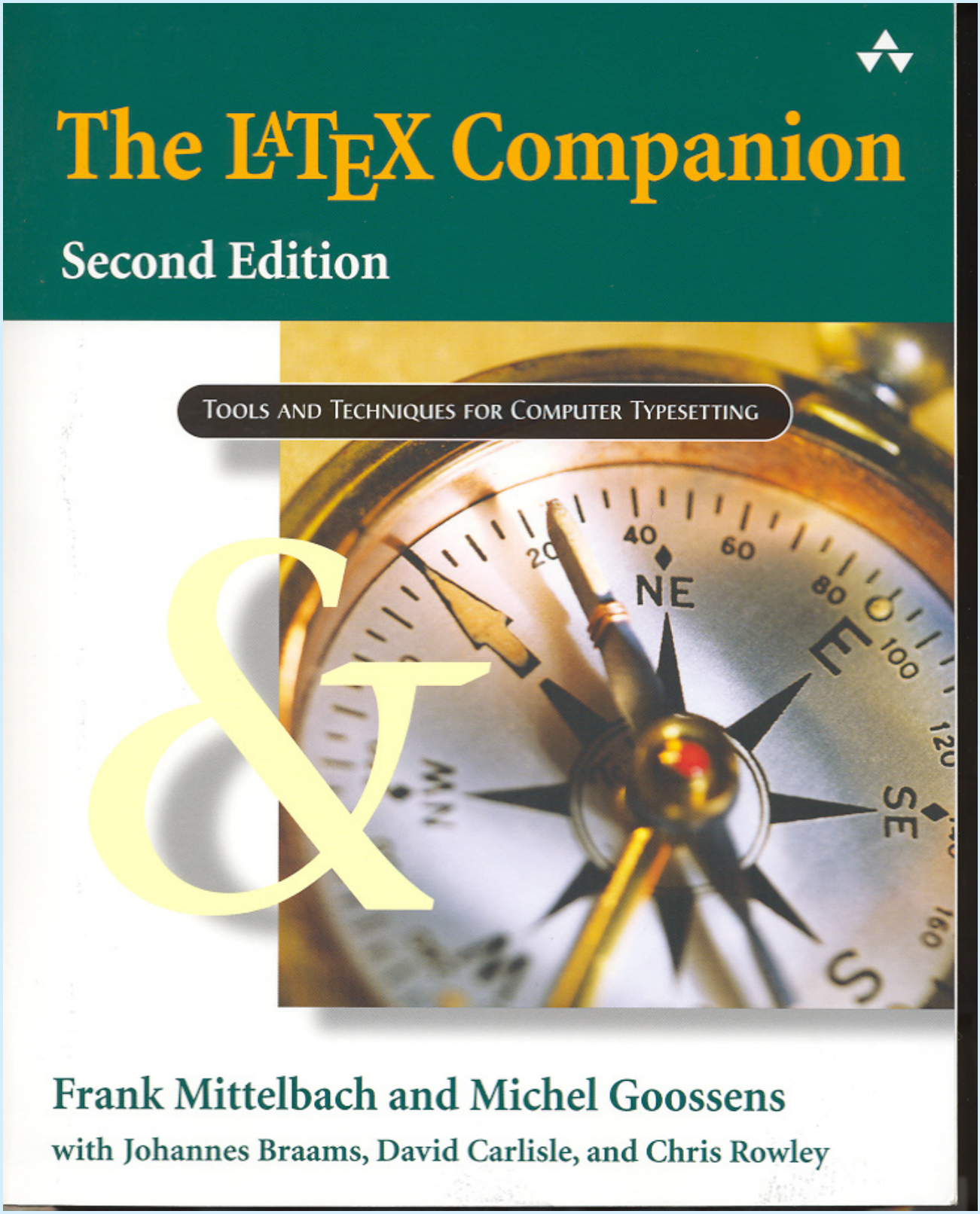
The LaTeX Companion
Second Edition
Tools and Techniques for Computer Typesetting
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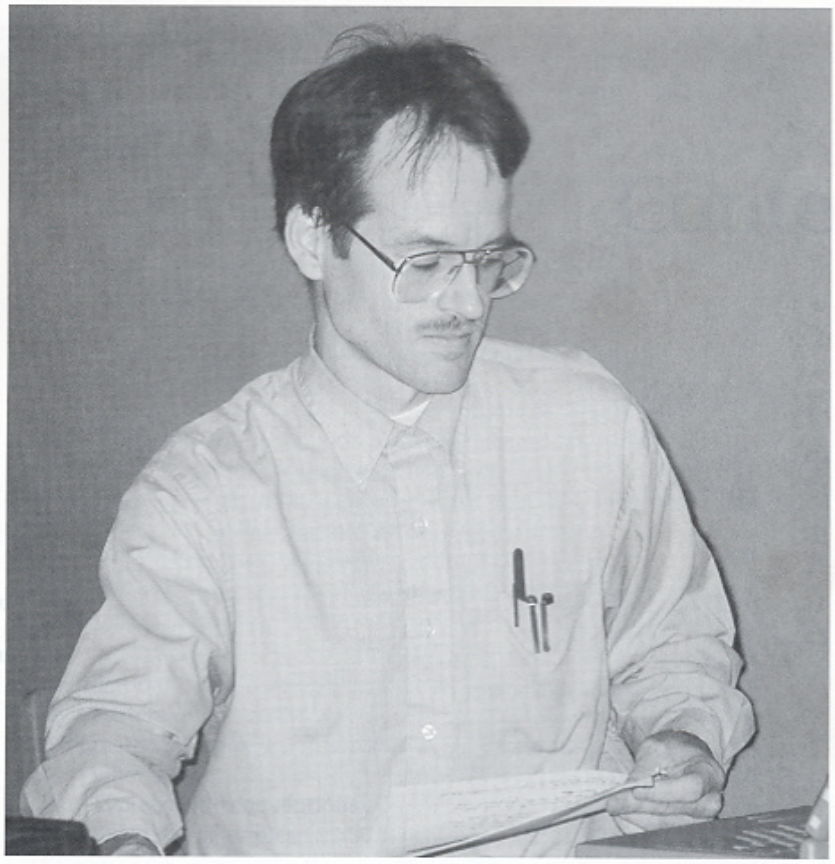
Frank Mittelbach and Michel Goossens
with Johannes Braams, David Carlisle, and Chris Rowley



We dedicate this book to the memory of Michael Downes (1958–2003), a great friend and wonderful colleague on the LaTeX Team. His thoughtful contributions to our work and our lives are diverse and profound. Moreover, he brightens the lives of countless grateful (La)TeX users through the wisdom built into his support for all aspects of mathematical typesetting—very many *masterpieces of the publishing art* will stand for ever as superb memorials to his quiet but deep insights.

Preface

A full decade has passed since the publication of the first edition of *The LaTeX Companion*—a decade during which some people prophesied the demise of TeX and LaTeX and predicted that other software would take over the world. There have been a great many changes indeed, but neither prediction has come to pass: TeX has not vanished and the interest in LaTeX has not declined, although the approach to both has gradually changed over time.

When we wrote the *Companion* in 1993 [55], we intended to describe what is usefully available in the LaTeX world (though ultimately we ended up describing what was available at CERN in those days). As an unintentional side effect, the first edition *defined* for most readers what should be available in a then-modern LaTeX distribution. Fortunately, most of the choices we made at that time proved to be reasonable, and the majority (albeit not all) of the packages described in the first edition are still in common use today. Thus, even though "the book shows its age, it still remains a solid reference in most parts", as one reviewer put it recently.

Nevertheless, much has changed and a lot of new and exciting functionality has been added to LaTeX during the last decade. As a result, while revising the book we ended up rewriting 90% of the original content and adding about 600 additional pages describing impressive new developments.

What you are holding now is essentially a new book—a book that we hope preserves the positive aspects of the first edition even as it greatly enhances them, while at the same time avoiding the mistakes we made back then, both in content and presentation (though doubtless we made some others). For this book we used the CTAN archives as a basis and also went through the `comp.text.tex` news group archives to identify the most pressing questions and queries.

In addition to highlighting a good selection of the contributed packages available on the CTAN archives, the book describes many aspects of the basic LaTeX system that are not fully covered in the *LaTeX Manual*, Leslie Lamport's *LaTeX: A Document Preparation System* [104]. Note, however, that our book is not a replacement for the *LaTeX Manual* but rather a companion to it: a reader of our book is assumed to have read at least the first part of that book (or a comparable introductory work, such as the *Guide to LaTeX* [101]) and to have some practical experience with producing LaTeX documents.

The second edition has seen a major change in the authorship; Frank took over as principal author (so he is to blame for all the faults in this book) and several members of the LaTeX3 project team joined in the book's preparation, enriching it with their knowledge and experience in individual subject areas.

Thanks to a great guy!

The preparation of the book was overshadowed by the sudden death of our good friend, colleague, and prospective co-author Michael Downes, whose great contributions to LaTeX, and $\mathcal{A}_{\mathcal{M}}$S-LaTeX in particular, are well known to many people. We dedicate this book to him and his memory.

* * *

We first of all wish to thank Peter Gordon, our editor at Addison-Wesley, who not only made this book possible, but through his constant encouragement also kept us on the right track (just a few years late). When we finally went into production, Elizabeth Ryan was unfailingly patient with our idiosyncrasies and steered us safely to completion.

We are especially indebted to Barbara Beeton, David Rhead, Lars Hellström, and Walter Schmidt for their careful reading of individual parts of the manuscript. Their numerous comments, suggestions, corrections, and hints have substantially improved the quality of the text.

Our very special thanks go to our contributing authors Christine Detig and Joachim Schrod for their invaluable help with Chapter 11 on index preparation.

Haunted package authors

Those who keep their ears to the ground for activities in the LaTeX world may have noticed an increased number of new releases of several well-established packages in 2002 and 2003. Some of these releases were triggered by our questions and comments to the package authors as we were preparing the manuscript for this second edition. Almost all package authors responded favorably to our requests for updates, changes, and clarifications, and all spent a considerable amount of time helping us with our task. We would particularly like to thank Jens Berger (jurabib), Axel Sommerfeldt (caption), Steven Cochran (subfig), Melchior Franz (soul, euro), and Carsten Heinz (listings) who had to deal with the bulk of the nearly 6000 e-mail messages that have been exchanged with various package authors.

Hearty thanks for similar reasons go to Alexander Rozhenko (manyfoot), Bernd Schandl (paralist), David Kastrup (perpage), Donald Arseneau (cite, relsize, threeparttable, url), Fabrice Popineau (TeX Live CD), Frank Bennett, Jr. (camel), Gerd Neugebauer (bibtool), Harald Harders (subfloat), Hideo Umeki

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We gratefully recognize all of our many colleagues in the (LA)TEX world who developed the packages—not only those described here, but also the hundreds of others—that aim to help users meet the typesetting requirements for their documents. Without the continuous efforts of these enthusiasts, LATEX would not be the magnificent and flexible tool it is today.

We would also like to thank Blenda Horn from Y&Y and Michael Vulis from MicroPress for supplying the fonts used to typeset the pages of this book.

The picture of Chris Rowley, taken after a good lunch at Kai Tek airport, Hong Kong, appears courtesy of Wai Wing. The picture of Michael Downes, taken at the TEX 2000 conference, Oxford, appears courtesy of Alan Wetmore.

* * *

We would like to thank our families and friends for the support given during the preparation of this book—though this may sound like an alibi sentence to many, it never felt truer than with this book.

Chris would like to thank the Open University, United Kingdom, for supporting his work on LATEX and the School of Computer Science and Engineering, University of New South Wales, for providing a most pleasant environment in which to complete his work on this book.

Frank Mittelbach
Michel Goossens
Johannes Braams
David Carlisle
Chris Rowley

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the "Graphics" category (1), which opened the "Graphics" menu (lower left), where we selected "Extended picture environment (pspicture)" (2). We then clicked the "View" button (3), which called the .dvi viewer Windvi (4), which displayed the text of the documentation.

On the figure one can see all available documentation categories (note the "Miscellaneous" button in the lower-right corner for special cases) as well as the "Search" and "Help" buttons for more advanced use.

C.5 TeX user groups

TeX users in several countries have set up TeX user groups, mostly based on language affinities. If you need help, you should contact your local user group first, since they might be able to come up with an answer that is most suited to your language-dependent working environment. Below we give some information about groups that have a formal existence (see http://www.tug.org/lugs.html or http://www.servalys.nl/lug/ for up-to-date and more complete lists). They can help you obtain TeX-related material on CD-ROMs or other publications.

cn: China PR
name: Chinese TeX Users Group
language: Chinese
web site: www.rons.net.cn
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ee: Estonia
name: Estonian User Group
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Enn Saar, Tartu
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es: Spain (CervanTeX)
name: CervanTeX
language: Spanish
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web site: www.cervantex.org

esc: Spain (Catalan)
name: Catalan TeX Users Group
language: Catalan

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language: Korean
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Biographies

Frank Mittelbach

Frank Mittelbach studied mathematics and computer science at the Johannes-Gutenberg University, Mainz. In 1989 he joined EDS, Electronic Data Systems, working in a newly formed group for document processing using TEX and other tools. In his current position he is responsible for concepts and implementation for remote monitoring and management of distributed systems and networks.

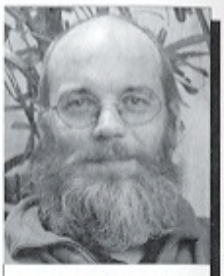
before TLC2...

His interest in the automated formatting of complex documents in general, and in LATEX in particular, goes back to his university days and has become a major interest, perhaps a vocation, and certainly it is now his "second job". He is author or co-author of many and varied LATEX extension packages, such as $\mathcal{A}_{\mathcal{M}}$S-LATEX, doc, multicol, and NFSS: the New Font Selection Scheme.

At the TUG conference at Stanford University in 1989, he gave a talk about the problems with LATEX 2.09, which led to his taking on the responsibility for the maintenance and further development of LATEX. This effort is generally known as the LATEX3 Project and in the capacity of technical director of this project, he has overseen the original major release of LATEX 2_ε in 1994 and the, by now, 15 subsequent maintenance releases of this software.

His publication of many technical papers on LATEX and on general research results in automated formatting brought him in contact with Peter Gordon from Addison-Wesley. Peter and Frank inaugurated the book series *Tools and Techniques for Computer Typesetting* (TTCT), with Frank as series editor. *The LATEX Companion* (1994) was the first book of this series whose titles by now cover LATEX

in all its facets. Forthcoming works will expand that core to cover other typesetting and information processing tools and concepts.


...and after

In 1990 Frank presented the paper *E-TEX: Guidelines for further TEX extensions*, which explained the most critical shortcomings of TEX and argued the need for its further development and for research into the many open questions of automated typesetting. This was the first time the topic of change or extension had been openly discussed within the TEX community and, after getting some early opposition, it helped to spawn several important projects, such as eTEX, Omega, and NTS. He is now interested in bringing together the fruits of these TEX extension developments, e.g., the Omega and eTEX projects, to get a stable, well-maintained, and widely available successor of TEX on which a future LATEX3 can be based.

Frank lives with his wife, Christel, and their three sons, Arno (age 19) and the twins Burkhard and Holger (age 6), in Mainz, Germany.

Michel Goossens

After finishing his Ph.D. in high energy physics Michel Goossens joined CERN, the European Laboratory for Particle Physics in Geneva (Switzerland) at the beginning of 1979, where he worked for a few years as a research physicist, and then moved on to software support in the Informatics Technologies Division.

Over the years he has worked with several typesetting systems: LATEX, of course, but also, more recently, HTML/SGML/XML. As a large international scientific laboratory, a large fraction of the thousands of physicists and engineers working at CERN use LATEX for publishing their papers or for writing their documentation. Therefore, since the late 80s Michel has been involved in developing and supporting tools related to TEX and, especially, LATEX.

A milestone in his LATEX life was a meeting with Frank and Chris at CERN at the end of 1992, where they gave a talk on LATEX3. After their seminar Michel showed them the "Local TEX Guide" that he and Alexander Samarin had written and proposed to extend the material and turn it into a book. This was the birth of the first edition of *The LATEX Companion*, which was published at the beginning of 1994. Using his experience in graphics and web presentation, he also co-authored *The LATEX Graphics Companion* (1997) and *The LATEX Web Companion* (1999), both of which appeared in the TTCT series.

Michel has occupied various positions in the TEX world. He was president of GUTenberg, the French-speaking TEX users Group (1995–2000), as well as president of TUG, the TEX Users Group (1995–1997).

For the past three years he has acted as the CERN Focal Point for the EU-funded TIPS (Tools for Innovative Publishing in Science) project. Within the framework of that project he was responsible for studying how XML tools can be optimally integrated into a framework for efficiently handling electronic information, especially for scientific documents. In particular, he looked at the complementary roles played by LaTeX and MathML for mathematics, SVG for graphics, PDF for typographic quality output, and XHTML or DocBook for structural integration in the Web environment.

He lives in the Geneva area and enjoys reading, watching a good film, walking along the lake or in the beautiful countryside, and visiting museums.

Johannes Braams

Johannes Braams studied electronic engineering at the Technical University in Enschede, the Netherlands. His master's thesis was on video encoding, based on a model of the human visual system. He first met LaTeX at the *dr. Neher Laboratories* of the Dutch PTT in 1984. He was a founding board member of the Dutch speaking TeX User Group (NTG) in 1988 and participated in developing support for typesetting Dutch documents.

He started work on the babel system following the Karlsruhe EuroTeX conference in 1989 and has been a member of the LaTeX3 project since the EuroTeX conference at Cork in 1990. In addition to babel, Johannes is the current maintainer of a number of LaTeX extension packages, such as the ntgclass family of document classes, the supertabular package, and the changebar package.

Johannes is still working for the Dutch PTT, nowadays known as KPN, primarily as a project manager for IT related projects. He lives with his wife, Marion, and two sons, Tycho (age 11) and Stephan (age 9), in Zoetermeer.

David Carlisle

David Carlisle studied mathematics at the University of Manchester and then worked as a researcher in the Mathematics and Computer Science departments at Cambridge and Manchester, where he started using LaTeX in 1987. He joined the LaTeX3 team in 1992, just prior to the start of development work on LaTeX 2ε.

For the last six years he has worked at NAG Ltd. in Oxford, UK, primarily on projects connected to the development of XML-based languages for the representation of mathematical expressions and documents. He is an editor of the OpenMath specification and was an invited expert on the W3C

Math Working Group responsible for MathML, becoming an editor of the MathML 2 Recommendation. Currently he is an editor of a proposed update to ISO/IEC TR 9573, the "ISO character entities". This allows a wide range of characters to be entered into XML and SGML documents using only ASCII characters, with syntax such as γ to denote γ.

David has also taken an interest in the XSLT language and is a major contributor to the xsl-list discussion group for that language. He has reviewed or acted as technical editor on several XSLT-related books. He lives in Oxfordshire with his wife, Joanna, and their son, Matthew (4 months).

Chris Rowley

When not indulging his addiction to travel, Chris lives in London with his wine cellar, his ceramic collection, and his memories. These last include some now rather hazy ones of the 60s, when he was addicted to mathematics but also dipped his mind into computing, both the theory of programming (pretty wild stuff back then) and number crunching (nice streamers from the paper tape).

at his favourite task

It was not until the early 80s that he discovered, on a newly occupied desk, a TV-like object that was connected to a computer and could help him do creative and useful things, such as producing a single page of beautiful typeset mathematics. That was not done using TEX—so it took two days to complete that single page; but it made him realize what was possible and set him thinking about a better way to achieve it. He is very grateful that he then very soon stumbled across TEX and, not long after, LATEX; the latter being especially providential, as his colleagues included six mathematical typists who needed something that would work for them too. A few years on he heard about a guy called Mittlebach-and-Schöpf (sic) in Mainz and the rest is ... *to be continued.*

Fifteen years later and Chris Rowley is now a senior member of the Faculty of Mathematics and Computing at the Open University, UK. He has been a manager and active member of the LATEX3 Project Team since its beginning, when he foolishly believed that it would all be done in two years or so. He has been on too many boards and committees, one of the most pleasant being the editorial board for *Tools and Techniques for Computer Typesetting*, and he has graced various offices in the TEX world, including Chair of UKTUG and a vice-presidency of TUG.

As the largest international player in industrialized mass education for home- and workplace-based university-level customers, the Open University has become a major multi-media publishing corporation with, despite commercial competition, an under-resourced, LATEX-based production system for its mathematical output. As a mathematician who already understood a fair bit about the production of

mathematical texts, Chris was well placed to play a vital rôle in the political, administrative, and technical aspects of establishing this system in the mid-80s.

He is now actively engaged on research into the automation of all aspects of document processing, especially multi-lingual typography for multi-use documents. By contrast, over the decades he has also done his share of practical work on LaTeX-based systems in production environments and acted as consultant on the digitization of mathematical texts to a number of standards bodies, companies, and organizations.

These activities have led Chris to the conviction that TeX has but two important long-term future uses: one is as a vernacular within less formal electronic communications between mathematicians, whilst the other is as a treasure trove of wonderful algorithms, especially for mathematical typesetting. He believes, moreover, that extending the monolithic design and intricate models of the TeX software system will not lead to powerful and flexible typesetting software for the 21st Century, ... but it's more fun than doing crosswords.

Christine Detig & Joachim Schrod

In 1982, Christine Detig met TeX on reel-tape during her computer science studies, resulting in her becoming a founding member of DANTE, the German TeX Users Group. Her early software experiences were gained around the TeX workbench, resulting in the formation of a small business in the provision of TeX distributions. Spreading TeX knowledge as part of her job as a research assistant at TU Darmstadt resulted in a book for TeX beginners: *Der LaTeX Wegweiser*. Meanwhile, visiting lots of international conferences has led to many friendships with the eclectic crowd of TeXies. Meet her there for a nice chat about the Future of TeX!

Joachim Schrod also started to use TeX in 1982 and he is another founding member of DANTE. He wrote and supported the international version of LaTeX until LaTeX 2$_\varepsilon$ came along. He has been involved in lots of TeX activities, most of them too long ago to be remembered, but among the more enduring are the creation of CTAN and the TeX Directory Structure. Today he is the CEO of a consulting company, where he strives to translate between business and technical people.

Christine & Joachim live in Rödermark, Germany.

LaTeX

The LaTeX Companion

Second Edition

Frank Mittelbach and Michel Goossens
with Johannes Braams, David Carlisle, and Chris Rowley

The LaTeX Companion has long been the essential resource for anyone using LaTeX to create high-quality printed documents. This completely updated edition brings you all the latest information about LaTeX and the vast range of add-on packages now available—over 200 are covered! Full of new tips and tricks for using LaTeX in both traditional and modern typesetting, this book will also show you how to customize layout features to your own needs—from phrases and paragraphs to headings, lists, and pages.

Inside, you will find:

- Expert advice on using LaTeX's basic formatting tools to create all types of publications—from memos to encyclopedias
- In-depth coverage of important extension packages for tabular and technical typesetting, floats and captions, multicolumn layouts—including reference guides and discussions of the underlying typographic and TeXnical concepts
- Detailed techniques for generating and typesetting contents lists, bibliographies, indexes, etc.
- Tips and tricks for LaTeX programmers and systems support

The accompanying CD-ROM contains a complete plug-and-play LaTeX installation, including all the packages and examples featured in the book.

New to this edition:

- Nearly 1,000 fully tested examples that illustrate the text and solve typographical and technical problems—all ready to run!
- An additional chapter on citations and bibliographies
- Expanded material on the setup and use of fonts to access a huge collection of glyphs, and to typeset text from a wide range of languages and cultures
- Major new packages for graphics, "verbatim" listings, floats, and page layout
- Full coverage of the latest packages for all types of documents—mathematical, multilingual, and many more
- Detailed help on all error messages, including those troublesome low-level TeX errors

Like its predecessor, ***The LaTeX Companion, Second Edition,*** is an indispensable reference for anyone wishing to use LaTeX productively.

All of the authors have over 10 years of varied experience working with LaTeX-related software systems. All but one are active members of the LaTeX3 Project Team, developing and maintaining the core LaTeX system.

The authors are donating a portion of the book's royalties to the LaTeX3 project fund, which supports the maintenance and future development of LaTeX.

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