[CANCER RESEARCH 47, 332-337, January 1, 1987]

INSTRUCTIONS FOR AUTHORS

Important points to note:
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p. 334—style for illustrations

Cancer Research is the official journal of the American Association for Cancer Research, Inc., and is devoted to the publication of significant, original research in all the subfields of cancer research, including: biochemistry; biology; biophysics; chemical and physical carcinogenesis, and mutagenesis; clinical investigations; endocrinology; epidemiology; experimental pathology; immunology; molecular biology and genetics; physiology; preclinical pharmacology and experimental therapeutics (including biological therapy); radiobiology and radiotherapy; and virology. Clinical investigations and epidemiological studies are published in a separate section from papers in the basic sciences.

Only those papers that report results of novel and timely studies and that meet high standards of scientific quality will be accepted. Papers are subjected to stringent review and are published within about three months of acceptance.

CATEGORIES OF PUBLICATION

The following types of manuscripts are considered for publication:

(1) Papers containing results of original experimental, clinical, or statistical studies that are sufficiently well documented to be acceptable to the critical reader.
(2) Concise reviews on subjects of importance to cancer researchers. Authors of unsolicited reviews should submit an outline of the proposed article for approval by the Editorial Board. If submission of the complete article is encouraged, the review will be given particularly stringent editorial evaluation before acceptance.
(3) Perspectives in Cancer Research, which are invited articles analyzing either very active or undeveloped areas of research and presenting fresh insights and personal viewpoints on where research in that area may or should be heading.
(4) Letters to the Editor which deal with issues of importance to cancer researchers. If experimental data are included, these should be kept to the minimum required for adequate understanding. Also included under this category is correspondence about manuscripts published in the Journal. Correspondence which concerns articles not published in *Cancer Research* will not be considered.
(5) Brief reports of meetings, symposia, and conferences related to cancer research. These should comprise no more than 3 printed pages (approximately 15 double-spaced typed pages) and include a statement of the purpose(s) of the meeting, an integrated summary of the findings presented, and recommendations for future research. The names and affiliations of key speakers may be included if space is available.
(6) Proceedings of symposia, published as external supplements to the Journal (*Cancer Research Supplements*), the full expenses of which are assumed by the sponsoring agency. These proceedings are published at the discretion of the Editor and do not undergo the usual review process.
(7) Brief listings of scientific meetings of interest to readers and of courses in cancer-related biomedical science. These should be submitted at least 3 months prior to the expected month of issue.
(8) Brief announcements of recent deaths of distinguished contributors to the field of cancer research.

EDITORIAL POLICY

When a manuscript is received for consideration, the Editors assume that no similar paper, other than an abstract or preliminary report, has been or will be submitted for publication elsewhere. Further, it is understood that all authors listed on a manuscript have agreed to its submission. Submission of a manuscript implies acceptance of the strict policy of the Journal that under no circumstances will the identities of the Associate Editors and reviewers be revealed.

Typically, a submitted manuscript is sent to an Associate Editor who selects two investigators in the field as reviewers. After the Editor's approval of their recommendations concerning acceptability, decisions are forwarded from the Editorial Office to authors. Every effort is made to render editorial decisions promptly, consistent with thoroughness of review. Authors should note that the average review time is 10 weeks from receipt of the original manuscript. If there is a marked discrepancy in the opinions of the reviewers, this may necessitate sending the paper to an additional reviewer. In this case, more time may be needed to finalize the review process.

Since editorial staff time to answer telephone calls from authors is limited, inquiries regarding the status of manuscripts should, if possible, be submitted in writing and should be made only on those manuscripts that exceed the average review time.

The Editorial Office cannot accept collect telephone calls from authors.

SUBMISSION AND PUBLICATION FEES

A **manuscript processing fee** of $75 is assessed for each manuscript to help defray the cost of editorial review. Payment of this processing fee may accompany the manuscript. An invoice will be mailed with the acknowledgment of receipt of the manuscript at the Editorial Office if payment has not already been made. As a courtesy to authors editorial review will not be delayed for receipt of payment. Authors are requested to fulfill their own institutional obligations with respect to purchase orders and call numbers so that payment of the manuscript handling charge can be expedited.

If an author resubmits a manuscript that our Editors previously found unacceptable for publication, it is journal policy to consider it a new submission, assign it a new manuscript number, and charge the author another $75 manuscript processing fee. The manuscript will not be reviewed until the author agrees in writing to this policy.

A **page charge** of $40 per printed page will be levied on all manuscripts accepted for publication. It is understood at the time of submission that the author(s) agrees to pay this charge in the event of publication. Under exceptional circumstances, when no other source of grant or other support exists, the author(s) may apply to the Editor at the time of submission for a waiver of the page charges. All such applications must be countersigned by an appropriate institutional official stating that no funds are available for the payment of page charges.

PROCEDURES FOR SUBMISSION

Contributions should be addressed to Dr. Peter N. Magee, Editor, *Cancer Research* Editorial Office, Fels Research Institute, Temple University School of Medicine, Philadelphia, Pa. 19140. They should be submitted by an author, preferably the senior author, who should indicate in a covering letter:

(1) that the paper should be considered for publication in *Cancer Research*;
(2) the exact address to which all related correspondence should be sent and a telephone number at which the author can be reached;
(3) that authorization has been given to use any information conveyed by either personal communication or release of unpublished experimental data;
(4) the salient and novel findings of the paper (in as concise a statement as possible);
(5) which one of the following subject categories applies to the manuscript:

BASIC SCIENCES SECTION
- Biochemistry and Biophysics
- Biology
- Carcinogenesis
- Endocrinology
- Immunology
- Molecular Biology and Genetics
- Preclinical Pharmacology and Experimental Therapeutics
- Virology

CLINICAL INVESTIGATIONS SECTION
- Clinical Studies
- Epidemiological Studies

[Please note, these categories are subject to modification over the course of the year to reflect the continually changing fields of

cancer research. Final category assignment of an article in an issue's Table of Contents is at the discretion of the Editor.]

Original submissions must include:

(1) The author's covering letter *in duplicate* containing the above information.
(2) Four copies of the manuscript.
(3) At least two sets of original illustrations. (If only two sets of original illustrations are submitted, we require that the author also include two sets of photocopies.)

Revised manuscript submissions must include:

(1) A covering letter *in duplicate*, clearly indicating what alterations have been made in response to the reviewers' criticisms. Satisfactory reasons should be given for noncompliance with any of the recommendations for revision.
(2) Four copies of the revised version of the manuscript, plus a red-marked copy of the manuscript indicating the changes made.
(3) A stamped self-addressed postcard containing the manuscript number to acknowledge receipt of the revision.

Note: If a new author has been added or an author has been deleted since the original submission, it is the responsibility of the corresponding author to ensure that the authors involved are aware of and agree to the changes in authorship. *Cancer Research* accepts no responsibility for such changes.

Revised manuscripts may undergo another review by an Associate Editor and/or referees, particularly if the original submission required extensive changes.

FORMAT AND STYLE

Papers should conform strictly to Journal style. A recent issue of *Cancer Research* will provide authors with assistance in the proper arrangement of papers. Manuscripts are to be written in clear, grammatical English. Papers that are not in good idiomatic English will be returned to the author without review. Laboratory slang as well as terminology and abbreviations not consistent with internationally accepted guidelines should be avoided.

For general and technical assistance in writing scientific papers, authors should refer to the following publications: *Stedman's Medical Dictionary* (Twenty-fourth Edition, 1984, The Williams & Wilkins Co., Baltimore, Md.); *CBE Style Manual* (Fifth Edition, 1983, published by the Council of Biology Editors, Inc., Bethesda, Md.); and *The ACS Style Guide* (First Edition, 1986, American Chemical Society, Washington, D. C.).

Data must be presented concisely. Large masses of data of peripheral significance to the main thesis of the investigation will not be published in *Cancer Research* but may be deposited with the National Auxiliary Publications Service, c/o Microfiche Publications, P.O. Box 3513, Grand Central Station, New York, N. Y. 10163-3513. The manuscript should contain a footnote that indicates how this ancillary material can be obtained. Such data should be submitted for review along with the manuscript.

The manuscript should be typed on 21.6- x 28-cm (8½- x 11-inch) paper with double spacing *throughout*, allowing for ample margins. Manuscripts with typing on both sides of the page will be returned to the authors. Consecutive numbering of all pages is requested, with the title page as page 1. The typescript should be arranged in the following order: (*a*) title, (*b*) author(s) and complete name(s) and location(s) of institution(s) or laboratory(ies), (*c*) running title, (*d*) footnotes, (*e*) text and references, (*f*) tables, (*g*) legends for all illustrations, (*h*) illustrations, and (*i*) other material. Numbered and lettered sections in the text should be avoided. The appropriate location for each table and illustration should be indicated by marginal notes. Simple chemical formulas or mathematical equations should be presented in a form that allows their reproduction in single horizontal lines of type; more complicated mathematical formulas or chemical structures difficult to set in type should be provided in the form of India ink drawings or glossy photographs for camera-ready reproduction.

Title. Titles should be brief but informative, and limited if possible to about 100 characters. It is important for literature retrieval to include in the title the key words necessary to identify the nature of the subject matter, including, if applicable, the species on which the work is done. Use of expressions such as "Studies on..." or "Observations of..." should be avoided, since they are not informative. Chemical formulas or abbreviations should not be used. *Titles in the form of declarative or interrogative sentences are not acceptable.* Also, do not use Roman or Arabic numerals to designate that the paper is one in a series (*see* section below on **Footnotes**).

Authors and Their Affiliations. Authors are urged to include their full names, complete with first and middle names or initials. Confusion often arises in the literature when authors are identified by surname and initials only. Authors' academic degrees should not be included. The full names of institutions and subsidiary laboratories should be given, together with a useful address (including postal code). If several authors and institutions are listed on a paper, it should be clearly indicated with which department and institution each author is affiliated.

Running Title. A brief running title should be provided, not to exceed 50 characters. Running titles in the form of declarative or interrogative sentences are not acceptable.

Footnotes. Lengthy footnotes are discouraged since the same information can in most instances be presented more effectively in the text.

Footnotes to the title page and text are to be designated consecutively with superscript Arabic numerals. A footnote to the title should contain information on financial support, including the source(s) and number(s) of the grant(s). If the paper is one of a series, a footnote to this effect may be included. Authors should also include a footnote designating to whom reprint requests should be addressed. An all-inclusive abbreviation footnote should contain a definition for every nonstandard abbreviation used in the paper.

For footnotes to tables, *see* section on **Tables** below.

Abstract. The abstract, to appear at the beginning of the paper, should be concise, yet indicative of the content of the paper. As abstracts are often copied directly by the secondary services, they should recapitulate in abbreviated form the purpose of the study and the experimental technique, results, and interpretations of the data. Data such as the number of test subjects and controls, strains of animals or viruses, drug dosages and routes of administration, tumor yields and latent periods, length of observation period, and magnitude of activity should be included. Vague, general statements such as "The significance of the results is discussed," or "Some physical properties were studied," are uninformative and not acceptable. All important terms relevant to the content of the paper should be incorporated into the abstract to assist indexers in the derivation of key words. Abbreviations should be kept to an absolute minimum; however, if they are needed, they must be properly identified so as to make the abstract independent of the text. Authors may wish to keep in mind that "Medline," a computerized monthly bibliography prepared by the National Library of Medicine, includes only those abstracts that contain fewer than 200 words; with very few exceptions, longer abstracts are not accessible through that service.

Introduction. It is not necessary to include all of the background literature in this section. Brief reference to the most pertinent papers generally suffices to acquaint the reader with the findings of others in the field and with the problem or question which the author's particular investigation addresses.

Materials and Methods. Explanation of the experimental methods should be brief but adequate for repetition by qualified investigators. Procedures that have been published previously should not be described in detail but merely cited in appropriate references. Only new and significant modifications of previously published procedures need complete exposition. The sources of special chemicals or preparations used should be given along with their locations [city and state (country, if foreign)].

This Journal endorses the principles embodied in the Declaration of Helsinki and expects that all investigations involving humans will have been performed in accordance with these principles. For animal experimentation reported in this Journal, it is expected that the *Guiding Principles in the Care and Use of Animals* approved by the American Physiological Society will have been observed.

Results. This section should include a concise textual description of the data presented in tables and illustrations. Excessive elaboration of data already given in tables and illustrations should be avoided. The Results and Discussion sections may be combined if, by so doing, space is saved or the logical sequence of the material is improved.

Discussion. In this section, the data should be interpreted concisely without repeating material already presented in the Results section. Speculation is permissible, but it must be well founded.

References. ***Number references in the order of their first mention in the text; cite only the number assigned to the reference.*** References should be typed in double-spaced form to ensure accurate copy editing. The bibliography should be limited to only those citations essential to the author's presentation. When comprehensive review articles are available, they are preferred to many separate references.

Before submission of the paper authors should verify the accuracy of all references and should check that all references have been cited in the text. Examples of the two most common types of Journal references are: Kolonel, L. N., Yoshizawa, C. N., Hirohata, T., and Myers, B. C. Cancer occurrence in shipyard workers exposed to asbestos in Hawaii. Cancer Res., *45*: 3924–3928, 1985.

Hitchings, G. H. and Baccanari, D. P. Design and synthesis of folate antagonists as antimicrobial agents. *In:* F. M. Sirotnak, J. J. Burchall, W. B. Ensminger, and J. A. Montgomery (eds.), Folate Antagonists as Therapeutic Agents, Vol. 1, pp. 151–172. Orlando, FL: Academic Press, Inc., 1984.

Journal articles and serial compendia. The complete title, journal, volume number, inclusive pages, and year of publication should be given. Serial compendia, such as *Advances in Cancer Research* and the *Annual Review of Biochemistry*, which appear annually in numbered sequence, should be cited as journals rather than books, thus omitting the names of publishers and editors. *Biological Abstracts* should be consulted for abbreviations of journals and serials.

Books and chapter citations. Citation of a specific chapter or article in a book should carry the author(s) of the chapter, its title, editor(s) of the book, book title, edition, volume, inclusive pages of the chapter, location and name of the publisher, and year of publication. For references to complete books, give all of the above information that is pertinent.

Papers in press and unpublished material. Papers in press may be listed among the references with the journal name and tentative year of publication. Papers in preparation or submitted for publication should be cited in a footnote, *not* in the References section. This rule also applies to unpublished data or personal communications. The names of all authors should be given, along with manuscript titles if possible.

Addenda. Data acquired after acceptance of the paper, by the authors themselves or by others, cannot be added to the text. An addendum may be added in proof upon approval by the Editor. Addenda should be kept extremely brief. The full expense of printing an addendum will be charged to the author.

Tables. Tables should be constructed so that when typeset, they will fit within a single Journal column (8.9 cm or 3½ inches). Tabular material should not duplicate data already presented in the charts. Unnecessary columns of data that can easily be derived from the rest of the results in the table should not be included. Large groups of individual values should be avoided; instead, these should be averaged and an appropriate designation of the dispersion such as standard deviation or standard error included.

Authors are obliged to indicate the significance of their observations by appropriate statistical analysis.

Every table *must* have a descriptive title and an explanatory paragraph that clearly gives the experimental details for understanding by the reader without reference to the text. Each column must carry an appropriate heading and, if numerical measurements are given, these units should be added to the column heading. Tables should be numbered with Arabic numerals and table footnotes should be indicated with superscript italic letters ($^{a, b, c}$, etc.).

All units of measurement and concentration should be clearly designated. Exponential terminology is discouraged (the term mM is preferable to 10^{-3} M). If exponentials are absolutely unavoidable in column headings, the quantity expressed should be preceded, not followed, by the power of 10 by which its value has been multiplied, *i.e.*, 10^{-3} × concentration (M). This will prevent confusion as to whether the quantity should be multiplied or divided to obtain the correct value.

Illustrations. ***Both line-cut (graphs and drawings) and halftone (photographs, photomicrographs, electrophoretic patterns, etc.) illustrations should be designated figures.***

Figures should be used when salient points need illustration for better comprehension by the reader. Halftones are particularly expensive to reproduce and only those absolutely essential to the clarity of the presentation should be included. Straight-line functions such as relationships between concentration and absorbance, or Lineweaver-Burk plots when these are linear, should be described in a few lines in the text.

Each figure should be labeled in pencil with the first author's name and the figure number on an adhesive label on the reverse side. For halftones, the top of the figure should also be noted.

Legends are required for all figures. They should briefly describe the data shown; details in the text should not be repeated. Staining should be included for halftones, where applicable. Each legend should adequately identify all symbols, abbreviations, mathematical expressions, abscissas, ordinates, units, and reference points used on the figure.

Line-cut illustrations, including flow diagrams and complex biochemical structures, should be prepared with professional instruments (not simply typewritten). They may be on Bristol board, tracing paper or cloth, or coordinate paper printed in light blue. *They should not be mounted on heavy cardboard.* Clear, glossy prints are acceptable in lieu of original drawings, provided that all parts of the illustration are in focus. X-ray films or Polaroid photographs are not acceptable. If original drawings are submitted, they should not be larger than 21.6 × 28 cm (8½ × 11 inches).

Except for especially complicated drawings showing large amounts of data, all line-cut illustrations are published at one-column width (8.9 cm or 3½ inches) or less. It is recommended that they be submitted in one-column size. If larger ones are submitted, *it is the responsibility of the author to see that the abscissas, ordinates, lines, and especially the symbols are sufficiently large to permit reduction.* When the graphs are reduced to the size of a single column, the letters and numbers must be at least 1.5 mm high and the smallest part of the illustration must be discernible or the drawing will be returned to the author for correction. On original artwork, this can be accomplished by having the minimum height for lower-case letters 5 mm; numerals and upper-case letters 6 mm; and symbols within the drawings 5 mm. The thickness of ruled lines on graphs is also vital for clear presentation of the data. Size recommendations for lines are as follows: #1 Leroy for graph grids, bonds, and arrows; #2 Leroy for graph borders or reference lines; and #5 Leroy for graph curves or emphasis lines.

The symbols can be defined directly in the body of the line-cut illustration or in the legend. Only those common symbols for which the printer has type (×, ○, ●, □, ■, △, ▲, ◐) should be used.

Graphs should be ruled off close to the area occupied by the curve, and abscissas and ordinates should be clearly marked with appropriate units. Explanations of the coordinates should not extend beyond the respective lines. Do not box-in graphs with top and right-hand frame lines unless these are essential for reference. Titles printed outside the confines of the drawing waste space; all of this information should be included in the legend. Also, to conserve space those curves that may appropriately appear together should be included in a single graph.

The use of exponentials for labeling coordinates in graphs is considered ambiguous and should, if possible, be avoided. If exponentials must be used, the quantity expressed should be *preceded* by the power of 10 by which its value has been multiplied, i.e., 10^3 × concentration (M). The form "Concentration (M × 10^{-3})" is not acceptable. If powers of 10 are used, the legend should designate how the quantity is to be calculated (whether multiplied or divided) to give the correct value.

Halftone illustrations should be submitted *unmounted* and *trimmed* to exclude all but essential material. The set of halftone illustrations intended for the printer's use must be made from original negatives; i.e., they must be first generation glossy prints. Photographs made from other prints are not acceptable for reproduction. Karyotypes should be presented in the form of cardboard plates onto which chromosome sections from an original photomicrograph are pasted.

All halftones will be published at either 1-, 1½-, or 2-column width and placed as close as possible to their first citation in the text. Halftones must be prepared within these dimensions if they are to be reproduced without reduction; otherwise, they will be reduced to conform to these widths.

Figure *numbers* should not be included on the face of the illustration. However, halftones that must appear together for comparison should be grouped under one figure number with each section lettered "a," "b," "c," etc., in the lower right-hand corner on the face of the illustration. Composite figures may be mounted on a plate, with the sections butted together and tooling (thin white lines) placed between the parts of the figure. For optimal reproduction, the contrast among photographs on a plate should be consistent. The overall dimensions of photographs on a plate should not exceed 18.4 × 22.4 cm (7¼ × 9 inches). The minimum dimensions to which the plate can be reduced must be indicated on the back.

Symbols, arrows, or letters used in photomicrographs should contrast with the background. Wax-based lettering such as PRES-TYPE and LETRASET is discouraged because of its tendency to crumble and adhere to vinyl overlays. Tissue overlays on halftones are a necessary protection. The important areas of the photographs that must be reproduced with greatest fidelity should be indicated on overlays.

Internal scale markers should always be included on the photographs themselves as opposed to listing magnification in the legend since it may be necessary to reduce the figures. Magnifications given in the legend will reflect size before reduction.

Color photographs are discouraged and will be published only if the Editors deem them indispensable. The complete expense of reproducing such photographs will be charged to the author. The author is also responsible for submitting prints that are of sufficient quality to permit accurate reproduction, and for approving the final color proof. If mounted, color photographs *must* be on a flexible backing. *Cancer Research* assumes no responsibility for the quality of the photograph as it appears in the Journal. Current estimates for color reproduction can be obtained from the Editorial Office.

ABBREVIATIONS

Abbreviations are in general a hindrance to readers in fields other than that of the author(s), to abstractors, and to scientists in foreign countries. Authors should limit their use to an absolute minimum. Single words should not be abbreviated, *e.g.*, daunomycin, folate, vincristine. Abbreviations are not to be used in titles, but running titles may carry abbreviations for purposes of brevity. Abstracts may contain abbreviations for terms mentioned many times in that section but their identification is mandatory.

Authors should follow the recommendations of the IUPAC-IUB Commission on Biochemical Nomenclature (*see* section below on **Terminology**). All nonstandard abbreviations should be identified in an inclusive abbreviation footnote to the first such abbreviation after the Abstract.

Abbreviations that form recognizable words, such as EAT and MOPS, are discouraged.

Standard Abbreviations. Authors may use, without definition, the abbreviations in the following lists.

NAD^+, NADH	nicotinamide adenine dinucleotide and its reduced form
$NADP^+$, NADPH	nicotinamide adenine dinucleotide phosphate and its reduced form

(DPN^+, TPN^+, and their reduced forms are not acceptable.)

CoA, acyl-CoA	coenzyme A and its acyl derivatives (*e.g.*, acetyl)
AMP, GMP, IMP, UMP, CMP, TMP	the 5′-phosphates of ribosyladenine, -guanine, -inosine, -uracil, -cytosine, and -thymine
ADP, etc.	the 5′(pyro)-diphosphates of adenosine, etc.
ATP, etc.	the 5′(pyro)-triphosphates of adenosine, etc.
dAMP, dGMP, dIMP	the 5′-phosphates of 2′-deoxyribosyladenine, etc.
RNA, DNA	ribonucleic acid, deoxyribonucleic acid
RNase, DNase	ribonuclease, deoxyribonuclease
mRNA	messenger RNA
nRNA	nuclear RNA
rRNA	ribosomal RNA
tRNA	transfer RNA (sRNA is not recommended for RNA preparations that accept amino acids.)
P_i, PP_i	orthophosphate, pyrophosphate
Tris	tris(hydroxymethyl)methylamine
EDTA	ethylenediaminetetraacetate
POPOP	1,4-bis[2-(5-phenyloxazolyl)]benzene
PPO	2,5-diphenyloxazole
DEAE, TEAE	diethylaminoethyl, triethylaminoethyl
UV, IR	ultraviolet, infrared
RBC, WBC	red blood cell(s), white blood cell(s)

Units of Concentration

molar (moles/liter)	M (not used for moles)
millimolar (millimoles/liter)	mM (preferred to 10^{-3} M)
micromolar (micromoles/liter)	μM (preferred to 10^{-6} M)
nanomolar	nM (not mμM)
picomolar	pM (not μμM)

The expression mg % should be avoided; weight concentrations should be given as g per ml, g per 100 ml, g per liter, etc.

Units of Length, Area, Volume, Mass, Time

The abbreviations below are correct for both singular and plural forms of each term.

meter	m
centimeter	cm
square centimeter	cm^2
millimeter	mm
micrometer (not micron)	μm (not μ)
nanometer (not millimicron)	nm (not mμ)
picometer (not micromicron)	pm (not μμ)
Angstrom (0.1 nm)	Å
liter	not abbreviated
milliliter	ml
microliter	μl (not λ)
gram	g
milligram	mg
microgram	μg (not γ)
kilogram	kg
hour	h
minute	min
second	s

Physical and Chemical Units

retardation factor	R_f
acceleration of gravity	g
sedimentation coefficient	s
sedimentation coefficient in water at 20°	$s_{20,w}$
degree Celsius (Centigrade)	°C
degree Fahrenheit	°F
Kelvin	K
diffusion coefficient	D
equilibrium constant	K
inhibition constant	K_i
Michaelis constant	K_m
maximum velocity	V_{max}

Others

mole	mol
Curie	Ci
equivalent	eq
counts per minute	cpm
disintegrations per minute	dpm
revolutions per minute	rpm
volt	V
Svedberg unit	S
absorbance	A (not O.D.)
probability	P
roentgen	R
standard deviation	SD
standard error of the mean	SE
logarithm (Briggsian)	log
logarithm (natural)	ln
entropy	S
molecular weight	M_r

In chemical compounds

ortho	*o*
meta	*m*
para	*p*
secondary	*sec*
tertiary	*tert*

Routes of administration

intramuscular	i.m.
intraperitoneal	i.p.
intravenous	i.v.
oral	p.o.
subcutaneous	s.c.

TERMINOLOGY

Approved terms and abbreviations for chemical substances have been collected in *Biochemical Nomenclature and Related Documents*, Inter-

national Union of Biochemistry, Third Edition, 1978. This volume is available from: The Biochemical Society, 7 Warwick Court, London WC1R 5DP, United Kingdom. Included are all recommendations issued by the IUPAC-IUB Commission on Biochemical Nomenclature in the following areas: general abbreviations and symbols; abbreviations and symbols for chemical names of special interest in biological chemistry; stereochemistry; natural products and related compounds; isotopically labeled and modified compounds; biochemical equilibrium data; α-amino acids; symbols for amino-acid derivatives and peptides; synthetic modifications of natural peptides; synthetic polypeptides or polymerized amino acids; amino-acid sequences; conformation of polypeptide chains; peptide hormones; human immunoglobulins, multiple forms of enzymes; nucleic acids, polynucleotides, and their constituents; lipids; steroids, quinones with isoprenoid side chains; carotenoids; tocopherols and related compounds; carbohydrates; cyclitols; phosphorus-containing compounds of importance in biochemistry; folic acids and related compounds; vitamins B-6 and related compounds; corrinoids.

Isotopically Labeled Compounds. A radioactive nuclide is indicated by its mass number as a superscript to the left of the symbol (^{32}P); when written out, it should correspond to the spoken word (phosphorus-32).

In an isotopically labeled compound, the isotopic prefix should be placed in *square brackets and immediately precede the name* (word) to which it refers, as in [^{14}C]thymidine, [α-^{14}C]leucine, L-[*methyl*-^{14}C]methionine, [^{3}H]-3-hydroxykynurenine. When more than one position in a substance is labeled by means of the same isotope and the positions are not indicated, the number of labeled atoms is added as a subscript to the right of the element, as in [$^{14}C_2$]glycolic acid. The symbol *U* indicates uniform labeling and *G*, general labeling, *e.g.*, [*U*-^{14}C]glucose (where the ^{14}C is uniformly distributed among all six positions) and [*G*-^{14}C]glucose (where the ^{14}C is distributed among all six positions, but not necessarily uniformly).

The isotopic prefix precedes that part of the name to which it refers, as in sodium [^{14}C]formate, iodo[$^{14}C_2$]acetic acid, 1-amino[^{14}C]methylcyclopentanol, α-naphth[^{14}C]oic acid, 2-acetamido-7-[^{131}I]iodofluorene, fructose 1,6-[1-^{32}P]bisphosphate, 17β-[^{3}H]estradiol. Terms such as "^{131}I-labeled albumin" should *not* be contracted to "[^{131}I]albumin" (since native albumin does not contain iodine), and "^{14}C-labeled amino acids" should similarly *not* be written as "[^{14}C]amino acids" (since there is no carbon in the amino group).

When isotopes of more than one element are introduced, their symbols should be arranged in alphabetical order, *e.g.*, [3-^{14}C; 2,3-D; ^{15}N]serine. Deuterium and tritium may be designated as ^{2}H and ^{3}H or as D and T, respectively.

When not sufficiently distinguished by the foregoing means, the positions of isotopic labeling are indicated by Arabic numerals, Greek letters, or prefixes in italics, as appropriate; these are to be placed within square brackets to appear before the symbol of the element concerned and are attached to it by a hyphen. Examples of this style are [1-^{14}C]alanine, L-[2-^{14}C]leucine or L-[α-^{14}C]leucine, [*carboxy*-^{14}C]leucine, [2,3-^{14}C]maleic anhydride, [3,4-^{14}C, ^{35}S]methionine, L-[*methyl*-^{14}C]methionine. The symbol indicating configuration always precedes the bracketed isotope, and a hyphen is used to separate it from the brackets, *e.g.*, D-[^{14}C]-glucose; L-[1-^{14}C]leucine.

The same rules apply when the labeled compound is designated by a standard abbreviation or symbol other than the atomic symbol, *e.g.*, [α-^{32}P]ATP, [^{32}P]CMP, or [^{125}I]IdUrd. The square brackets are not to be used, however, with atomic symbols, or when the isotopic symbol is attached to a word that is not a specific chemical name, abbreviation, or symbol. Proper usage here is: $^{14}CO_2$, $^{2}H_2O$, $H_2{}^{35}SO_4$, $^{32}P_i$, ^{131}I-labeled, ^{3}H-ligands, ^{14}C-steroids.

Enzymes. Authors should use the Recommended Name given in *Enzyme Nomenclature 1984: Recommendations of the Nomenclature Committee of the International Union of Biochemistry on the Nomenclature and Classification of Enzymes* (Academic Press, Inc., Orlando, FL, 1984). In some cases the Systematic Name or the reaction catalyzed should also be included. It is strongly recommended that the Enzyme Commission number be stated at first mention.

For information on isozyme nomenclature, consult *Biochemical Nomenclature and Related Documents*, mentioned previously, or J. Biol. Chem., *252:* 5939–5941, 1977.

Histones. The six histone fractions are to be labeled H1, H1°, H2A, H2B, H3, and H4, rather than F1, F1°, F2a2, F2b, F3, and F2a1, respectively.

Interferon Assays. When reporting the calibration of interferon assays, authors should state the name, identifying number, and assigned potency of the international standard used to calibrate their assay, along with the observed geometric mean titer of the standard, the standard deviation of that value, the number of titrations performed to obtain that value, and the technical details of the assay.

Inbred Strains. Designations for inbred mouse strains should conform to the guidelines in "Standardized Nomenclature for Inbred Strains of Mice: Eighth Listing," Cancer Res., *45:* 945–977, 1985, prepared by Joan Staats for the Committee on Standardized Nomenclature for Mice; for designations of inbred strains of rats, please refer to "Standardized Nomenclature for Inbred Strains of Rats: Fourth Listing," Michael Festing and Joan Staats. Transplantation, *16* (No. 3): 221–245, 1973.

Outbred Animal Stocks. Nomenclature for outbred laboratory animals should conform to that recommended by the Committee on Nomenclature, Institute of Laboratory Animal Resources: "A Nomenclature System for Outbred Animals," Lab. Animal Care, *20:* 903–906, 1970.

Drugs. Generic names of drugs are preferred; a proprietary name may be used only after the first mention of the generic name and should be avoided in titles unless both names can easily be listed. If a foreign proprietary name is used, the name of the comparable U. S. product should be given. When there is no generic name for a drug, authors should give the chemical name or formula or a description of the active ingredients.

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Advice on biochemical nomenclature is readily available from Dr. Waldo E. Cohn, Director, Office of Biochemical Nomenclature, Biology Division, Oak Ridge National Laboratory, Box Y, Oak Ridge, Tennessee 37380; (615) 574-0808.

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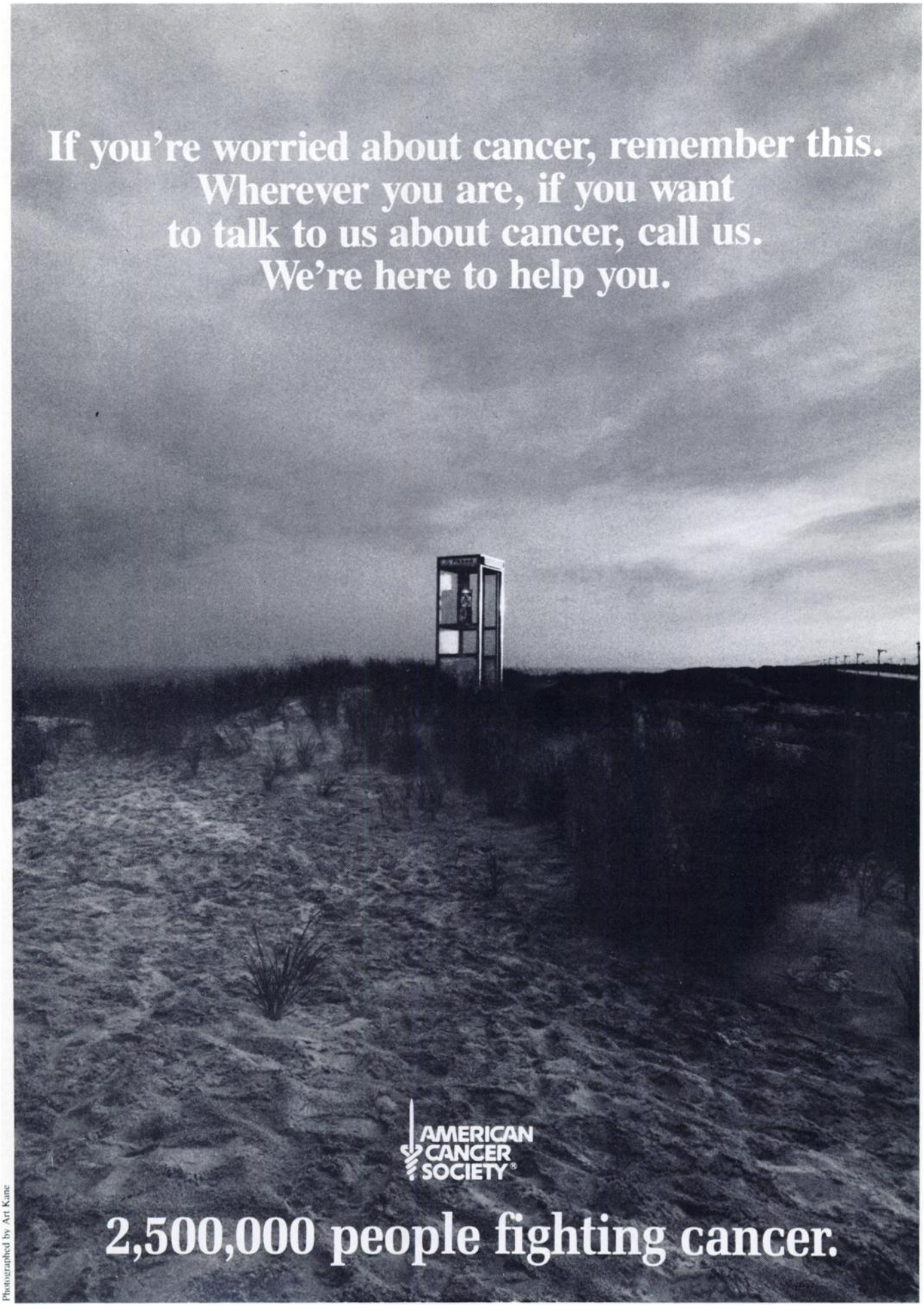

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