes*. PhD Thesis, Univ. Calif., Berkeley

[include thesis or dissertation title in journals that do not ask for article titles]

TRANSLATION

191. Aachen BL. 1937. *Basis of Society*. Transl. R Jones, 1958, in *Am. J. Sociol.* 23:18–57 (From German)

UNPUBLISHED INFORMATION

Refer to such data in the text as personal communication, submitted, unpublished data, etc., listing all researchers by initials and surname (e.g., W.C. Houser, U.M. Bandlier & C.F. Kim, unpublished data). Except for *Economics*, *Financial Economics*, *Physical Chemistry*, and *Resource Economics*, do not list these references in the Literature Cited section. Citations of unpublished works are not permitted in *Entomology*.

WEBSITE

195. Taussig M. 2015. Seeds of time. *Flatbread Society*.
<http://www.flatbreadsociety.net/stories/30/seeds-of-time>

YEAR, 1ST EDITION

112. Castellanos J. 1994 (1589). [No period before parentheses]

REPEATED REFERENCES

If different sections of the same book, symposium, etc. are cited in separate references, give full information once, with the reference listed under the editor's name. Include title of chapter in each reference.

10. Blomb B. 2001. Clotting. See Ref. 31, pp. 143-215

31. Seges WH, ed. 2001. *Blood Clotting Enzymology*. New York: Academic

38. Straub EH. 2001. Hemophilia. See Ref. 31, pp. 216-49

Do not use "Ibid." Instead, repeat the name of the author each time.

APPENDIX B: STANDARD ABBREVIATIONS AND UNITS

Symbols and abbreviations on this list, as well as all SI base and derived units and prefixes, may be used in your manuscript without explanation.

acceleration of gravity	g	equilibrium constant	K
acquired immune deficiency syndrome	AIDS	equivalent	eq
alternating current	ac	erg	spell out
angstrom	Å	et alii (and others)	et al.
ante meridiem	AM	et cetera	etc.
approximately	~	exempli gratia (for example)	e.g.
approximately equal	≈	exponential	exp.
aqueous	aq	figure	spell out
arbitrary unit	a.u.	foot	ft
astronomical unit	AU	foot candle	fc
atmosphere	atm	gauss	G
atomic mass unit	amu	Gibbs energy change	ΔG (not ΔF)
atomic unit	au	giga-	G-
atomic weight	at wt	gram calories	gcal
bar	spell out	gravitational constant	G
barn	b	gravity, centrifugal	g
British thermal unit	Btu	hour	h
calorie (heat calorie)	cal	human immunodeficiency virus	HIV
centimeter-gram-second	cgs	hydrogen ion (concentration)	pH
compare	cf.	id est (that is)	i.e.
cosecant	csc	inch	spell out
cosine	cos	infective dose	ID ₅₀
cotangent	cot	infrared	IR
counts per minute	cpm	international unit	IU
curie	Ci	kilo-	k-
curl	spell out	kilobase, kilobase pair	kb
cycles per second	Hz	kilocycle	kc
daltons	Da	kilowatt-hour	kWh
day	spell out	lethal dose	LD ₅₀
decibel	B	levo	L
degree	°	liter	L
degrees Celsius	°C	logarithm	log
degrees Fahrenheit	°F	logarithm, natural	ln
deuteron	d	magnitude	mag
dextro	D	maximum	max
diffusion coefficient	D	mega-	M-
direct current	dc	metric ton (tonne)	t
dyne	dyn	Michaelis constant	K_m
electromagnetic unit	emu	micro	μ-
electromotive force	emf	microgram	μg (not λ)
electron	e	micrometer (not micron)	μm
electron spin resonance	ESR	millibar	mbar
electron volt	eV	milliequivalent	meq
electrostatic units	esu	milliliter	mL
enthalpy change	ΔH	millimeters of mercury	mm Hg
entropy change	ΔS	million years ago, mega annum	Mya, Ma
entropy unit	eu		

minute	min	solar mass	M_{\odot}
minutes of arc	arcmin	species	sp., spp.
molar (concentration)	M (not $\mu\text{mol/mL}$)	Specific rotation	α
mole	mol (not M)	square centimeter	cm^2
molecular weight	M_r or mol wt	Svedberg (10^{-13} s)	S
month	spell out	standard deviation	SD
neutron	n	standard error	SE
normal (concentration)	N	tangent	tan
oersted	Oe	tera-	T-
page, pages	p., pp.	tesla	T
parsec	pc	three-dimensional	3D
parts per million	ppm	ton	spell out
percent	%	tonne (metric ton)	t
post meridiem	PM	torr	torr (not Torr)
potential difference	PD	two-dimensional	2D
probable error	pe	ultrahigh frequency	UHF
proton	p	ultraviolet	UV
radiation, ionizing, absorbed dose	rad	universal gravitational constant	G
radiofrequency	RF	universal time	UT
retardation factor	R_F	variant	r.
revolutions per minute	rpm	versus	spell out
roentgen	r	weight concentration	g/mL (not mg%)
root mean square	rms	weight percent	wt%
second	s	week	spell out
seconds of arc	arcsec	year	spell out
sedimentation coefficient	s		