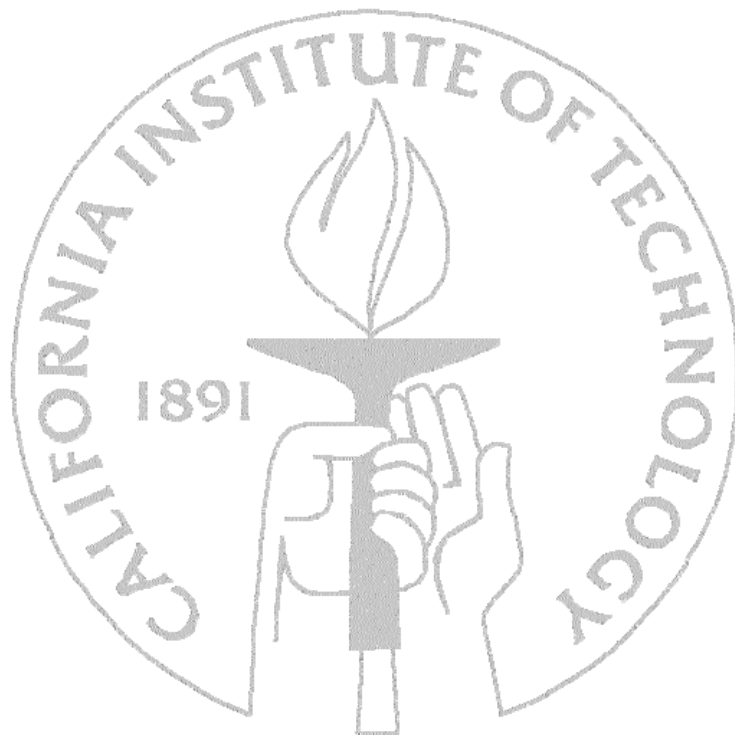


Ph.D. Thesis Regulations



Prepared by
The Office of the Dean of Graduate Studies
California Institute of Technology
2008

CALIFORNIA INSTITUTE OF TECHNOLOGY

REGULATIONS FOR FORMAT AND PRESENTATION OF GRADUATE THESIS

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Introduction

The Ph.D. degree is conferred by the Institute primarily in recognition of breadth of scholarship, depth of research, and power to investigate problems independently and efficiently, rather than for the completion of definite courses of study through a stated period of residence. The work for the degree consists of research and systematic studies that advance knowledge. In addition, the candidate must have acquired the power of clear and forceful self-expression in both oral and written English. Therefore, the candidate must describe their work in a thesis and defend it in an oral examination by the faculty. The Engineer's degree represents advanced studies and limited research in the field of the degree.

The procedures described herein will enable the candidate to fulfill the requirements of the California Institute of Technology, including those additional requirements of the University Microfilms, Inc. which, by faculty agreement, will microfilm the final manuscript and publish an abstract in *Dissertation Abstracts International*. Degree candidates should also consult the University Microfilms, Inc. booklet entitled *Publishing Your Dissertation: How to Prepare Your Manuscript for Publication*, which is available in the Graduate Office or online at <http://www.umi.com>.

An electronic copy of the final thesis must be presented to the Institute via the ETD database hosted by the Caltech Libraries. The copy should be prepared in accordance with the instructions given here and the copy must be complete and accompanied by all illustrative material. Rewriting and changes may be necessary if the specifications are not met. The degree will not be officially awarded until the thesis is submitted in satisfactory form and approved by the Dean of Graduate Studies.

A thesis may be organized as a single paper or as a series of relatively independent chapters unified by a summary chapter. The chapters are often papers that have been or will be submitted to journals in the field. Where the student is not the only or first author, the student must establish their major contribution, typically through an introductory chapter describing the "theme of the thesis."

In addition, there may be certain special requirements that will vary from option to option, particularly in the preparation and presentation of draft copies, format, bibliographical form, number of copies needed for the examining committee, and additional final copies beyond the electronic copy submitted to the ETD database. Candidates should consult their Division Office for information concerning these additional requirements.

Questions and problems arising in the preparation of the final copy may be discussed with the Graduate Office. The Millikan Library contains manuals on the thesis preparation and a file of *Dissertation Abstracts International*, which may be helpful in answering specific questions.

PREPARING THE TEXT OF YOUR MANUSCRIPT

Proofreading and Editing

All manuscripts should be proofread before being submitted to the Graduate Office. The consistency and accuracy of the spelling, punctuation, capitalization, abbreviations and word divisions are primarily the responsibility of the thesis writer, who should consult a dictionary and a manual of style for correct usage. Students are especially urged to use the "spell-check" feature of the computer software being used and to proofread the manuscript carefully, or to enlist the help of a friend or professional proofreader. The Institute proofreader will return to the student for correction and resubmission any thesis that has obviously not been carefully proofread. Students should also allow a minimum of two weeks for proofreading before the final examination is scheduled.

Similarly, the thesis writer, not the Institute proofreader, is fully responsible for editing the style and grammar of the manuscript. Any student who is unsure of their abilities should seek the help of a friend or professional editor.

Up-to-date advice on software packages suitable for manuscript preparation can be obtained from the Information Management Services and Systems (IMSS) organization or from experienced students in the same field. Some academic options provide templates for preparing the manuscript but due to the variation in requirements between options, the Graduate Office does not provide such templates.

Reproduction

The following important reminders should be observed in all cases so that the best reproduction quality can be achieved.

- All textual material should be double-spaced, but long quotations and footnotes may be single-spaced.
- The print size should be 10 point or larger, because the manuscript will be reduced in size on microfilm.
- The print should be letter quality with dark black characters that are consistently clear and dense.

Margins

Left margin	-	1½ inches
Right margin	-	1 inch
Top and bottom	-	1 inch

The same width margins must also be allowed on pages containing graphs, tables, and other illustrative materials. These regulations must be followed so that the manuscript can be microfilmed and so that the Institute library can bind a final copy for reference use.

Pagination

All pages except the title page must be numbered at least 3/4" from the top of the page. Use small Roman numerals for all preliminary pages. Begin the numbering with a small Roman numeral ii on the top of the page following the title page. Use Arabic numerals beginning with the Introduction or Chapter I of the main text of the thesis, and continue with every sheet that follows, whether it be text, figures, explanation for figures or photos, tables, maps, appendices, etc., numbering pages to the end. Page numbers must be within the margins at the top of each page. However, each chapter may be numbered separately, using consecutive capital letters or Roman numerals to distinguish the individual chapters throughout the thesis (i.e. A-1..., I-1...).

Paginate the parts of the thesis in the following order:

Sequential small Roman numerals (at the top of the page within margins):

1. Title page	(not numbered)
2. Copyright page (if applicable)	ii
3. Acknowledgment	iii
4. Abstract	iv
5. Table of Contents	v
6. List of illustrations and/or list of tables, Nomenclature (if applicable)	vi

Sequential Arabic numerals (at top of page within margins):

7. Main text of thesis, including any Introduction or Summary.
8. Material to follow text, such as references, appendices, and fold-in maps. However, such material may be included at the end of each chapter, making each chapter a complete and self-contained paper with its own pagination.

SAMPLE TITLE PAGE

Use the format below, making allowance for the left margin of 1½ inches in centering the print. The year shown should be the year in which the degree is granted at Commencement. The date in parentheses on the next line is the specified date of the final thesis examination. This will protect the candidate in the event a question of priority of presentation of information should arise.

FLOW INDUCED VIBRATIONS OF LONG STRUCTURES

Thesis by

Jonathan Nichols

In Partial Fulfillment of the Requirements

for the Degree of

Doctor of Philosophy

California Institute of Technology

Pasadena, California

2000

(Defended July 29, 1999)

SAMPLE COPYRIGHT PAGE

This is an example of the copyright page, which must follow the title page and would be numbered page ii at the top.

NOTE: The year on the copyright page must be the same as the year that the author will be receiving the actual diploma (see sample title page).

ii

© 2000

Jonathan Nichols

All Rights Reserved

Appendices

Detailed experimental procedures, data tables, computer programs, etc. may be placed in appendices. This may be particularly appropriate if the thesis includes several published papers.

Summary

If the thesis consists of relative independent chapters, a unifying summary should be included at the end or beginning of the thesis. Such a summary will generally be needed to be quite different in style and length than the abstract.

Abstract

An abstract of the thesis will be published in *Dissertation Abstracts International* and will also be used by researchers via electronic search to determine whether or not they wish to access your complete dissertation. Therefore, this abstract must provide a succinct and informative condensation of your work, not exceeding 350 words. Graphs, charts, tables or illustrations should not be included. An extra copy of your abstract and one extra title page must be submitted with the University Microfilm Agreement form. These must be prepared carefully since they will not be edited in any way, unless the extra abstract exceeds 350 words in length. However, the abstract within the dissertation does not need to be limited in any way. Candidates are welcome to prepare a lengthier abstract for inclusion in the dissertation. Please follow these guidelines for preparing your abstract.

- Do not exceed 350 words.
- Print on one side of the paper only, double-spaced. Margins must be maintained.
- Avoid abbreviations and acronyms.

Charts, Graphs, Tables, Photographs, and Oversized Maps

Please keep in mind:

- Illustrative material in black will reproduce satisfactorily, while colors will appear as slightly varying shades of gray. Labels or symbols rather than colors should identify lines on a graph.
- Shaded areas--such as countries on a map--will have better contrast if cross-hatching is used instead of color.
- Photographs should be professional-quality black and white. Color photographs should be reprinted in black and white by a photo lab. Most photographs will reproduce acceptably on positive microfilm or microfiche but will lack clarity on xerographic copies made from the microfilm.
- Charts, graphs, and maps that are larger than the standard 8 1/2" x 11" page size may be used in your manuscripts.

- Each oversize map up to 36" x 36" will be filmed as one exposure and will be available from UMI as a standard black and white 35mm slide or as a glossy 17" x 23" black and white print. Illustrations and photographs can be reproduced as black and white 6" x 9" glossy prints or 35mm slides upon request from UMI.

References

The precise form of a bibliography or reference section can conform to the style current in the thesis writer's discipline, but this form must be employed consistently throughout the thesis. (Allowance will, of course, be made for any material already published and included in the thesis or for individual sections intended for publication in a particular journal.) Similar materials should be presented symmetrically; entries for the same type of material should have the same publication facts, order of items, and punctuation. For helpful guides to the systems of documentation established in various fields, the student should consult one or more of the following manuals. A copy of each is located both at SFL Reference and at Science Reference in Millikan.

The ACS style guide: A manual for authors and editors / Janet S. Dodd, editor. 2nd ed. Washington, D.C.: American Chemical Society, 1997.
QD8.5 .A25 1997 (Also at Mil-1 Reserves)

Chicago manual of style 14th ed. Chicago, IL: University of Chicago Press, 1993.
Z253 .C57 1993 (Also at Mil4Ref and at AstroRef)

Electronic styles: A handbook for citing electronic information / Xia Li and Nancy B. Crane. 2nd ed. Medford, NJ: Information Today, 1996.
PN171 .D37 L5 1996

Elements of style / by William Strunk Jr.; with revisions, an introduction, and a chapter on writing by E. B. White. 4th ed. Boston: Allyn and Bacon, c2000.
PE1408 .S772 2000

A manual for writers of term papers, theses, and dissertations / Kate L. Turabian. 6th ed. / rev. by John Grossman and Alice Bennett. Chicago, IL: University of Chicago Press, 1996.
LB2369 .T8 1996

MLA handbook for writers of research papers / Joseph Gibaldi. 5th ed. New York: Modern Language Association of America, 1999.
LB2369 .G53 1995 (Also at Mil4Ref)

Scientific style and format: the CBE manual for authors, editors, and publishers / Style Manual Committee, Council of Biology Editors. 6th ed. Cambridge; New York: Cambridge University Press, 1994.
T11 .S386 1994 (Also at AstroRef)

United States government printing office style manual Washington, D.C.: U.S. G.P.O., 2000. Z253 .U58 (Also online: <http://www.access.gpo.gov/styleman/2000/browse-sm-00.html>)

In addition, many technical journals publish these style rules every year or so in the journals themselves.

Use of Published Material

Published articles of which the candidate is author or joint author may be included as part of the thesis, with due regard to copyright regulations (see next section). For the "original copy" of the manuscript, such printed pages must follow the same requirements, maintaining margins, type size (at least 8 point), and page number sequencing.

Use of Copyrighted Material

As the author of the dissertation manuscript, you will be asked to certify that any previously copyrighted material used in your work, beyond "fair use," is with written permission of the copyright owner, and that UMI will not be held responsible for any damages, which may arise from copyright violations. (See sample permission letter on page 14). By signing the UMI Agreement Form, you agree to the above terms.

Often no problem will arise if the use of the copyrighted material is for nonprofit educational use and the amount and substantiality of the portion used is small enough. Some definitions of "small enough" seem to be a complete article of 2500 words or less, or an excerpt from prose work of not more than 1000 words or 10% of the total work, whichever is less. If the thesis itself is copyrighted and some profit is to be derived from its use, then this exception probably will no longer apply. However, for each published article included in the thesis copies of permission letters from copyright owners must be attached to the Agreement Form. These permission letters must state that the copyright owner is aware of that UMI may supply single copies on demand.

MICROFILMING AGREEMENT

By faculty agreement, all doctoral dissertations accepted in partial fulfillment of the degree requirements will be microfilmed by University Microfilms, Inc. Ann Arbor, MI. A printed agreement between the student and this firm must be completed and signed by the student, and submitted with the final thesis. The agreement is a legal document or contract, specifying the rights of the author and the rights of UMI with respect to the thesis. The candidate is urged to read the agreement carefully, particularly noting the clauses dealing with publication and reproduction rights, and the section dealing with copyrighting the thesis. Note that this latter service will be performed by UMI for a fee to be paid by the student.

The publishing agreement that you sign grants UMI the following rights:

- The right to reproduce and distribute your abstract in any form.
- Exclusive rights to reproduce and distribute your manuscript in and from microfilm or electronic format.

NOTE: These rights do not prevent you from granting other publishing rights as you choose.

Submission of Ph.D. Thesis

Before the Final Thesis Exam

1. A copy of the regulations for thesis preparation can be obtained from the Graduate Office located on the second floor of the Center for Student Services, Room 230, or online at http://www.gradoffice.caltech.edu/documents_default.htm before you begin work on your thesis. The following forms are required for Ph.D. completion and can be obtained in the Graduate Office or online via the URL above.

- Petition for Examination & Thesis Approval Form
- University Microfilms, Inc. Agreement
- Survey of Earned Doctorates
- Proofreader Agreement
- Athenaeum Termination
- Forwarding Address Form
- Instructions for submitting an electronic thesis
- Exit Survey
- GSC Lab Review Survey

2. The Institute requirements state that an examining committee must consist of a minimum of four voting members, three of which must be Caltech faculty. When your examining committee has been selected, arrange for a convenient date and time and make the necessary room reservations. Distribute copies of the thesis to your committee members, as well as the Graduate Office for proofreading, at least two weeks before your exam giving everyone ample time to read and comment on the thesis. For specific departmental and divisional deadlines and requirements, check with your option secretary.

NOTE: If you are defending in the summer term, please be aware that your health insurance coverage will end on August 31.

Petition for Examination- Complete first page in its entirety and sign on page one at the bottom. On page two, have Section I completed and signed by the Registrar and Section II by the Option Representative. Return the signed form to the Graduate Office **no later than** the Monday two weeks before the week of your exam, for the Dean's approval. Also at this time you are required to submit a complete version of your thesis for proofreading by the Graduate Office. The corrections need not be made until after your examination.

A day or two before your examination, pick up the petition along with the corrected copy of the thesis from the Graduate Office. Take the petition form to your exam to be signed by each member of your committee, including the result of the exam.

If you have a subject minor, a faculty representative of the minor option must sign Section VII on page four.

After the Final Thesis Exam

The final, corrected thesis must be uploaded to the Electronic Thesis Database (ETD) by the fifth week of the succeeding term if the candidate defended his or her thesis during the previous summer or the first and second terms; or two weeks before the degree is to be conferred if the candidate defended during the month of May.

The following material should be submitted to the Graduate Office as soon as possible after the thesis examination.

Petition for Examination- Following your exam, submit the examination petition form along with a corrected copy of your thesis to your Division Chair for approval. Return the signed and completed form to the Graduate Office where it will be kept on file until commencement.

University Microfilms, Inc. Agreement (UMI) form- In order to satisfy all Institute requirements, please submit the **UMI** form (available for download on the Graduate Office website www.gradoffice.caltech.edu) to the Graduate Office, Mail Code 230-87, simultaneous to the thesis upload. If you wish to register the copyright of your thesis, attach a U.S. Postal Money Order or Cashier's Check without an expiration date in the amount of \$65 to the Agreement and make it payable to: **PQIL**. Due to the length of time it take to fully process a final thesis, we cannot accept Money Orders or Cashier's Checks with an expiration date (i.e., expires 90 days from the time of issue, etc.). ***Personal checks cannot be accepted.*** You may also charge this fee to your student account by authorizing the Library deduct your account through the Bursar's Office. If you would like to order reprints of your abstract, increase the amount as appropriate (ex. \$30 for the first 100 reprints). NOTE: THE YEAR ON THE COPYRIGHT PAGE MUST MATCH THE YEAR ON THE TITLE PAGE, WHICH IS THE YEAR THE DEGREE WILL BE AWARDED.

Survey of Earned Doctorates- The survey is required.

Forwarding Address Form- Submit the Forwarding Address form to the Graduate Office when all final paperwork is turned in. Be sure to include the address at which you can be reached until June. Please indicate at this time if you intend to participate in Commencement ceremonies. Information on Commencement will be mailed to you by the Registrar's Office before the end of April. If you plan to attend Commencement and have not received any forms to participate by the end of April, please contact the Registrar's Office or the Graduate Office as soon as possible.

Exit Interview - You must clear or make arrangements to clear your student account before you can receive a letter stating that you have completed all of the requirements for the degree. Also, the formal diploma may be held if accounts have not been cleared or arrangements made. Caltech graduating students are expected to participate in an exit interview process with the Bursar's staff before commencement. This process is designed to inform students of their rights and responsibilities, furnish loan and other fiscal data, notify students of federal regulations where applicable, update information and address questions students may have regarding their personal accounts.

Further information can be found at http://bursar.caltech.edu/checkout_grad.htm.

Library Clearance - Contact the main circulation desk of the Library to make sure that all items have been returned before you leave campus.

Athenaeum Membership - Athenaeum members must fill out the Athenaeum termination form to either terminate the account or make alternate arrangements with the Athenaeum to continue membership as an alumnus or other classification. You can either return the form directly to the Athenaeum or to the Graduate Office.

Exit Survey -Caltech graduating students are expected to complete the student exit survey. The survey is available year-round online at http://bursar.caltech.edu/checkout_grad.htm. Be sure to select the survey for "Graduate Students."

International Student Checkout: All international students should notify the International Student Programs Office of upcoming graduation dates. To apply for practical training, students should provide at least two to three months notice prior to the beginning of employment. Forms and instruction for practical training can be obtained in the ISP office (Room 250 - Center for Student Services).

Thesis - Submit to the Caltech Library System an electronic copy of the final thesis. Instructions for submission and formatting can be found online at <http://library.caltech.edu/etd/default.htm>. The Library will generate an archival copy of the thesis from the electronic thesis, and both the electronic copy and the archival copy will be kept on permanent file in the Millikan Library to be available for reference or reproduction.

Final Checklist for the Ph.D. Degree

- An electronic copy of the thesis submitted to the ETD database via the Caltech Library System along with the publishing specifications.
- University Microfilms, Inc. Agreement Form along with permission letters for previously published articles. Attach one extra 350 word abstract and one title page. Submit to the Graduate Office.
- If registering your copyright, a \$65 money order or cashier's check (without an expiration date) made payable to PQIL. Attach to the University Microfilms, Inc. Agreement form and send to the Graduate Office.
- Survey of Earned Doctorates form to the Graduate Office.
- One extra title page to the Graduate Office.
- Proofread copy of the thesis with proofreader corrections to the Graduate Office.
- Proof that you have informed the Bursar's Office of your completion and have provided them with your forwarding address. Submit to the Graduate Office.
- Forwarding Address Form include the address at which you can be reached until June to the Graduate Office.
- Athenaeum termination form. (Graduate Office or Athenaeum)
- Exit interview (http://bursar.caltech.edu/checkout_grad.htm)
- GSC Lab Review Survey (<http://labreviews.caltech.edu/survey.html>)

Final Checklist for the Engineer's Degree

- An electronic copy of the thesis submitted to the ETD database via the Caltech Library System along with the publishing specifications.

- University Microfilms, Inc. Agreement Form along with permission letters for previously published articles. Attach one extra 350 word abstract and one title page. Submit to the Graduate Office.
- If registering your copyright, a \$65 money order or cashier's check (without an expiration date) made payable to PQIL. Attach to the University Microfilms, Inc. Agreement form and send to the Graduate Office.
- Survey of Earned Doctorates form to the Graduate Office.
- One extra title page to the Graduate Office.
- Proofread copy of the thesis with proofreader corrections to the Graduate Office.
- Proof that you have informed the Bursar's Office of your completion and have provided them with your forwarding address. Submit to the Graduate Office.
- Forwarding Address Form include the address at which you can be reached until June to the Graduate Office.
- Athenaeum termination form. (Graduate Office or Athenaeum)
- Exit interview (http://bursar.caltech.edu/checkout_grad.htm)
- GSC Lab Review Survey (<http://labreviews.caltech.edu/survey.html>)

Some Common Errors

1. Reversed punctuation of quotations. Periods and commas always precede final quotation marks, even if the quotation consists of a single letter.

For example:

We shall call the shear stiffness "K."

2. Incorrect punctuation of abbreviations. The Latin abbreviation for "and others" contains only one period "et al." The abbreviations "i.e." and "e.g." are punctuated with two periods and set off by commas from the sentences in which they appear.

For example:

Analysis of long and narrow buildings, e.g., the Jet Propulsion Laboratory, must take into account the shear stiffness, i.e., K in our equation.

3. Names of authors spelled differently in the text and in the bibliography; reference numbers or dates in the text that do not agree with the bibliography.
4. Unnumbered pages, especially those containing figures or captions to figures.
5. Inconsistent hyphenation of compound words, such as "ray-tracing," "ray tracing," and "raytracing."
6. Inconsistent capitalization of proper names used as adjectives, such as "Boolean" and "Hamiltonian."
7. Inconsistent presentation of bibliographic information.

Sample Permission Letter

[Letterhead stationery or return address]

[Date]

[Name and address of addressee]

Dear _____ :

[Optional beginning sentence: This letter will confirm our recent telephone conversation.] I am completing a doctoral dissertation at _____ University entitled "_____." I would like your permission to reprint in my dissertation excerpts from the following:

[Insert full citation and description of the original work]

The excerpts to be reproduced are: [insert detailed explanation or attach copy]

The requested permission extends to any future revisions and editions of my dissertation, including non-exclusive world rights in all languages, and to the prospective publication of my dissertation by UMI Company. These rights will in no way restrict republication of the material in any other form by you or by others authorized by you. Your signing of this letter will also confirm that you own [or your company owns] the copyright to the above-described material.

If these arrangements meet with your approval, please sign this letter where indicated below and return it to me in the enclosed return envelope. Thank you very much.

Sincerely,

[Your name and signature]

PERMISSION GRANTED FOR THE
USE REQUESTED ABOVE:

[Type name of addressee below signature line]

Date: _____

Instructions for permission letters:

1. Be sure to include your return address, telephone and fax numbers, and date at the top of the letter.
2. Spare no effort in confirming the exact name and address of the addressee. Call the person to confirm the copyright ownership.
3. State clearly the name of your university and your dissertation's title.
4. Describe precisely the proposed use of the copyrighted material. If necessary or appropriate attach a copy of the quotations, diagrams, pictures, and other materials. If the proposed use is extensive, such as the general use of an archival or manuscript collection, describe it in broad and sweeping terms. Your objectives are to eliminate any ambiguities and to be sure the permission encompasses the full scope of your needs.
5. The sample signature form at the end of the sample letter is appropriate when an individual grants the permission. When a company, such as a publishing house, is granting permission, use the following signature format:

PERMISSION GRANTED FOR THE USE REQUESTED ABOVE:

[Type name of company]

By: _____

Title: _____

Date: _____

Proofreaders' Marks

↵	Delete	⌋	Move right
⌋	Close up	⌈	Move up
↵⌋	Delete and close up	⌋	Move down
↔	Transpose	≡	Align horizontally
#	Insert space		Align vertically
eg. #	Equalize space	↵	Insert comma
¶	Start new paragraph	⊙	Insert period
no ¶	Run existing paragraphs together	:/	Insert colon
Ⓢ	Spell out	;/	Insert semicolon
STET	Let it stand	?	Insert question mark
cap	Change to capital letter(s)	↵	Insert apostrophe
lc	Change to lowercase letter(s)	↵↵	Insert single quotation marks
ital	Change to <i>italic</i> type	↵↵	Insert quotation marks
rom	Change to roman type	⌈ ⌋	Insert parentheses
bf	Change to boldface type	⌈ ⌋	Insert brackets
⌈	Move left	=	Insert hyphen