

## **SURVIVAL GUIDE FOR SCIENTISTS**



# Survival Guide for Scientists

Writing – Presentation – Email

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To Truusje, Wouter, Guido and Kristel



# SUMMARY CONTENTS

|                                   |                         |     |
|-----------------------------------|-------------------------|-----|
| Preface                           |                         | 31  |
| Writing Guide for Scientists      |                         |     |
| 1                                 | Introduction            | 34  |
| 2                                 | Manuscript handling     | 41  |
| 3                                 | Text formatter          | 50  |
| 4                                 | Text structure          | 55  |
| 5                                 | Text content            | 58  |
| 6                                 | Text spelling           | 75  |
| 7                                 | Math                    | 77  |
| 8                                 | Figures                 | 82  |
| 9                                 | Tables                  | 90  |
| 10                                | Submission              | 92  |
| 11                                | Referee reports         | 95  |
| 12                                | Administration          | 103 |
| 13                                | Reaching out            | 106 |
| 14                                | Alternative publishing  | 107 |
| 15                                | Protecting your papers  | 111 |
| 16                                | About                   | 114 |
| Presentation Guide for Scientists |                         |     |
| 1                                 | General                 | 119 |
| 2                                 | Process of presentation | 126 |
| 3                                 | Spoken text             | 133 |
| 4                                 | Slides                  | 146 |
| 5                                 | Technical aspects       | 179 |
| 6                                 | Ten commandments        | 187 |
| 7                                 | Checklist               | 188 |
| 8                                 | About                   | 190 |

## Email Guide for Scientists

|       |                     |     |
|-------|---------------------|-----|
| 1     | Introduction        | 193 |
| 2     | General principles  | 197 |
| 3     | Receiving emails    | 204 |
| 4     | Sending emails      | 212 |
| 5     | Managing account(s) | 229 |
| 6     | Archiving emails    | 237 |
| 7     | Security            | 242 |
| 8     | Internet Protocols  | 247 |
| 9     | About               | 249 |
| Index |                     | 251 |

# DETAILED CONTENTS

|  |    |
|--|----|
| Preface                                      | 31 |
| WRITING GUIDE FOR SCIENTISTS                 |    |
| 1 Introduction                               | 34 |
| 1.A Target group                             | 34 |
| 1.B Goal of your paper                       | 35 |
| 1.B.1 Help your readers                      | 35 |
| 1.B.2 Profile of your readers                | 35 |
| 1.B.3 Quality of your papers                 | 35 |
| 1.C Discussion groups                        | 35 |
| 1.D General advice for authors               | 36 |
| 1.D.1 Help your coauthors                    | 36 |
| 1.E Format of the Writing Guide              | 36 |
| 1.E.1 Publication form                       | 36 |
| 1.E.1.A Printed version                      | 36 |
| 1.E.1.B Digital version                      | 36 |
| 1.E.2 Navigation                             | 37 |
| 1.E.3 Size of the Writing Guide              | 37 |
| 1.E.4 Text formatter                         | 37 |
| 1.F How to use the <i>Writing Guide</i> ?    | 37 |
| 1.F.1 Requested prior knowledge              | 37 |
| 1.F.2 Further study                          | 37 |
| 1.F.2.A Courses in writing scientific papers | 38 |
| 1.G Improving your English                   | 38 |
| 1.H Culture                                  | 39 |
| 1.I Limitations                              | 39 |
| 1.J Male chauvinism                          | 39 |
| 1.K Ethics                                   | 39 |
| 1.L Conventions in the <i>Writing Guide</i>  | 39 |
| 1.L.1 Double quotes                          | 40 |
| 1.L.2 Single quotes                          | 40 |
| 1.M Commercial products                      | 40 |

|   |   |    |
|---|---|----|
| 2 | Manuscript handling                             | 41 |
|   | 2.A Consistency                                 | 41 |
|   | 2.B Manuscript types                            | 41 |
|   | 2.B.1 Generic scientific texts                  | 41 |
|   | 2.B.1.A Extreme size constraint                 | 42 |
|   | 2.B.1.B Theses                                  | 42 |
|   | 2.B.1.B.1 Consistency                           | 42 |
|   | 2.B.2 Some special scientific texts             | 42 |
|   | 2.B.2.A Computer programs                       | 42 |
|   | 2.B.2.A.1 Manual                                | 43 |
|   | 2.B.2.B Comments                                | 43 |
|   | 2.B.2.C Conference abstracts                    | 43 |
|   | 2.B.2.C.1 Style of conference abstracts         | 43 |
|   | 2.B.2.C.2 Credit in conference abstracts        | 44 |
|   | 2.B.2.D Referee reports                         | 44 |
|   | 2.B.2.E Grant proposals                         | 44 |
|   | 2.B.2.E.1 Formatter                             | 44 |
|   | 2.B.3 Your own layout                           | 44 |
|   | 2.B.3.A Digital format                          | 44 |
|   | 2.C Where to publish?                           | 45 |
|   | 2.D Corrections by coauthors                    | 45 |
|   | 2.D.1 Bilateral correction process              | 45 |
|   | 2.D.2 Checking coauthors                        | 46 |
|   | 2.E Corrections by one coauthor                 | 46 |
|   | 2.E.1 White space in concepts                   | 46 |
|   | 2.E.1.A Communication with first author         | 47 |
|   | 2.E.1.B Size limit                              | 47 |
|   | 2.E.1.C Final format                            | 47 |
|   | 2.E.2 Version control                           | 47 |
|   | 2.E.2.A Long papers                             | 47 |
|   | 2.E.2.B Meeting of authors                      | 47 |
|   | 2.E.2.C Dead line for active corrector          | 48 |
|   | 2.E.2.D Incremental texts                       | 48 |
|   | 2.E.2.E Duplication problems                    | 48 |
| 3 | Text formatter                                  | 50 |
|   | 3.A <i>Tex</i> family                           | 50 |
|   | 3.A.1 Record: length and ending of record       | 50 |
|   | 3.A.2 Compatibility                             | 51 |
|   | 3.A.2.A Converting from old versions            | 51 |
|   | 3.A.3 Other text formatters like <i>MS-Word</i> | 51 |
|   | 3.B <i>MS-Word</i> survival                     | 51 |
|   | 3.B.1 Word 2007                                 | 51 |
|   | 3.B.2 Justification                             | 52 |
|   | 3.B.3 Left alignment                            | 52 |

|           |                                   |    |
|-----------|-----------------------------------|----|
| 3.B.4     | Full justification                | 52 |
| 3.B.5     | Mathematical equations            | 52 |
| 3.B.6     | Recovery                          | 52 |
| 3.B.7     | Navigation                        | 53 |
| 3.B.8     | Dictionaries                      | 53 |
| 3.B.9     | Macros                            | 53 |
| 3.B.10    | Templates                         | 53 |
| 3.B.11    | Version control                   | 54 |
| 3.B.12    | Wid ows                           | 54 |
| 4         | Text structure                    | 55 |
| 4.A       | Organization of content           | 55 |
| 4.A.1     | Margins                           | 55 |
| 4.A.2     | Justification                     | 55 |
| 4.A.3     | Subheadings                       | 56 |
| 4.A.3.A   | Hidden subheadings                | 56 |
| 4.A.4     | Paragraphs                        | 56 |
| 4.A.5     | Spaghetti text                    | 56 |
| 4.A.6     | Parking places                    | 57 |
| 4.A.7     | Standard partitioning             | 57 |
| 4.A.8     | Smooth text transitions           | 57 |
| 4.B       | Length of sentences               | 57 |
| 5         | Text content                      | 58 |
| 5.A       | Obligatory items                  | 58 |
| 5.A.1     | Title                             | 58 |
| 5.A.2     | Authors                           | 58 |
| 5.A.2.A   | First author                      | 58 |
| 5.A.2.A.1 | Many first authors                | 58 |
| 5.A.2.B   | Coauthors                         | 59 |
| 5.A.2.B.1 | Placeholder                       | 59 |
| 5.A.2.B.2 | Individual contributions          | 59 |
| 5.A.2.B.3 | Contribution of world specialist  | 59 |
| 5.A.2.C   | Order of authors                  | 59 |
| 5.A.2.D   | Corresponding author              | 60 |
| 5.A.2.E   | Spelling of names                 | 60 |
| 5.A.2.E.1 | Use of first names in author list | 60 |
| 5.A.3     | Affiliations                      | 60 |
| 5.A.3.A   | Change of affiliation             | 61 |
| 5.A.4     | Abstract                          | 61 |
| 5.A.4.A   | Keywords                          | 61 |
| 5.A.4.B   | Subject classification            | 61 |
| 5.A.5     | Date                              | 62 |
| 5.A.6     | Introduction                      | 62 |
| 5.A.7     | Conclusion                        | 62 |

|           |  |    |
|-----------|--|----|
| 5.A.8     | Acknowledgement                        | 63 |
| 5.A.8.A   | People in acknowledgement              | 63 |
| 5.A.8.B   | Refused coauthors                      | 63 |
| 5.A.8.C   | Institutions in acknowledgement        | 63 |
| 5.A.9     | List of references                     | 63 |
| 5.A.9.A   | Choice of references                   | 64 |
| 5.A.9.B   | Blockbuster                            | 64 |
| 5.A.9.C   | Reviewers                              | 64 |
| 5.A.9.D   | Own work                               | 64 |
| 5.A.9.E   | Unpublished                            | 65 |
| 5.A.9.E.1 | Internet                               | 65 |
| 5.A.9.F   | Preprint server                        | 65 |
| 5.A.9.G   | Accepted for publication               | 65 |
| 5.A.9.H   | Private communication                  | 66 |
| 5.A.9.I   | Non-journal references                 | 66 |
| 5.A.9.J   | Foreign language                       | 66 |
| 5.A.9.K   | Spelling of names                      | 66 |
| 5.A.9.L   | Use of “et al.”                        | 66 |
| 5.A.9.M   | Ibid.                                  | 67 |
| 5.A.10    | List of figure captions                | 67 |
| 5.B       | Experiment                             | 67 |
| 5.B.1     | Arbitrary units                        | 68 |
| 5.C       | Theory                                 | 68 |
| 5.C.1     | Arbitrary units                        | 68 |
| 5.C.2     | Proportionality sign                   | 68 |
| 5.C.3     | Simulations                            | 69 |
| 5.D       | Theory and experiment                  | 69 |
| 5.D.1     | Your new model                         | 69 |
| 5.D.2     | Message to theoreticians               | 69 |
| 5.D.3     | Message to experimentalist             | 70 |
| 5.D.3.A   | Scaled units                           | 70 |
| 5.E       | Priority                               | 70 |
| 5.E.1     | Credit to others                       | 71 |
| 5.E.1.A   | Criticizing prior work                 | 71 |
| 5.E.2     | First-time claim                       | 71 |
| 5.E.3     | Emphasize own work                     | 72 |
| 5.F       | Grammar                                | 72 |
| 5.F.1     | Use of “This means” and “That implies” | 72 |
| 5.F.2     | When “that” or “which” leads a clause  | 72 |
| 5.F.3     | Same words over and over again         | 72 |
| 5.F.3.A   | Thesaurus                              | 73 |
| 5.F.3.A.1 | Online                                 | 73 |
| 5.F.4     | Absolute statements                    | 73 |
| 5.F.5     | Exclamation marks                      | 73 |
| 5.F.6     | Emphasized and underlined text         | 73 |

|  |    |
|--|----|
| 5.F.7 Active or passive form                       | 73 |
| 5.F.7.A Abstract subjects                          | 74 |
| 6 Text spelling                                    | 75 |
| 6.A Consistency                                    | 75 |
| 6.B Hyphens  | 75 |
| 6.C Quotation marks                                | 75 |
| 6.D Full capital abbreviations                     | 75 |
| 6.E Conventional abbreviations                     | 76 |
| 6.F Non-alphabetic characters                      | 76 |
| 7 Math   | 77 |
| 7.A Conventions                                    | 77 |
| 7.A.1 Alphabet                                     | 77 |
| 7.A.1.A Vectors                                    | 77 |
| 7.A.1.B Diacritics                                 | 78 |
| 7.A.1.B.1 Abbreviations as subscript               | 78 |
| 7.A.2 Naming conventions                           | 78 |
| 7.A.3 Units and constants                          | 78 |
| 7.A.3.A International bodies                       | 78 |
| 7.A.3.B Dimensions                                 | 78 |
| 7.B Display math (in contrast to inline math)      | 78 |
| 7.B.1 Punctuation marks                            | 79 |
| 7.B.2 Equation signs and definition sign           | 79 |
| 7.B.3 Numbering of equations                       | 79 |
| 7.B.4 Symbols in equations                         | 80 |
| 7.B.5 Brackets                                     | 80 |
| 7.B.6 Use of appendices                            | 80 |
| 7.B.7 Abuse of same symbol                         | 80 |
| 7.C Inline math                                    | 80 |
| 7.C.1 Integration with text                        | 80 |
| 7.C.2 Beginning of sentence                        | 80 |
| 7.C.3 Headings with math                           | 81 |
| 8 Figures  | 82 |
| 8.A Default setting                                | 82 |
| 8.B Text aspects of figures                        | 82 |
| 8.B.1 Manuscript text referring to figures         | 82 |
| 8.B.2 Figure captions                              | 83 |
| 8.B.2.A Example of bad caption                     | 83 |
| 8.B.3 Font size in figures                         | 83 |
| 8.B.4 Fonts in figure text (labeling of axes etc.) | 83 |
| 8.C Postscript                                     | 84 |
| 8.C.1 Compatibility                                | 84 |
| 8.C.2 Bounding box                                 | 84 |

|                                    |    |
|------------------------------------|----|
| 8.D Non-postscript                 | 85 |
| 8.E Drawing elements               | 85 |
| 8.E.1 Frames                       | 85 |
| 8.E.2 Axes                         | 85 |
| 8.E.2.A Two different X or Y axes  | 85 |
| 8.E.2.B Tick marks                 | 85 |
| 8.E.2.C Labels                     | 85 |
| 8.E.3 Grid lines                   | 86 |
| 8.E.4 Line thickness               | 86 |
| 8.E.5 Line style                   | 86 |
| 8.E.6 Symbols                      | 86 |
| 8.E.7 Busy figures                 | 86 |
| 8.E.8 Color                        | 86 |
| 8.E.8.A Grey scales                | 87 |
| 8.E.9 Kill dangerous colors        | 87 |
| 8.F Colorful figures               | 87 |
| 8.F.1 Three-dimensional figures    | 87 |
| 8.F.1.A Professional lighting      | 88 |
| 8.F.1.B Interpretation             | 88 |
| 8.F.2 Color coding                 | 88 |
| 8.F.3 Cross-sections               | 88 |
| 9 Tables                           | 90 |
| 9.A Columns and rows               | 90 |
| 9.B Justification                  | 90 |
| 9.C Caption and title              | 90 |
| 9.D Reuse                          | 91 |
| 10 Submission                      | 92 |
| 10.A Permission                    | 92 |
| 10.B Submission letter             | 92 |
| 10.B.1 Nature and Science          | 93 |
| 10.B.1.A Manuscript                | 93 |
| 10.B.1.A.1 Good-news show          | 93 |
| 10.B.1.A.2 Math                    | 94 |
| 10.B.1.A.3 Graphics                | 94 |
| 10.B.1.B Submission letter         | 94 |
| 10.C Mode of transport             | 94 |
| 11 Referee reports                 | 95 |
| 11.A Answering reports             | 95 |
| 11.A.1 Who will write the replies? | 95 |
| 11.A.2 Styled text                 | 95 |
| 11.A.3 Style of rebuttal           | 96 |
| 11.A.4 Header of replies           | 96 |

|            |                                    |     |
|------------|------------------------------------|-----|
| 11.A.5     | Opening remarks rebuttal           | 96  |
| 11.A.6     | Scientific conflicts               | 97  |
| 11.A.6.A   | Referee finds a flaw               | 97  |
| 11.A.7     | Length of rebuttal                 | 97  |
| 11.A.8     | Manuscript modifications           | 97  |
| 11.A.8.A   | One referee at a time              | 97  |
| 11.A.8.B   | Modifications due to other referee | 98  |
| 11.A.9     | Conflicting referee reports        | 98  |
| 11.A.10    | Additional references              | 98  |
| 11.B       | Perseverance                       | 98  |
| 11.C       | Letter to the editor               | 98  |
| 11.D       | Resubmission package               | 99  |
| 11.E       | Failed submission                  | 99  |
| 11.E.1     | Protest against refusal of review  | 100 |
| 11.F       | Writing referee reports            | 100 |
| 11.F.1     | Pride                              | 100 |
| 11.F.2     | Reviewing load                     | 101 |
| 11.F.3     | Alternative referees               | 101 |
| 11.F.4     | Standard format                    | 101 |
| 11.F.5     | Quality of manuscript              | 102 |
| 12         | Administration                     | 103 |
| 12.A       | Publication costs                  | 103 |
| 12.B       | Reprint orders                     | 103 |
| 12.C       | Mailing list                       | 103 |
| 12.D       | Digital Archive                    | 104 |
| 12.D.1     | Group file server                  | 104 |
| 12.D.2     | Saving files                       | 104 |
| 13         | Reaching out                       | 106 |
| 13.A       | Publicizing your work              | 106 |
| 14         | Alternative publishing             | 107 |
| 14.A       | Official: preprint server          | 107 |
| 14.B       | Unofficial publishing              | 107 |
| 14.B.1     | Format                             | 107 |
| 14.B.1.A   | Pdf files                          | 107 |
| 14.B.1.A.1 | Pdf fonts                          | 108 |
| 14.B.1.A.2 | Layout of paper                    | 108 |
| 14.B.1.A.3 | Figures in pdf files               | 108 |
| 14.B.1.A.4 | Figures in single-column pdf files | 109 |
| 14.B.1.A.5 | Figures in two-column pdf files    | 109 |
| 14.B.1.A.6 | Navigation                         | 109 |
| 14.B.1.B   | Postscript                         | 109 |
| 14.B.1.C   | Web page                           | 109 |

|            |                                       |     |
|------------|---------------------------------------|-----|
| 14.B.1.C.1 | Html formatting                       | 110 |
| 14.B.1.C.2 | Navigation                            | 110 |
| 14.B.1.D   | Desktop publishing                    | 110 |
| 14.B.2     | Copy right and web posting            | 110 |
| 15         | Protecting your papers                | 111 |
| 15.A       | Reasons                               | 111 |
| 15.A.1     | Commercial reasons                    | 111 |
| 15.A.2     | First discovery                       | 111 |
| 15.B       | Protection solutions                  | 111 |
| 15.B.1     | Regular publications                  | 111 |
| 15.B.2     | Watermarks                            | 111 |
| 15.B.3     | <i>MS-Word</i> documents              | 112 |
| 15.B.4     | Protecting pdf files                  | 112 |
| 15.B.4.A   | Commercial copy protection            | 112 |
| 15.B.4.B   | Access protection                     | 112 |
| 15.B.4.C   | Disable text copying once and for all | 112 |
| 15.B.5     | Websites                              | 113 |
| 16         | About                                 | 114 |
| 16.A       | Abbreviations                         | 114 |
| 16.B       | Trademarks                            | 114 |
| 16.C       | Acknowledgement                       | 115 |

## PRESENTATION GUIDE FOR SCIENTISTS

|         |   |            |
|---------|---|------------|
| 1       | General   | 119        |
| 1.A     | Target group                                      | 119        |
| 1.B     | Goal of presentations in general                  | 120        |
| 1.B.1   | Classification of talks                           | 120        |
| 1.B.2   | Talks of type a)                                  | 120        |
| 1.B.3   | Talks of type b)                                  | 120        |
| 1.B.4   | Talks of type d)                                  | 120        |
| 1.C     | Goal of the <i>Presentation Guide</i>             | <b>121</b> |
| 1.C.1   | Discussion groups                                 | 121        |
| 1.D     | Presentation formatter                            | 121        |
| 1.D.1   | Are hints limited to users of PowerPoint?         | 122        |
| 1.E     | Format of the <i>Presentation Guide</i>           | 122        |
| 1.F     | Publication form of the <i>Presentation Guide</i> | 122        |
| 1.F.1   | Publication form                                  | 122        |
| 1.F.1.A | Printed version                                   | 122        |
| 1.F.1.B | Digital version                                   | 122        |
| 1.F.2   | Navigation  | 122        |
| 1.G     | Use of the <i>Presentation Guide</i>              | 122        |

|  |     |
|--|-----|
| 1.G.1 Communities                                | 123 |
| 1.H Size of the <i>Presentation Guide</i>        | 123 |
| 1.I Male chauvinism                              | 123 |
| 1.J Training courses                             | 123 |
| 1.J.1 Improving your English                     | 124 |
| 1.K Conventions of the <i>Presentation Guide</i> | 124 |
| 1.K.1 Double quotes                              | 124 |
| 1.K.2 Single quotes                              | 124 |
| 1.K.3 Vague qualifiers                           | 124 |
| 1.K.4 Commandments                               | 124 |
| 1.K.5 To-Do list for you, readers                | 125 |
| 1.L Legal disclaimer                             | 125 |
| 1.M Slick presentations                          | 125 |
| 1.N Preparation time                             | 125 |
| 2 Process of presentation                        | 126 |
| 2.A Conferences                                  | 126 |
| 2.A.1 Parallel                                   | 126 |
| 2.A.2 Plenary                                    | 126 |
| 2.A.3 Preference schedule for your talk          | 127 |
| 2.A.4 Leaving and entering audience              | 127 |
| 2.A.5 Position in auditorium                     | 127 |
| 2.A.6 Hotel                                      | 127 |
| 2.A.6.A Room mates                               | 128 |
| 2.B Single event                                 | 128 |
| 2.B.1 Group meeting                              | 128 |
| 2.C Evaluation committees                        | 129 |
| 2.C.1 Crucial prior knowledge                    | 129 |
| 2.C.2 Acquaintance                               | 129 |
| 2.C.3 Handouts                                   | 129 |
| 2.D Attitude                                     | 130 |
| 2.D.1 Body movements                             | 130 |
| 2.D.2 Body position                              | 130 |
| 2.D.3 Dressing                                   | 131 |
| 2.E Handouts                                     | 131 |
| 2.F Rehearse                                     | 131 |
| 2.F.1 Without audience                           | 131 |
| 2.F.2 Important talk                             | 131 |
| 2.F.2.A Reviewers                                | 132 |
| 2.F.2.B Procedure                                | 132 |
| 2.F.2.C Without audience                         | 132 |
| 3 Spoken text                                    | 133 |
| 3.A Allotted time                                | 133 |
| 3.A.1 Defend your time                           | 133 |

|                                     |     |
|-------------------------------------|-----|
| 3.B Volume, tone and pace           | 133 |
| 3.B.1 Volume                        | 133 |
| 3.B.2 Pace                          | 134 |
| 3.B.3 Female speakers               | 134 |
| 3.B.4 Nervousness                   | 134 |
| 3.B.4.A Speech support              | 134 |
| 3.B.4.A.1 Speech therapists         | 135 |
| 3.C Language                        | 135 |
| 3.C.1 Stopgaps                      | 135 |
| 3.C.2 Synonyms                      | 135 |
| 3.D Scientific level                | 135 |
| 3.D.1 Seminar                       | 136 |
| 3.D.2 Colloquium                    | 136 |
| 3.D.3 Plenary                       | 136 |
| 3.D.4 Popular talks                 | 136 |
| 3.E Too much information (TMI)      | 136 |
| 3.F Funnel                          | 137 |
| 3.G Tell one story                  | 137 |
| 3.G.1 Operators                     | 137 |
| 3.G.2 No distraction                | 137 |
| 3.H Social behavior                 | 138 |
| 3.H.1 Credit                        | 138 |
| 3.H.1.A Opening remarks             | 138 |
| 3.H.1.B Closing remarks             | 138 |
| 3.H.1.C Conference                  | 138 |
| 3.H.1.D Colloquium                  | 138 |
| 3.H.1.E Your ego                    | 139 |
| 3.H.1.F Lack of credit              | 139 |
| 3.I Questions and interference      | 139 |
| 3.I.1 Repeat the question           | 139 |
| 3.I.1.A Advantages                  | 140 |
| 3.I.1.A.1 Audience participates     | 140 |
| 3.I.1.A.2 Gain of time              | 140 |
| 3.I.1.A.3 Reduce effect of question | 140 |
| 3.I.2 Politeness                    | 140 |
| 3.I.2.A Crackpots                   | 140 |
| 3.I.3 During talk                   | 140 |
| 3.I.3.A Test of audience            | 141 |
| 3.I.3.B Disturbing expert           | 141 |
| 3.I.3.C Too many questions          | 141 |
| 3.I.4 At end                        | 141 |
| 3.I.4.A Comments                    | 141 |
| 3.I.5 Hostile participants          | 142 |
| 3.I.5.A Priority claim              | 142 |
| 3.I.5.B Trap                        | 142 |

|                                 |     |
|---------------------------------|-----|
| 3.1.5.C Backup sheets           | 142 |
| 3.1.5.D Humor                   | 142 |
| 3.1.6 Hostile audience          | 143 |
| 3.1.7 Evaluation committee      | 143 |
| 3.1.7.A Atmosphere              | 143 |
| 3.1.7.B Hostile questions       | 143 |
| 3.1.7.C Divide et impera        | 143 |
| 3.J Requests from audience      | 144 |
| 3.J.1 Unpublished material      | 144 |
| 3.J.2 Life internet connections | 144 |
| 3.K Slide by slide              | 144 |
| 3.K.1 Slide contains plots      | 145 |
| 4 Slides                        | 146 |
| 4.A General structure           | 146 |
| 4.A.1 File size                 | 146 |
| 4.A.2 Reusability               | 146 |
| 4.A.3 Composition               | 147 |
| 4.A.3.A Landscape               | 147 |
| 4.A.3.B Separators              | 147 |
| 4.A.3.C Plots                   | 147 |
| 4.A.3.D Alignment               | 148 |
| 4.A.3.E Margins                 | 148 |
| 4.A.3.E.1 Top                   | 148 |
| 4.A.3.E.2 Bottom                | 148 |
| 4.A.3.E.3 Left and right        | 148 |
| 4.A.3.E.4 Large left margin     | 148 |
| 4.A.3.F Guides                  | 148 |
| 4.A.4 Credit                    | 149 |
| 4.A.4.A Full references         | 149 |
| 4.A.4.B Advertising own work    | 149 |
| 4.A.4.B.1 Website               | 150 |
| 4.A.4.B.2 Hyperlinks            | 150 |
| 4.B Contrast and colors         | 150 |
| 4.B.1 Object colors             | 150 |
| 4.B.1.A Colored background      | 150 |
| 4.B.1.B Graded background       | 151 |
| 4.B.1.C Background texture      | 151 |
| 4.B.1.D Background picture      | 151 |
| 4.B.2 Slide background          | 151 |
| 4.B.2.A Acceptable background   | 152 |
| 4.B.3 Dangerous colors          | 152 |
| 4.B.3.A Default colors          | 152 |
| 4.B.4 Shadowing                 | 152 |
| 4.C Text properties             | 153 |

|           |                                       |     |
|-----------|---------------------------------------|-----|
| 4.C.1     | Font                                  | 153 |
| 4.C.1.A   | Font size                             | 153 |
| 4.C.1.B   | Bold                                  | 153 |
| 4.C.1.B.1 | Serif                                 | 153 |
| 4.C.1.B.2 | Non-serif                             | 153 |
| 4.C.1.C   | Underlining                           | 154 |
| 4.C.1.D   | Font color                            | 154 |
| 4.C.1.E   | Collection of fonts                   | 154 |
| 4.C.2     | Spelling and grammar                  | 154 |
| 4.C.2.A   | Complete sentences                    | 154 |
| 4.C.2.B   | Periods                               | 154 |
| 4.C.2.C   | Capitals                              | 154 |
| 4.C.2.D   | Definite articles                     | 155 |
| 4.C.2.E   | Exclamation sign                      | 155 |
| 4.C.2.F   | Question mark                         | 155 |
| 4.C.2.G   | Space before unit                     | 155 |
| 4.C.3     | Alignment                             | 155 |
| 4.C.3.A   | Align left                            | 155 |
| 4.C.3.B   | Align right if text connects to right | 155 |
| 4.C.3.C   | Centered alignment                    | 155 |
| 4.C.3.D   | Multi-lined texts                     | 155 |
| 4.C.4     | Title                                 | 156 |
| 4.C.4.A   | Frames                                | 156 |
| 4.C.5     | Text frames                           | 156 |
| 4.C.5.A   | Good text frames                      | 156 |
| 4.D       | Outlined text (bullets)               | 157 |
| 4.D.1     | Header                                | 157 |
| 4.D.2     | Type of bullets                       | 157 |
| 4.D.2.A   | Balls as character                    | 157 |
| 4.D.2.B   | Numbered outline                      | 158 |
| 4.D.2.C   | Other bullet characters               | 158 |
| 4.D.2.D   | Bullets as pictures                   | 158 |
| 4.D.2.E   | Color coding                          | 158 |
| 4.D.2.F   | Formatting outline lines              | 158 |
| 4.D.2.F.1 | Font                                  | 158 |
| 4.D.2.F.2 | Line spacing                          | 158 |
| 4.D.2.F.3 | Multiple lines in one outline item    | 158 |
| 4.D.2.F.4 | Horizontal alignment                  | 159 |
| 4.D.2.F.5 | Vertical alignment                    | 159 |
| 4.D.2.F.6 | Multiple-line spacing                 | 159 |
| 4.D.2.F.7 | Professional examples                 | 159 |
| 4.E       | Tables                                | 160 |
| 4.E.1     | Alignment                             | 160 |
| 4.E.2     | Absolute numbers                      | 160 |
| 4.E.3     | Error bars                            | 160 |

|  |     |
|--|-----|
| 4.F Math                                   | 160 |
| 4.F.1 Math from copy/paste                 | 160 |
| 4.F.1.A Contrast                           | 161 |
| 4.F.1.B Math with <i>Tex</i>               | 161 |
| 4.F.1.C Math with <i>MathType</i>          | 161 |
| 4.F.2 Numbering equations                  | 162 |
| 4.F.3 Size                                 | 162 |
| 4.F.4 Style                                | 162 |
| 4.F.4.A Inline math                        | 162 |
| 4.F.4.A.1 Fonts                            | 162 |
| 4.F.4.B Font size                          | 162 |
| 4.F.4.C Coloring equations                 | 162 |
| 4.F.4.D Boxing equations                   | 163 |
| 4.G Graphics                               | 163 |
| 4.G.1 Figures not being plots              | 163 |
| 4.G.1.A Bitmap or vector                   | 163 |
| 4.G.1.B Bitmaps with poor contrast         | 164 |
| 4.G.1.C Gif transparent                    | 164 |
| 4.G.1.D Collection of pictures             | 164 |
| 4.G.1.E Animation                          | 164 |
| 4.G.2. Scientific plots                    | 164 |
| 4.G.2.A Rule from the <i>Writing Guide</i> | 164 |
| 4.G.2.B Number of figures                  | 164 |
| 4.G.2.C Second X-axis and Y-axis           | 165 |
| 4.G.2.D Frames around figures              | 165 |
| 4.G.2.E Captions and titles                | 165 |
| 4.G.2.F Archived plots                     | 165 |
| 4.G.2.G Cleaning up plots                  | 165 |
| 4.G.2.H Repair figures                     | 166 |
| 4.H Obligatory slides                      | 166 |
| 4.H.1.A Slide titles                       | 166 |
| 4.H.1.B <i>PowerPoint</i> templates        | 167 |
| 4.H.1.C Frames and logos                   | 167 |
| 4.H.1.D Dates and occasion                 | 167 |
| 4.H.1.E Progress macros                    | 167 |
| 4.H.1.F Numbering                          | 168 |
| 4.H.1.G Bottom margin                      | 168 |
| 4.H.2 Front slide                          | 168 |
| 4.H.3 Title slide                          | 168 |
| 4.H.4 Contents slide                       | 168 |
| 4.H.5 Introduction slide                   | 168 |
| 4.H.6 Progress                             | 169 |
| 4.H.6.A Progress slide                     | 169 |
| 4.H.6.B Slide numbering                    | 169 |
| 4.H.6.C Headers and footers                | 170 |

|           |                                  |     |
|-----------|----------------------------------|-----|
| 4.H.7     | Coworkers                        | 170 |
| 4.H.7.A   | Science agencies                 | 170 |
| 4.H.8     | Conclusions                      | 170 |
| 4.H.8.A   | Style                            | 170 |
| 4.H.8.B   | Combining with other information | 171 |
| 4.H.8.C   | One-liners                       | 171 |
| 4.H.8.D   | Size                             | 171 |
| 4.H.8.E   | New information                  | 171 |
| 4.H.8.F   | Following slides                 | 171 |
| 4.H.8.G   | Afterburner                      | 171 |
| 4.I       | Animation                        | 171 |
| 4.I.1     | Animated text                    | 172 |
| 4.I.2     | Animated gif                     | 172 |
| 4.I.3     | Java applet                      | 172 |
| 4.I.4     | Video                            | 173 |
| 4.I.4.A   | Windows Media Player             | 173 |
| 4.I.5     | Extra files                      | 173 |
| 4.I.5.A   | Too many or too slick movies     | 173 |
| 4.J       | Navigation through slides        | 173 |
| 4.J.1     | Presenter view                   | 174 |
| 4.K       | Transition                       | 174 |
| 4.L       | Software incompatibilities       | 174 |
| 4.L.1     | PowerPoint                       | 174 |
| 4.L.1.A   | Backward compatibility           | 175 |
| 4.L.1.B   | Auto recovery                    | 175 |
| 4.L.1.C   | Improved auto-recovery           | 176 |
| 4.L.2     | Proprietary fonts                | 176 |
| 4.L.3     | Missing fonts                    | 176 |
| 4.L.3.A   | Embedding of fonts               | 177 |
| 4.L.3.A.1 | Pack and Go (Obsolete now)       | 177 |
| 4.L.3.B   | Old <i>PowerPoint</i> versions   | 177 |
| 4.L.3.B.1 | Installation advice              | 177 |
| 4.L.3.B.2 | Font-saving problems             | 178 |
| 4.L.4     | Printing problems with handouts  | 178 |
| 4.L.5     | PowerPoint 2007                  | 178 |
| 5         | Technical aspects                | 179 |
| 5.A       | At home                          | 179 |
| 5.A.1     | Beamer (obsolete now)            | 179 |
| 5.A.2     | Laptop                           | 179 |
| 5.A.2.A   | Power management                 | 179 |
| 5.A.2.B   | Laptop rebooting                 | 179 |
| 5.A.2.C   | Laptop resolution                | 180 |
| 5.A.2.D   | Wifi                             | 180 |
| 5.A.2.E   | Wireless mouse                   | 180 |

|                                      |     |
|--------------------------------------|-----|
| 5.A.2.F Bluetooth                    | 180 |
| 5.A.3 Accessories                    | 181 |
| 5.A.3.A Adapters for wall plugs      | 181 |
| 5.A.3.B Plugs and sockets            | 181 |
| 5.A.3.C Ethernet                     | 181 |
| 5.A.3.D Phone and modem              | 181 |
| 5.A.3.D.1 Fixed-line phone           | 181 |
| 5.A.3.D.2 Mobile phone               | 181 |
| 5.A.3.E Pointer                      | 182 |
| 5.A.3.F Count-down timer             | 182 |
| 5.A.3.G Flashlight                   | 182 |
| 5.A.4 Print handout                  | 182 |
| 5.A.5 Backup                         | 183 |
| 5.A.5.A For use at conference        | 183 |
| 5.A.5.B For reuse                    | 183 |
| 5.A.6 Personal care                  | 183 |
| 5.B Traveling                        | 183 |
| 5.B.1 Airport                        | 183 |
| 5.B.1.A Wireless                     | 184 |
| 5.B.2 At conference                  | 184 |
| 5.B.2.A Your own laptop              | 184 |
| 5.B.2.A.1 When to switch on laptop   | 184 |
| 5.B.2.A.2 Start <i>PowerPoint</i>    | 184 |
| 5.B.2.B Troubleshooting              | 184 |
| 5.B.2.B.1 Be the last to test beamer | 185 |
| 5.B.2.C Lighting                     | 185 |
| 5.B.2.D Fixed position               | 185 |
| 5.B.3 Conference laptop              | 185 |
| 5.B.4 Sound                          | 186 |
| 5.B.5 Boards                         | 186 |
| 5.B.6 Flip-charts                    | 186 |
| 5.B.7 After care                     | 186 |
| 5.B.7.A At home                      | 186 |
| 6 Ten commandments                   | 187 |
| 7 Checklist                          | 188 |
| 7.A The night before you leave       | 188 |
| 8 About                              | 190 |
| 8.A Trademarks                       | 190 |

## EMAIL GUIDE FOR SCIENTISTS

|           |                                   |     |
|-----------|-----------------------------------|-----|
| 1         | Introduction                      | 193 |
| 1.A       | Goal of the <i>Email Guide</i>    | 193 |
| 1.A.1.    | Discussion groups                 | 193 |
| 1.B       | Target group                      | 194 |
| 1.B.1.    | Technical text                    | 194 |
| 1.B.2.    | Male chauvinism                   | 194 |
| 1.C       | Format of the <i>Email Guide</i>  | 194 |
| 1.C.1.    | Size of the <i>Email Guide</i>    | 194 |
| 1.C.2.    | Publication form                  | 195 |
| 1.C.2.A   | Printed version                   | 195 |
| 1.C.2.B   | Digital version                   | 195 |
| 1.D       | How to use the <i>Email Guide</i> | 195 |
| 1.D.1.    | Navigation                        | 195 |
| 1.E       | Conventions                       | 195 |
| 1.E.1.    | Double quotes                     | 195 |
| 1.E.2.    | Single quotes                     | 195 |
| 1.E.3.    | Hyperlinks                        | 196 |
| 1.F       | Legal disclaimer                  | 196 |
| 2         | General principles                | 197 |
| 2.A       | Face to face or by email          | 197 |
| 2.B       | Confirm by email                  | 197 |
| 2.C       | Educate the world                 | 198 |
| 2.C.1.    | Colleagues                        | 198 |
| 2.C.2.    | Educate secretaries               | 198 |
| 2.C.3.    | Educating managers                | 198 |
| 2.C.4.    | Educating your students           | 198 |
| 2.D       | Internet philosophy               | 198 |
| 2.D.1.    | Requests for Comments             | 199 |
| 2.D.2.    | ASCII as standard                 | 199 |
| 2.E       | Email 'programs'                  | 199 |
| 2.E.1.    | Server or client                  | 199 |
| 2.E.2.    | Email servers                     | 200 |
| 2.E.3.    | Email clients                     | 200 |
| 2.E.3.A   | Webmail                           | 200 |
| 2.E.3.A.1 | Clumsy web interface              | 201 |
| 2.E.3.A.2 | Webmail as a last resort          | 201 |
| 2.E.3.A.3 | Copy of recent emails             | 201 |
| 2.E.4.    | Windows or Unix                   | 201 |
| 2.F       | To-Do list                        | 202 |
| 2.G       | Raw email address                 | 202 |
| 2.G.1.    | Hiding email address              | 202 |
| 2.H       | Your own email address            | 203 |

|           |                                 |     |
|-----------|---------------------------------|-----|
| 3         | Receiving emails                | 204 |
| 3.A       | Filtering                       | 204 |
| 3.B       | Spam                            | 204 |
| 3.B.1.    | Commercial anti-spam software   | 205 |
| 3.B.2.    | Included hyperlinks             | 205 |
| 3.B.3.    | Non-commercial spam             | 205 |
| 3.B.3.A   | Get even with offenders         | 205 |
| 3.B.4.    | Spam reporting                  | 206 |
| 3.C       | Viewing                         | 206 |
| 3.C.1.    | Adding columns                  | 206 |
| 3.C.2.    | Font                            | 207 |
| 3.C.3.    | Format                          | 207 |
| 3.C.4.    | Mail check frequency            | 207 |
| 3.D       | Acting on received emails       | 207 |
| 3.D.1.    | No action required              | 207 |
| 3.D.2.    | Single action required          | 208 |
| 3.D.2.A   | No more Mr. Nice Guy            | 208 |
| 3.D.2.B   | Action is writing email(s)      | 208 |
| 3.D.2.C   | Deadlines                       | 208 |
| 3.D.2.C.1 | No deadline                     | 208 |
| 3.D.2.C.2 | Unreasonable deadlines          | 208 |
| 3.D.2.C.3 | Extremely unreasonable requests | 209 |
| 3.D.3.    | Multiple actions required       | 209 |
| 3.D.3.A   | Action for more people          | 209 |
| 3.D.3.B   | Response forms                  | 210 |
| 3.D.3.C   | Endless actions                 | 210 |
| 3.E       | Dangerous attachments           | 210 |
| 3.E.1.    | Dangerous attachments           | 210 |
| 3.F       | Dangerous emails                | 211 |
| 4         | Sending emails                  | 212 |
| 4.A       | There is no unsend              | 212 |
| 4.B       | Formatting of your message      | 212 |
| 4.B.1.    | ASCII                           | 212 |
| 4.B.1.A   | ASCII styling                   | 212 |
| 4.B.2.    | Rtf                             | 213 |
| 4.B.3.    | Html                            | 213 |
| 4.B.3.A   | Figures                         | 213 |
| 4.B.3.B   | Lack of standardization         | 213 |
| 4.B.4.    | Hyperlinks                      | 214 |
| 4.B.4.A   | Wrapping                        | 214 |
| 4.B.5.    | Hard returns                    | 214 |
| 4.B.6.    | Bad characters                  | 215 |
| 4.B.7.    | Font                            | 215 |
| 4.C       | Requested action                | 215 |

|                                      |            |
|--------------------------------------|------------|
| 4.C.1. Single request only           | 216        |
| 4.C.2. Requested response time       | 216        |
| 4.D Special emails                   | 216        |
| 4.D.1. Sensitive emails              | 216        |
| 4.D.2. Formal emails                 | 216        |
| 4.D.2.A Letter simulation            | 217        |
| 4.D.2.B Name and Address information | 217        |
| 4.D.2.C Reference                    | 217        |
| 4.D.2.D Salutation                   | 217        |
| 4.D.2.E Recap                        | 217        |
| 4.D.2.F Data                         | 217        |
| 4.D.2.G Attachments                  | 217        |
| 4.D.2.H Formal cc.                   | 218        |
| 4.D.2.I Formal bcc.                  | 218        |
| 4.D.2.J Example                      | 218        |
| 4.D.2.K Fax has legal consequences   | 218        |
| 4.D.3. Confidential emails           | 219        |
| 4.E Header                           | 219        |
| 4.E.1. Automatic address             | 219        |
| 4.E.2. Reuse of email addresses      | 219        |
| 4.E.2.A Address books                | 219        |
| 4.E.3. Header part <i>To</i>         | <b>219</b> |
| 4.E.3.A Email to all                 | 220        |
| 4.E.4. Header part <i>Cc</i>         | <b>220</b> |
| 4.E.5. Header part <i>Bcc</i>        | <b>220</b> |
| 4.E.6. Subject                       | 220        |
| 4.E.7. Attachments                   | 221        |
| 4.E.7.A Reason for attachment        | 221        |
| 4.E.7.B Stupid attachments           | 221        |
| 4.E.7.C Color                        | 221        |
| 4.E.7.D Naming of file               | 221        |
| 4.E.7.E Business card                | 221        |
| 4.F Body                             | 222        |
| 4.F.1. Style                         | 222        |
| 4.F.2. Salutation                    | 222        |
| 4.F.2.A Friends                      | 222        |
| 4.F.2.B No salutation                | 223        |
| 4.F.3. Requested action              | 223        |
| 4.F.4. Trivial body                  | 223        |
| 4.F.5. Signature files               | 223        |
| 4.F.6. Grammar and spelling          | 223        |
| 4.F.6.A Date                         | 224        |
| 4.F.6.A.1 Relative dates             | 224        |
| 4.F.6.B Time                         | 224        |
| 4.F.7. Figures                       | 224        |

|  |     |
|--|-----|
| 4.F.8. Tables                                | 224 |
| 4.F.9. Planning a group event                | 224 |
| 4.G Replying to emails                       | 225 |
| 4.G.1. Check the end of your message         | 225 |
| 4.G.2. Send your own format                  | 226 |
| 4.G.3. Standard reply                        | 226 |
| 4.G.4. Trimming                              | 226 |
| 4.G.5. Reply to all                          | 227 |
| 4.G.6. Waiting time before you reply         | 227 |
| 4.G.7. Out-of-office reply                   | 227 |
| 4.H Redirecting                              | 228 |
| 4.I Forwarding                               | 228 |
| 4.I.1. To one person                         | 228 |
| 4.I.2. To more people                        | 228 |
| 4.J Credit card                              | 228 |
| 5 Managing account(s)                        | 229 |
| 5.A Multiple accounts                        | 229 |
| 5.A.1. Prestige of account name              | 229 |
| 5.A.2. Automatic forwarding                  | 229 |
| 5.A.2.A Hard forward                         | 230 |
| 5.A.2.B Soft forward                         | 230 |
| 5.A.3. Multiple POP3/SMTP servers            | 230 |
| 5.A.4. <i>Exchange Server</i> plus POP3/SMTP | 231 |
| 5.A.4.A Sending emails                       | 231 |
| 5.A.4.B Filtering emails                     | 231 |
| 5.A.5. Multiple Exchange Servers             | 231 |
| 5.B Synchronization issues                   | 232 |
| 5.B.1. No syncing required                   | 232 |
| 5.B.1.A Fully Localized                      | 232 |
| 5.B.1.B One portable computer only           | 232 |
| 5.B.1.C Web interface only                   | 232 |
| 5.B.1.D Network drive only                   | 233 |
| 5.B.2. Syncing required                      | 233 |
| 5.B.2.A Slow servers are a fact of life      | 233 |
| 5.B.2.B VPN                                  | 233 |
| 5.B.2.C Synchronization challenges           | 233 |
| 5.B.3. Movable storage                       | 234 |
| 5.B.3.A USB device                           | 234 |
| 5.B.3.B Synchronization                      | 234 |
| 5.C Retrieving emails                        | 235 |
| 5.C.1. Received mail                         | 235 |
| 5.C.1.V.1 Inbox copy                         | 235 |
| 5.C.2. Reply address                         | 235 |
| 5.D Sending email                            | 236 |

|           |                                  |     |
|-----------|----------------------------------|-----|
| 6         | Archiving emails                 | 237 |
| 6.A       | Keeping old emails               | 237 |
| 6.B       | Archiving formats                | 237 |
| 6.B.1.    | Ideal format                     | 237 |
| 6.B.2.    | Proprietary file formats         | 238 |
| 6.B.3.    | <b>Outlook</b> format            | 238 |
| 6.B.3.A   | Pst files                        | 238 |
| 6.B.3.A.1 | Two versions of <i>Outlook</i>   | 238 |
| 6.C       | Filing system                    | 239 |
| 6.C.1.    | Sent emails                      | 239 |
| 6.C.1.V.1 | Attachments                      | 239 |
| 6.C.2.    | Received emails                  | 239 |
| 6.C.2.A   | Attachments                      | 239 |
| 6.C.2.A.1 | Saving with attachments          | 240 |
| 6.C.2.A.2 | Saving separately                | 240 |
| 6.C.2.A.3 | Version control                  | 240 |
| 6.D       | Finding                          | 240 |
| 6.E       | Backing up                       | 241 |
| 7         | Security                         | 242 |
| 7.A       | ICT group                        | 242 |
| 7.A.1.    | Are you a computer professional? | 242 |
| 7.B       | Encryption                       | 242 |
| 7.C       | Privacy                          | 243 |
| 7.C.1.    | Remaining anonymous              | 243 |
| 7.C.1.A   | Sending anonymous emails         | 243 |
| 7.C.2.    | Receiving emails anonymously     | 243 |
| 7.D       | Protecting your data             | 243 |
| 7.D.1.    | Office PC                        | 243 |
| 7.D.1.A   | Protect partitions               | 244 |
| 7.D.1.B   | No traces                        | 244 |
| 7.D.1.C   | USB disk                         | 245 |
| 7.D.2.    | Network drive                    | 245 |
| 7.D.2.A   | Encryption                       | 245 |
| 8         | Internet Protocols               | 247 |
| 8.A       | Uri's                            | 247 |
| 8.B       | Name servers                     | 247 |
| 8.B.1.    | Spoofing                         | 247 |
| 8.C       | Core protocols                   | 248 |
| 8.D       | Ports                            | 248 |
| 8.E       | Email RFC                        | 248 |

|                   |     |
|-------------------|-----|
| 9 About           | 249 |
| 9.A Abbreviations | 249 |
| 9.B Trademarks    | 249 |
| <br>              |     |
| INDEX             | 251 |



## PREFACE

Communication is part of almost any professional activity. For researchers, writing scientific papers and giving scientific presentations is a daily ritual. Scientists that do not practice these communication activities will not make any contribution to science. Fortunately, communication skills can easily be learnt by any professional. Unfortunately, many scientists – due to a chronic lack of self-knowledge – do not feel any necessity for improving their own communication competences. As a result, scientists often (50% of the time) give bad talks and often (50% of the cases) write low-quality manuscripts. In addition, many courses are given by people whose profession it is to give those courses. Lessons given by non-active researchers are hardly ever useful, but invariably a waste of time.

In the present guide I give very practical how-to advice on essential topics such as the foundations for writing scientific texts (including dealing with referees and editors), presenting data and research information, and the writing of collegial, efficient emails. Each section is organized as a collection of short rules, outlined and numbered in a logical order as self-explanatory pieces of information – allowing the reader the freedom to study any number of them in any desired order.

A number of the hints are certainly politically incorrect, but they are all the more useful and can be found nowhere else.

Originally the guides were aimed primarily at undergraduate, graduate, and postdoctoral students in the natural sciences. But I have discovered that also more senior scientists will profit from it.

But it doesn't stop there: many of my hints, in particular those referring to presentations, are of invaluable use for a much broader audience of professionals, up to consultants and (public) managers.

Studying the full text will cost less than one and a half hour. Implementing the hints will immediately result in far better presentations, far better scientific papers and far better emails. In the beginning, adoption of the guidelines might cost somewhat more time. But in the end it will be amply rewarding: Your manuscripts will be more easily accepted by editors and referees, they will be better read, and better cited. Your talks will stand out. And all of this achieved by – in the long run – spending altogether less time on these activities.

This guide represents my views and my advice. But it is also meant to be your guide. Navigate to [www.sciencesurvivalblog.com](http://www.sciencesurvivalblog.com) to contribute, discuss or criticize my hints. The whole community will profit. Next editions will have your hints in them as well.

This text has evolved as the result of collaborations with PhD students, postdocs and senior colleagues of the *University of Amsterdam*, *University of Twente* and the *FOM-Institute for Atomic and Molecular Physics*. I am grateful for their input.

I am thankful to Sanford Bingham, CEO of FileOpen Systems Inc., for his generous (software) support in the early stage of this project.

*Ad Lagendijk*

**WRITING GUIDE  
FOR  
SCIENTISTS**

# 1 INTRODUCTION

The text you are reading right now, the *Writing Guide for Scientists* (from now on: *Writing Guide*), lays out a set of fundamental rules regarding writing scientific texts.

This “writing” is interpreted in a broad way. The rules include advise on submission strategies, on how to deal with editors and referees, on web posting, and advise on many more aspects of producing scientific articles.

This tutorial in itself is not a scientific text, and therefore the principles presented here hardly apply to the text itself.

The *Writing Guide* is part of the *Survival Guide for Scientists* (from now on the *Survival Guide*). Occasionally there might be general referrals in the *Writing Guide* to other parts of the *Survival Guide*. However, the *Writing Guide* is supposed to be self-contained. For completeness we present here the names of all the guides that together constitute the *Survival Guide* for Scientists:

- *Presentation Guide for Scientists*, or short: Presentation Guide; as an addendum to the *Presentation Guide* we have published the *Example Guide*
- Email Guide for Scientists, or short: Email Guide
- Writing Guide for Scientists, or short: Writing Guide
- Survival Guide for Junior Scientists, or short: Junior Guide
- Survival Guide for Senior Scientists, or short: Senior Guide

## 1.A Target group

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The target group I had originally in mind was physics undergraduate and graduate students, and physics postdocs. From experience I have discovered that senior physicists could also profit from studying the set of instructions laid out in the *Writing Guide*. (Just check a recent article in an international physics journal to appreciate this argument: quite a number of my rules are violated in these papers.)

The text is very likely also beneficial for mathematicians and for workers in other natural science disciplines, like chemistry and astronomy. The content is highly modular. Researchers in other fields can easily skip parts they consider too closely related to physics, or which they deem irrelevant for other reasons.

The number of cross-links in the guide is kept to a minimum. Each item can be studied on its own.

## **1.B Goal of your paper**

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If you do not agree with the goals I will present in the following list, there is no need for you to continue to study the *Writing Guide*.

The primary goals are:

- I to maximize the number of readers;
- II to minimize the time needed to 'read' your paper;
- III to maximize the fraction of satisfied readers;
- IV to maximize the number of citations the paper will get.

The world of scientific publications is well characterized by the one-liner: "Get cited, or get lost".

### **1.B.1 Help your readers**

To achieve the above four objectives you must make life easy and pleasant for your readers. If your intention is to make life easy on yourself you should quit physics (or for that matter any other natural science; law school might be more appropriate).

By only diagonally browsing your article, or by just studying its conclusion, or by merely looking at one of your figures, the reader should get valuable information. Your paper should allow for smooth and quick navigation. Readers might already know half of the content of your writing. Assist them in spotting the new material fast and help them skipping the rest.

### **1.B.2 Profile of your readers**

Your average reader is mildly interested. Never expect scientists to go through your article from beginning to end. They will never read your references (but they will certainly check whether or not you cite them).

Professional researchers have to browse many, many papers on a daily basis and are continuously looking for a pretext to put your paper aside. You can call yourself lucky if they grant you ten seconds to obtain a first impression.

### **1.B.3 Quality of your papers**

If you agree with the four principal goals laid out above, you can profit a lot from following the hints of the *Writing Guide*. Only some of my hints (but in my opinion really only a few) are a matter of taste.

Studying the principles will help researchers to write better papers, to produce superior replies to referees, and to become better referees.

<http://www.sciencesurvivalblog.com>

## **1.C Discussion groups**

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The author of the *Writing Guide*, that is me, has over 30 years of experience of writing scientific papers. In my opinion many of my hints are crucial for writ-

ing good texts. But it is also your guide: if you do not agree with one, some, or many of my hints, post your own ideas at our weblog [www.sciencesurvivalblog.com](http://www.sciencesurvivalblog.com). If more people agree with you, the *Writing Guide* will be improved by implementing your advice.

<http://www.sciencesurvivalblog.com>

## 1.D General advice for authors

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Do not reinvent the wheel. Scientific texts have evolved over hundreds of years. Copy, steal, plagiarize, reuse, or whatever your favorite expression is for the action of using text structures, texts, mathematical equations, and figures, generated by senior and junior colleagues and by competitors. In many cases no source has to be acknowledged.

### 1.D.1 Help your coauthors

An additional advantage of closely following the advice given in this guide, is that your coauthors, including your supervisor, will be very satisfied with the efficient way you handle the shared papers.

Some of my advice will mean some unexpected hard work on the side of the (first) author (that is you) of a scientific paper. On the long run this will pay off.

## 1.E Format of the Writing Guide

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This tutorial is organized as a large collection of short rules, outlined and numbered in a hierarchical way. The directives often represent an independent piece of information, so that the reader can work through any number of items in any desired sequence.

### 1.E.1 Publication form

The *Writing Guide* is available in basically two forms: as a book and as an ebook.

#### 1.E.1.A Printed version

In the printed version the first three guides (*Presentation Guide*, *Email Guide*, and *Writing Guide*) are collected in one volume.

#### 1.E.1.B Digital version

The *Writing Guide* will also be available as ebook (protected pdf). The pdf file will be prepared in cooperation with *FileOpen Systems*.

<http://fileopen.com>

### 1.E.2 Navigation

Navigation through the digital version is easy: there are bookmarks in the pdf version.

The printed version will be bound in such a way that it can be read hands-free.

### 1.E.3 Size of the Writing Guide

Suggestions for additions, corrections, or other ideas for changes and improvements are welcome if they do not make the text much longer. It is my intention to keep the size of the *Writing Guide* to a maximum of about 600 paragraphs. This size constraint ensures that scientists can read the whole text in less than half an hour. Increasing the size beyond this limit would deter too many members of the target group.

### 1.E.4 Text formatter

In physics and mathematics the standard text formatters are members of the Tex family (LaTeX and AmsTeX, for instance). A number of my formatting hints will be given in 'LaTeX language'. However, any reader will be able to translate these suggestions into commands for his own text formatter (such as *MS-Word*).

<http://en.wikipedia.org/wiki/TeX>

<http://en.wikipedia.org/wiki/LaTeX>

<http://www.ams.org/tex/amstex.html>

## 1.F How to use the *Writing Guide*?

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The *Writing Guide* is meant to be self-contained. Its study should be enough to produce well-written, well-structured papers (that still could contain bogus science).

A good, additional training in writing first-rate scientific papers is to scrutinize, with a number of colleague junior scientists a recent, short paper in a high-impact journal. These papers are supposed to represent the state-of-the-art in writing of scientific papers. This exercise might not make you happy, but it will certainly boost your self-confidence.

### 1.F.1 Requested prior knowledge

The student is expected to have a reasonable knowledge of English, either because he is a native speaker, or because during his university education he had to study science textbooks that were written in English.

### 1.F.2 Further study

Some scientific organizations (examples: AIP, APS, OSA, IEEE) and some journals offer long and useful style manuals. (I recommend in particular the *AIP Style Manual* and an appendix of the *Review of Modern Physics Style Guide*.) The de-

finitive information is in the Standard Handbook of the ISO, but unfortunately is far too expensive (you can consult an excerpt from the ISO guidelines). If your appetite has been wetted after reading my *Writing Guide*, you can consult any of the above-mentioned style manuals. But you should realize that you are expected to work on science and on actually writing scientific papers, and not to work too much on reading about how to write scientific papers.

[http://www.aip.org/pubservs/style/4thed/AIP\\_Style\\_4thed.pdf](http://www.aip.org/pubservs/style/4thed/AIP_Style_4thed.pdf)

<http://forms.aps.org/author/styleguide.pdf>

[http://ao.osa.org/submit/style/jrnls\\_style.cfm](http://ao.osa.org/submit/style/jrnls_style.cfm)

<http://standards.ieee.org/guides/style/>

<http://rmp.aps.org/files/rmpguapa.pdf>

[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=3653](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=3653)

<http://www.iso.org/iso/home.htm>

<http://www.tug.org/TUGboat/Articles/tb18-1/tb54becc.pdf>

### 1.F.2.A Courses in writing scientific papers

In university environments courses are frequently presented on how to write scientific papers. Do not follow these courses, even if your employer considers them obligatory. These lessons are not a good way of spending your time. The lectures are not given by active, professional researchers. Your task is to write papers that are crystal clear to your scientific community. You should cater to no other audience. The opinion of humanists, university lecturers and professors in language are absolutely irrelevant, and invariably an obstacle.

## 1.G Improving your English

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If you want to improve your English, listen to English radio programs (like the *BBC World Service*), read high-quality intellectual magazines as the *New York Review of Books*, watch *CNN*, or watch English-spoken TV programs (without subtitles in your own language). Make sure that presentations and scientific discussions in your group are in English.

A useful and amusing resource is Paul Brians' complete website on *Common Errors in English Usage*.

<http://www.bbc.co.uk/worldservice/>

<http://www.nybooks.com/>

<http://edition.cnn.com/>

<http://www.wsu.edu/~brians/errors/>

## 1.H Culture

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Much of this instruction manual is based on the assumption that the writer of the scientific texts works in a small-scale scientific group. In some branches the mores are totally different. For instance in high-energy-physics communities a four-page paper can easily carry hundreds of authors. It is obvious that writing such a paper involves, besides science, a lot of politics. And politics is (almost) nowhere to be found in the *Writing Guide*. In such communities my tutorial might still be useful for internal reports, theses and the like.

## 1.I Limitations

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The *Writing Guide* deals with a number of different types of manuscripts. There is quite some play between the prescribed writing styles of various international journals. Some of my hints might not be allowed by your favorite journals. But these particular hints might still be useful for your internal reports, theses, proposals, etc.

## 1.J Male chauvinism

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In many western societies women are underrepresented in the natural sciences. This absence is an undesirable situation. In this tutorial I could have been politically correct by continuously using “he/she” and “his/her”. As this would make the text look uglier I have not done so. The reader should realize that wherever I say “he”, it could well have been “she”.

## 1.K Ethics

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Natural science is about objective stuff ‘out there’. Its findings should not depend on the observer. Work is being published to allow other workers to criticize the outcome, to check it, or to expand it.

In principle you could be requested to justify your results twenty, or more, years after the publication date. Reporting your results in detail in (internal and external) scientific texts, and archiving them extensively, apart from keeping good laboratory journals, is part of good ethical behavior of each and every natural scientist.

## 1.L Conventions in the *Writing Guide*

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Words that are in *italic* represent (deposited) names of organizations, brands, companies and/or computer program names (and actions within a computer program). Examples: *Acrobat*, *LaTeX*. Proper credit will be listed regarding these (deposited) names at the end of this guide.

### **1.L.1 Double quotes**

Double quotation marks indicate quotes, either from text or from speech. To have the quotes stand out, their font color is red (not visible in the printed version).

### **1.L.2 Single quotes**

In this booklet I use single quotes to indicate a 'strange' word, or a regular word occurring in an unusual meaning. In stead of single quotes I could also have used the word "so-called".

## **1.M Commercial products**

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Regularly I will mention commercial (software) products that can help you in writing your paper. If your institution is of academic nature (university, college, etc.), then for a number of these products your institute might have a (cheaper) site license.