

# Encyclopaedia of Scientific Units, Weights and Measures

Their SI Equivalences and Origins

François Cardarelli



Springer

# Contents

<b>List of Tables . . . . .</b>	<b>xvii</b>
<b>1 Introduction . . . . .</b>	<b>1</b>
1.1 Why a Conversion Handbook? . . . . .	1
1.2 How to Use This Book . . . . .	2
<b>2 The International System of Units . . . . .</b>	<b>3</b>
2.1 History . . . . .	3
2.2 The General Conference on Weights and Measures . . . . .	6
2.3 Organization of the SI . . . . .	10
2.3.1 SI Base Units . . . . .	10
2.3.2 SI Supplementary Units . . . . .	12
2.3.3 SI Derived Units . . . . .	13
2.3.4 Non-SI and SI Units Used in Combination . . . . .	14
2.3.4.1 Commonly Used Legal Non-SI Units . . . . .	14
2.3.4.2 Non-SI Units Defined by Experiment . . . . .	14
2.3.4.3 Non-SI Units Temporarily Maintained . . . . .	15
2.3.4.4 Non-SI Units Which Must be Discontinued . . . . .	15
2.4 SI Prefixes . . . . .	15
<b>3 Other Systems of Units . . . . .</b>	<b>19</b>
3.1 MTS, MKpS, MKSA . . . . .	19
3.1.1 The MKpS System . . . . .	19
3.1.2 The MTS System . . . . .	19
3.1.3 The MKSA (Giorgi) System . . . . .	20
3.2 Cgs, Gauss, IEUS, a.u. . . . .	20
3.2.1 The cgs System . . . . .	20
3.2.1.1 The esu Subsystem . . . . .	21
3.2.1.2 The emu Subsystem . . . . .	21
3.2.2 The Gauss System . . . . .	22
3.2.3 International Electrical Units . . . . .	25
3.2.4 Atomic Units (a.u.) . . . . .	25
3.3 British and American Systems of Units . . . . .	26
3.3.1 Imperial Units . . . . .	26
3.3.1.1 Imperial Units of Length . . . . .	28
3.3.1.1.1 UK Linear Measure . . . . .	29
3.3.1.1.2 UK Nautical Measure . . . . .	29
3.3.1.1.3 UK Surveyors' Measure . . . . .	31
3.3.1.2 Imperial Units of Area . . . . .	31
3.3.1.2.1 UK Measures of Area . . . . .	32
3.3.1.2.2 UK Surveyor's Measure . . . . .	32
3.3.1.2.3 Circular Units . . . . .	32
3.3.1.3 Imperial Units of Volume and Capacity . . . . .	33
3.3.1.3.1 UK Measures of Volume . . . . .	33
3.3.1.3.2 UK Liquid Measure . . . . .	34
3.3.1.3.3 UK Dry Measure . . . . .	34

3.3.1.4	Imperial Units of Weight . . . . .	34
3.3.1.4.1	UK Avoirdupois Weight . . . . .	34
3.3.1.4.2	UK Apothecaries' Weight . . . . .	38
3.3.1.4.3	UK Troy Weight . . . . .	38
3.3.2	The American System of Measures (US Customary Units) . . . . .	39
3.3.2.1	US Customary Units of Length . . . . .	39
3.3.2.1.1	US Linear Measure . . . . .	39
3.3.2.1.2	US Nautical Measure . . . . .	40
3.3.2.1.3	US Surveyors' Measure . . . . .	40
3.3.2.2	US Customary Units of Area . . . . .	40
3.3.2.2.1	US Measures of Area . . . . .	40
3.3.2.2.2	US Surveyors' Measure . . . . .	41
3.3.2.2.3	Circular Units . . . . .	42
3.3.2.3	US Units of Volume and Capacity . . . . .	42
3.3.2.3.1	US Measures of Volume . . . . .	42
3.3.2.3.2	US Liquid Measure . . . . .	42
3.3.2.3.3	US Dry Measure . . . . .	42
3.3.2.3.4	US Apothecaries' Measures of Capacity . . . . .	44
3.3.2.4	US Customary Units of Weight . . . . .	44
3.3.2.4.1	US Avoirdupois Weight . . . . .	44
3.3.2.4.2	US Apothecaries' Weight . . . . .	44
3.3.2.4.3	US Troy Weight . . . . .	45
3.3.3	Obsolete Weight and Capacity Measures . . . . .	46
3.3.3.1	UK Units of Weight for Butter and Cheese . . . . .	46
3.3.3.2	UK Units for Beer, Wines and Spirits . . . . .	46
3.3.3.3	UK Units of Weight for Coal . . . . .	47
3.3.3.4	UK Units for Clothes . . . . .	47
3.3.3.5	UK and US Hay and Straw Weights . . . . .	49
3.3.3.6	UK Weight for Wool . . . . .	49
3.3.3.7	US Units of Capacity Used in Food Recipes . . . . .	49
3.3.3.8	US Units of Capacity for Wine . . . . .	49
3.3.3.9	Modern UK and US Dimensionless Units for Numbers of Paper Sheets . . . . .	51
3.3.3.10	Old UK and US Dimensionless Units for Numbers of Paper Sheets . . . . .	51
3.3.3.11	Old US Units for Measuring the Volume of Stacked Firewood . . . . .	51
3.3.3.12	UK and US Dimensionless Counting Units . . . . .	51
3.4	The Foot-Pound-Second (FPS) System . . . . .	51
3.5	Ancient and Obsolete Systems of Weights and Measures . . . . .	55
3.5.1	Systems from Antiquity . . . . .	56
3.5.1.1	The Chinese System . . . . .	57
3.5.1.1.1	Old Chinese Units of Length . . . . .	57
3.5.1.1.2	Old Chinese Units of Area . . . . .	57
3.5.1.1.3	Old Chinese Units of Weight . . . . .	57
3.5.1.1.4	Old Chinese Units of Capacity . . . . .	57
3.5.1.2	The Indian System . . . . .	61
3.5.1.2.1	Old Indian Units of Length . . . . .	61
3.5.1.2.2	Indian Units of Weight . . . . .	61
3.5.1.2.3	Indian Units of Capacity . . . . .	61
3.5.1.3	The Egyptian System . . . . .	61
3.5.1.3.1	Egyptian Units of Length . . . . .	61
3.5.1.3.2	Egyptian Units of Area . . . . .	61
3.5.1.3.3	Egyptian Units of Weight . . . . .	65
3.5.1.3.4	Egyptian Units of Capacity . . . . .	65

3.5.1.4	The Assyrio-Chaldean-Persian System . . . . .	65
3.5.1.4.1	Persian Units of Length . . . . .	65
3.5.1.4.2	Persian Units of Area . . . . .	65
3.5.1.4.3	Persian Units of Weight . . . . .	67
3.5.1.4.4	Persian Units of Capacity . . . . .	67
3.5.1.5	The Hebrew System . . . . .	67
3.5.1.5.1	Hebrew Units of Length . . . . .	67
3.5.1.5.2	Hebrew Units of Weight (Sacred System) . . . . .	67
3.5.1.5.3	Hebrew Units of Weight (Talmudic or Rabbinical System) . . . . .	68
3.5.1.5.4	Hebrew Units of Capacity (Dry) . . . . .	68
3.5.1.5.5	Hebrew Units of Capacity (Liquids) . . . . .	68
3.5.1.6	The Greek System (Attic) . . . . .	68
3.5.1.6.1	Greek Units of Length . . . . .	68
3.5.1.6.2	Greek Units of Weight . . . . .	70
3.5.1.6.3	Greek Units of Capacity (Dry) . . . . .	70
3.5.1.6.4	Greek Units of Capacity (Liquids) . . . . .	70
3.5.1.7	The Roman System . . . . .	70
3.5.1.7.1	Roman Units of Length . . . . .	70
3.5.1.7.2	Roman Units of Area . . . . .	70
3.5.1.7.3	Roman Units of Weight . . . . .	73
3.5.1.7.4	Roman Units of Capacity (Dry) . . . . .	73
3.5.1.7.5	Roman Units of Capacity (Liquids) . . . . .	73
3.5.1.8	The Arabic System . . . . .	73
3.5.1.8.1	Arabic Units of Length . . . . .	73
3.5.1.8.2	Arabic Units of Area . . . . .	73
3.5.1.8.3	Arabic Units of Weight (System of the Prophet) . . . . .	73
3.5.1.8.4	Arabic Units of Capacity . . . . .	73
3.5.2	Obsolete National and Regional Systems . . . . .	73
3.5.2.1	Western and Southern Europe . . . . .	73
3.5.2.1.1	Old French System (Ancien Régime) . . . . .	73
3.5.2.1.1.1	Old French Units of Length . . . . .	79
3.5.2.1.1.2	Old French Units of Area . . . . .	79
3.5.2.1.1.3	Old French Units of Capacity . . . . .	80
3.5.2.1.1.4	Old French Units of Weight . . . . .	80
3.5.2.1.2	Old French System (1812–1840) . . . . .	83
3.5.2.1.2.1	Old French Units of Length (Metric) . . . . .	83
3.5.2.1.2.2	Old French Units of Weight (Metric) . . . . .	83
3.5.2.1.3	Old Belgian System . . . . .	83
3.5.2.1.3.1	Old Belgian Units of Length . . . . .	83
3.5.2.1.3.2	Old Belgian Units of Weight . . . . .	84
3.5.2.1.4	Old Swiss System . . . . .	84
3.5.2.1.4.1	Old Swiss Units of Length . . . . .	84
3.5.2.1.4.2	Old Swiss Units of Weight . . . . .	84
3.5.2.1.4.3	Old Swiss Units of Weight (Apoth.) . . . . .	84
3.5.2.1.5	Old Scottish System . . . . .	85
3.5.2.1.5.1	Old Scottish Units of Length . . . . .	85
3.5.2.1.5.2	Old Scottish Units of Surface Area . . . . .	85
3.5.2.1.5.3	Old Scottish Units of Capacity . . . . .	85
3.5.2.1.5.4	Old Scottish Units of Weight . . . . .	86
3.5.2.1.6	Old Irish System . . . . .	86
3.5.2.1.6.1	Old Irish Units of Length . . . . .	86
3.5.2.1.6.2	Old Irish Units of Capacity . . . . .	87

3.5.2.1.7	Old Italian System.....	87
3.5.2.1.7.1	Old Italian Units of Length.....	87
3.5.2.1.7.2	Old Italian Units of Weight.....	87
3.5.2.1.7.3	Old Italian Measures (Regional Variations) .....	88
3.5.2.1.8	Old Spanish System (Castillian) .....	88
3.5.2.1.8.1	Old Spanish Units of Length.....	88
3.5.2.1.8.2	Old Spanish Units of Area.....	88
3.5.2.1.8.3	Old Spanish Units of Weight.....	90
3.5.2.1.8.4	Old Spanish Units of Capacity (Liquids) .....	90
3.5.2.1.8.5	Old Spanish Units of Capacity (Dry).....	90
3.5.2.1.9	Old Portuguese System .....	90
3.5.2.1.9.1	Old Portuguese Units of Length .....	90
3.5.2.1.9.2	Old Portuguese Units of Area .....	90
3.5.2.1.9.3	Old Portuguese Units of Weight .....	93
3.5.2.1.9.4	Old Portuguese Units of Capacity (Dry).....	93
3.5.2.1.9.5	Old Portuguese Units of Capacity (Liquids) .....	93
3.5.2.1.10	Old Maltese System.....	93
3.5.2.1.10.1	Old Maltese Units of Length .....	94
3.5.2.1.10.2	Old Maltese Units of Capacity.....	94
3.5.2.1.10.3	Old Maltese Units of Weight.....	94
3.5.2.1.11	Old Balearic Islands System .....	94
3.5.2.1.11.1	Old Balearic Units of Length.....	94
3.5.2.1.11.2	Old Balearic Units of Capacity (Liquids) .....	94
3.5.2.1.11.3	Old Balearic Units of Capacity (Dry).....	95
3.5.2.1.11.4	Old Balearic Units of Weight.....	95
3.5.2.1.12	Old Greek System .....	95
3.5.2.1.12.1	Old Greek Units of Length .....	95
3.5.2.1.12.2	Old Greek Units of Capacity .....	95
3.5.2.1.12.3	Old Greek Units of Weight.....	96
3.5.2.1.13	Old Cypriot System.....	96
3.5.2.1.13.1	Old Cypriot Units of Length and Area .....	96
3.5.2.1.13.2	Old Cypriot Units of Capacity.....	96
3.5.2.1.13.3	Old Cypriot Units of Weight.....	96
3.5.2.1.14	Old Turkish System.....	97
3.5.2.1.14.1	Old Turkish Units of Length .....	97
3.5.2.1.14.2	Old Turkish Units of Area .....	97
3.5.2.1.14.3	Old Turkish Units of Capacity .....	97
3.5.2.1.14.4	Old Turkish Units of Weight .....	97
3.5.2.2	Central and Northern Europe.....	99
3.5.2.2.1	Old Austrian System .....	99
3.5.2.2.1.1	Old Austrian Units of Length .....	99
3.5.2.2.1.2	Old Austrian Units of Surface Area .....	99
3.5.2.2.1.3	Old Austrian Units of Capacity (Liquids) .....	99
3.5.2.2.1.4	Old Austrian Units of Capacity (Dry) .....	100

3.5.2.2.1.5	Old Austrian Units of Weight (Ordinary) . . . . .	100
3.5.2.2.1.6	Old Austrian Units of Weight (Apothecary) . . . . .	100
3.5.2.2.2	Old German System (Prussian) . . . . .	100
3.5.2.2.2.1	Old German Units of Length . . . . .	100
3.5.2.2.2.2	Old German Units of Weight . . . . .	100
3.5.2.2.2.3	Old German Units of Capacity (Dry) . . . . .	103
3.5.2.2.2.4	Old German Units of Capacity (Liquids) . . . . .	103
3.5.2.2.3	Old Yugoslavian System . . . . .	103
3.5.2.2.3.1	Old Yugoslavian Units of Length . . . . .	103
3.5.2.2.3.2	Old Yugoslavian Units of Surface Area . . . . .	103
3.5.2.2.3.3	Old Yugoslavian Units of Weight . . . . .	104
3.5.2.2.4	Old Czechoslovakian System . . . . .	104
3.5.2.2.4.1	Old Czechoslovakian Units of Length . . . . .	104
3.5.2.2.4.2	Old Czechoslovakian Units of Surface Area . . . . .	104
3.5.2.2.4.3	Old Czechoslovakian Units of Capacity . . . . .	104
3.5.2.2.5	Old Hungarian System . . . . .	105
3.5.2.2.5.1	Old Hungarian Units of Length . . . . .	105
3.5.2.2.5.2	Old Hungarian Units of Surface Area . . . . .	105
3.5.2.2.5.3	Old Hungarian Units of Capacity . . . . .	105
3.5.2.2.6	Old Romanian System . . . . .	105
3.5.2.2.6.1	Old Romanian Units of Length . . . . .	105
3.5.2.2.6.2	Old Romanian Units of Capacity . . . . .	105
3.5.2.2.6.3	Old Romanian Units of Weight . . . . .	106
3.5.2.2.7	Old Dutch System . . . . .	106
3.5.2.2.7.1	Old Dutch Units of Length . . . . .	106
3.5.2.2.7.2	Old Dutch Units of Weight . . . . .	106
3.5.2.2.7.3	Old Dutch Units of Capacity (Dry) . . . . .	107
3.5.2.2.7.4	Old Dutch Units of Capacity (Liquids) . . . . .	107
3.5.2.2.8	Old Danish System . . . . .	107
3.5.2.2.8.1	Old Danish Units of Length . . . . .	107
3.5.2.2.8.2	Old Danish Units of Surface Area . . . . .	107
3.5.2.2.8.3	Old Danish Units of Capacity . . . . .	109
3.5.2.2.8.4	Old Danish Units of Weight . . . . .	109
3.5.2.2.9	Old Polish System . . . . .	109
3.5.2.2.9.1	Old Polish Units of Length . . . . .	109
3.5.2.2.9.2	Old Polish Units of Surface Area . . . . .	109
3.5.2.2.9.3	Old Polish Units of Capacity . . . . .	112
3.5.2.2.9.4	Old Polish Units of Weight . . . . .	112
3.5.2.2.10	Old Swedish System . . . . .	112
3.5.2.2.10.1	Old Swedish Units of Length . . . . .	112
3.5.2.2.10.2	Old Swedish Units of Area . . . . .	112
3.5.2.2.10.3	Old Swedish Units of Weight . . . . .	112
3.5.2.2.10.4	Old Swedish Units of Capacity . . . . .	112

3.5.2.2.11	Old Norwegian System .....	116
3.5.2.2.11.1	Miscellaneous Old Norwegian Units .....	116
3.5.2.2.12	Old Finnish System .....	116
3.5.2.2.12.1	Old Finnish Units of Capacity .....	116
3.5.2.2.13	Old Icelandic System .....	117
3.5.2.2.13.1	Old Icelandic Units of Length .....	117
3.5.2.2.13.2	Old Icelandic Units of Area .....	117
3.5.2.2.13.3	Old Icelandic Units of Capacity (Dry) .....	117
3.5.2.2.13.4	Old Icelandic Units of Weight .....	117
3.5.2.2.14	Old Estonian System .....	117
3.5.2.2.14.1	Old Estonian Units of Length .....	117
3.5.2.2.14.2	Old Estonian Units of Surface Area .....	119
3.5.2.2.14.3	Old Estonian Units of Capacity .....	119
3.5.2.2.14.4	Old Estonian Units of Weight .....	119
3.5.2.2.15	Old Latvian System .....	119
3.5.2.2.15.1	Old Latvian Units of Length .....	119
3.5.2.2.15.2	Old Latvian Units of Area .....	120
3.5.2.2.15.3	Old Latvian Units of Capacity .....	120
3.5.2.2.15.4	Old Latvian Units of Weight .....	120
3.5.2.2.16	Old Russian System .....	120
3.5.2.2.16.1	Old Russian Units of Length .....	120
3.5.2.2.16.2	Old Russian Units of Weight (Ordinary) .....	122
3.5.2.2.16.3	Old Russian Units of Weight (Apothecary) .....	122
3.5.2.2.16.4	Old Russian Units of Capacity (Dry) .....	122
3.5.2.2.16.5	Old Russian Units of Capacity (Liquids) .....	122
3.5.2.3	Africa .....	122
3.5.2.3.1	Old Moroccan System .....	122
3.5.2.3.1.1	Old Moroccan Units of Length .....	122
3.5.2.3.1.2	Old Moroccan Units of Capacity .....	125
3.5.2.3.1.3	Old Moroccan Units of Weight .....	125
3.5.2.3.2	Old Algerian System .....	125
3.5.2.3.2.1	Old Algerian Units of Length .....	125
3.5.2.3.2.2	Old Algerian Units of Capacity .....	125
3.5.2.3.2.3	Old Algerian Units of Weight .....	126
3.5.2.3.3	Old Tunisian System .....	126
3.5.2.3.3.1	Old Tunisian Units of Length .....	126
3.5.2.3.3.2	Old Tunisian Units of Capacity .....	126
3.5.2.3.3.3	Old Tunisian Units of Weight .....	126
3.5.2.3.4	Old Libyan System .....	127
3.5.2.3.4.1	Old Libyan Units of Length .....	127
3.5.2.3.4.2	Old Libyan Units of Area .....	127
3.5.2.3.4.3	Old Libyan Units of Capacity (Liquids) .....	127
3.5.2.3.4.4	Old Libyan Units of Capacity (Dry) .....	127
3.5.2.3.4.5	Old Libyan Units of Weight .....	128

3.5.2.3.5	Old Egyptian System . . . . .	128
3.5.2.3.5.1	Old Egyptian Units of Length . . . . .	128
3.5.2.3.5.2	Old Egyptian Units of Area . . . . .	128
3.5.2.3.5.3	Old Egyptian Units of Capacity . . . . .	128
3.5.2.3.5.4	Old Egyptian Units of Weight . . . . .	130
3.5.2.3.6	Old Abyssinian System . . . . .	130
3.5.2.3.6.1	Old Abyssinian Units of Length . . . . .	130
3.5.2.3.6.2	Old Abyssinian Units of Capacity . . . . .	130
3.5.2.3.6.3	Old Abyssinian Units of Weight . . . . .	130
3.5.2.3.7	Old Eritrean System . . . . .	131
3.5.2.3.7.1	Old Eritrean Units of Length . . . . .	131
3.5.2.3.7.2	Old Eritrean Units of Capacity . . . . .	131
3.5.2.3.7.3	Old Eritrean Units of Weight . . . . .	131
3.5.2.3.8	Old Ethiopian System . . . . .	131
3.5.2.3.8.1	Old Ethiopian Units of Length . . . . .	131
3.5.2.3.8.2	Old Ethiopian Units of Weight . . . . .	132
3.5.2.3.9	Old Somalian System . . . . .	132
3.5.2.3.9.1	Old Somalian Units of Length . . . . .	132
3.5.2.3.9.2	Old Somalian Units of Capacity . . . . .	132
3.5.2.3.9.3	Old Somalian Units of Weight . . . . .	132
3.5.2.3.10	Old Guinean System . . . . .	132
3.5.2.3.10.1	Old Guinean Units of Length . . . . .	132
3.5.2.3.10.2	Old Guinean Units of Weight . . . . .	132
3.5.2.4	Middle East and Asia . . . . .	135
3.5.2.4.1	Old Saudi-Arabian System . . . . .	135
3.5.2.4.1.1	Old Saudi-Arabian Units of Length . . . . .	135
3.5.2.4.1.2	Old Saudi-Arabian Units of Capacity (Liquids) . . . . .	135
3.5.2.4.1.3	Old Saudi-Arabian Units of Capacity (Dry) . . . . .	135
3.5.2.4.1.4	Old Saudi-Arabian Units of Weight . . . . .	136
3.5.2.4.2	Old Persian System . . . . .	136
3.5.2.4.2.1	Old Persian Units of Length . . . . .	136
3.5.2.4.2.2	Old Persian Units of Capacity . . . . .	136
3.5.2.4.2.3	Old Persian Units of Weight . . . . .	136
3.5.2.4.3	Old Syrian System . . . . .	138
3.5.2.4.3.1	Old Syrian Unit of Length . . . . .	138
3.5.2.4.3.2	Old Syrian Units of Capacity . . . . .	138
3.5.2.4.3.3	Old Syrian Units of Weight . . . . .	138
3.5.2.4.4	Old Turkmenian System . . . . .	138
3.5.2.4.4.1	Old Turkmenian Units of Length . . . . .	138
3.5.2.4.4.2	Old Turkmenian Units of Weight . . . . .	138
3.5.2.4.5	Old Indian System . . . . .	139
3.5.2.4.5.1	Old Indian Units of Length . . . . .	139
3.5.2.4.5.2	Old Indian Units of Area . . . . .	139
3.5.2.4.5.3	Old Indian Units of Capacity . . . . .	139
3.5.2.4.5.4	Old Indian Units of Weight . . . . .	139
3.5.2.4.6	Old Burmese System . . . . .	139
3.5.2.4.6.1	Old Burmese Units of Length . . . . .	139
3.5.2.4.6.2	Old Burmese Units of Capacity . . . . .	143
3.5.2.4.6.3	Old Burmese Units of Weight . . . . .	143
3.5.2.4.7	Old Ceylonese and Madrasian System . . . . .	143
3.5.2.4.7.1	Old Ceylonese and Madrasian Units of Length . . . . .	143
3.5.2.4.7.2	Old Ceylonese and Madrasian Units of Weight . . . . .	143

3.5.2.4.8	Old Annamese System.....	144
3.5.2.4.8.1	Old Annamese Units of Length....	144
3.5.2.4.8.2	Old Annamese Units of Area.....	144
3.5.2.4.8.3	Old Annamese Units of Capacity...	144
3.5.2.4.8.4	Old Annamese Units of Weight....	144
3.5.2.4.9	Old Cambodian System.....	144
3.5.2.4.9.1	Old Cambodian Units of Length...	146
3.5.2.4.9.2	Old Cambodian Units of Capacity..	146
3.5.2.4.9.3	Old Cambodian Units of Weight...	146
3.5.2.4.10	Old Thai System .....	146
3.5.2.4.10.1	Old Thai Units of Length .....	146
3.5.2.4.10.2	Old Thai Units of Area .....	146
3.5.2.4.10.3	Old Thai Units of Capacity .....	146
3.5.2.4.10.4	Old Thai Units of Weight .....	146
3.5.2.4.11	Old Indonesian System .....	151
3.5.2.4.11.1	Old Indonesian Units of Length ...	151
3.5.2.4.11.2	Old Indonesian Units of Capacity ..	151
3.5.2.4.11.3	Old Indonesian Units of Weight ...	151
3.5.2.4.12	Old Philippine System.....	151
3.5.2.4.12.1	Old Philippine Units of Area.....	151
3.5.2.4.12.2	Old Philippine Units of Capacity..	151
3.5.2.4.12.3	Old Philippine Units of Weight....	153
3.5.2.4.13	Old Japanese System .....	153
3.5.2.4.13.1	Old Japanese Units of Length .....	153
3.5.2.4.13.2	Old Japanese Units of Area .....	153
3.5.2.4.13.3	Old Japanese Units of Capacity...	153
3.5.2.4.13.4	Old Japanese Units of Weight....	153
3.5.2.5	Central and South America .....	156
3.5.2.5.1	Old Cuban System.....	156
3.5.2.5.1.1	Old Cuban Units of Area.....	156
3.5.2.5.1.2	Old Cuban Units of Capacity....	156
3.5.2.5.2	Old Haitian System .....	156
3.5.2.5.2.1	Old Haitian Units of Length .....	156
3.5.2.5.2.2	Old Haitian Units of Capacity....	156
3.5.2.5.3	Old Honduran, Costa-Rican, Nicaraguan, Salvadoran, and Guatemalan System.....	157
3.5.2.5.3.1	Old Honduran, Costa-Rican, Nicaraguan, Salvadoran, and Guatemalan Units of Length .....	157
3.5.2.5.3.2	Old Honduran, Costa-Rican, Nicaraguan, Salvadoran, and Guatemalan Units of Area.....	157
3.5.2.5.3.3	Old Honduran, Costa-Rican, Nicaraguan, Salvadoran, and Guatemalan Units of Capacity....	157
3.5.2.5.3.4	Old Honduran, Costa-Rican, Nicaraguan, Salvadoran, and Guatemalan Units of Weight....	158
3.5.2.5.4	Old Venezuelan System.....	158
3.5.2.5.4.1	Old Venezuelan Units of Length ...	158
3.5.2.5.4.2	Old Venezuelan Units of Weight...	158
3.5.2.5.5	Old Colombian System .....	158
3.5.2.5.5.1	Old Colombian Units of Length ...	159
3.5.2.5.5.2	Old Colombian Units of Weight ...	159
3.5.2.5.6	Old Brazilian System.....	159
3.5.2.5.6.1	Old Brazilian Units of Length ....	159

3.5.2.5.6.2	Old Brazilian Units of Capacity....	160
3.5.2.5.6.3	Old Brazilian Units of Weight....	160
3.5.2.5.7	Old Paraguayan System.....	160
3.5.2.5.7.1	Old Paraguayan Units of Length...	160
3.5.2.5.7.2	Old Paraguayan Units of Capacity .	161
3.5.2.5.7.3	Old Paraguayan Units of Weight..	161
3.5.2.5.8	Old Argentinan System.....	161
3.5.2.5.8.1	Old Argentinan Units of Length ..	161
3.5.2.5.8.2	Old Argentinan Units of Capacity (Liquids).....	162
3.5.2.5.8.3	Old Argentinan Units of Capacity (Dry).....	162
3.5.2.5.8.4	Old Argentinan Units of Weight...	162
3.5.2.5.9	Old Chilean System.....	162
3.5.2.5.9.1	Old Chilean Units of Length.....	162
3.5.2.5.9.2	Old Chilean Units of Capacity....	163
3.5.2.5.9.3	Old Chilean Units of Weight.....	163
3.5.2.5.10	Old Peruvian System.....	163
3.5.2.5.10.1	Old Peruvian Units of Length and Area.....	163
3.5.2.5.10.2	Old Peruvian Units of Weight....	163
3.5.2.6	North America .....	164
3.5.2.6.1	Old Mexican System .....	164
3.5.2.6.1.1	Old Mexican Units of Length .....	164
3.5.2.6.1.2	Old Mexican System Units of Area ..	164
3.5.2.6.1.3	Old Mexican Units of Capacity (Liquids).....	164
3.5.2.6.1.4	Old Mexican Units of Capacity (Dry).....	164
3.5.2.6.1.5	Old Mexican Units of Weight.....	165
4	Conversion Tables .....	167
4.1	Units in Alphabetical Order .....	167
4.2	Conversion Tables Listed by Physical Quantities .....	674
4.2.1	Conversion Tables for Units of Mass .....	674
4.2.2	Conversion Tables for Units of Length.....	684
4.2.3	Conversion Tables for Units of Area .....	695
4.2.4	Conversion Tables for Units of Volume and Capacity .....	702
4.2.5	Conversion Table for Units of Linear Density .....	708
4.2.6	Conversion Table for Units of Surface Mass Density .....	709
4.2.7	Conversion Table for Units of Mass Density .....	710
4.2.8	Conversion Table for Units of Specific Gravity.....	712
4.2.9	Conversion Table for Units of Time.....	714
4.2.10	Conversion Table for Units of Dynamic Viscosity .....	716
4.2.11	Conversion Table for Units of Kinematic Viscosity .....	717
4.2.12	Conversion Table for Units of Linear Velocity .....	718
4.2.13	Conversion Table for Units of Angular Velocity.....	720
4.2.14	Conversion Table for Units of Force .....	722
4.2.15	Conversion Table for Units of Pressure and Stress.....	724
4.2.16	Conversion Table for Units of Energy, Heat and Work .....	728
4.2.17	Conversion Table for Units of Power .....	730
4.2.18	Conversion Table for Units of Plane and Solid Angle .....	734
4.2.19	Conversion Table for Units of Thermal Conductivity.....	736
4.2.20	Conversion Tables for Units of Concentration .....	738
4.2.21	Conversion Table for Units of Temperature .....	740
4.2.22	Conversion Table for Electrical Units.....	741
4.2.23	Conversion Table for Units Used in Magnetism.....	742

4.2.24 Conversion Table for Photometric Units . . . . .	743
4.2.25 Conversion Table for Units Used in Nuclear Sciences . . . . .	744
4.2.26 Conversion Table for Energy Equivalents for Electromagnetic Radiation . . . . .	745
4.2.27 Conversion Table for Ideal Gas Constant in Various Units . . . . .	746
4.2.28 Conversion Table for Dimensions for Permeability Coefficients . . . . .	747
4.2.29 Conversion Table for International Kinematic Viscosity Indices . . . . .	748
4.2.30 Conversion Table for Standard Sieve Designation Series . . . . .	751
4.2.31 Conversion Table for International Standard Wire and Sheet Gauges . . . . .	755
4.2.32 Conversion Table for Normal Pipe Sizes . . . . .	759
<b>5 Fundamental Constants . . . . .</b>	<b>771</b>
5.1 Fundamental Mathematical Constants . . . . .	771
5.2 Fundamental Physical Constants . . . . .	772
<b>6 Appendices . . . . .</b>	<b>781</b>
6.1 Greek Alphabet . . . . .	781
6.2 Roman Numerals . . . . .	781
6.3 Rules about Large Numbers (>1 000 000) . . . . .	782
6.4 Date and Time Numerical Representation . . . . .	783
6.5 National, Regional and International Standardization Bodies . . . . .	783
6.5.1 International Standards Bodies . . . . .	784
6.5.2 National Standards Bodies Worldwide . . . . .	785
6.5.2.1 National Standards Bodies . . . . .	785
6.5.2.2 US Standards and Standardizations Bodies, Technical Associations and Societies . . . . .	800
6.6 Acceleration Due to Gravity at any Latitude and Elevation . . . . .	811
6.7 International Practical Temperature Scale (IPTS, 1968) . . . . .	812
6.8 International Temperature Scale (ITS-90) . . . . .	813
6.9 French-English Lexicon for Units . . . . .	814
6.10 French-English Lexicon for Physical Quantities . . . . .	816
6.11 International Clothing and Shoe Sizes (US, UK, Europe, and Japan) . . . . .	819
6.12 Common Time Acronyms . . . . .	822
6.13 Old Alchemical Symbols Used in Astronomy, Chemistry, and Biology . . . . .	822
6.14 International Geological Time Scale . . . . .	823
6.15 Old Symbols Used in the British System . . . . .	826
6.16 Electromagnetic Spectrum . . . . .	827
6.17 Standard Paper Sizes (ISO and US) . . . . .	827
6.18 International Country Code Designations . . . . .	829
6.19 International Currency Codes . . . . .	836
<b>7 Bibliography . . . . .</b>	<b>839</b>
7.1 Specific References . . . . .	839
7.2 References About the Metric System and the SI . . . . .	841
7.3 References of General Interest . . . . .	842
7.4 Historical References . . . . .	843
7.5 International and National Standards . . . . .	845