***Maness International Geological (MIG) Font™©***

Version 1.34

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***Knowledge plus Reason equals Truth.***

The ***Maness International Geological (MIG) Font™©*** (2006-2010, all rights reserved), comprises an unique set of letters, numbers, symbols, characters and glyphs, generated to provide geologists and others in the earth sciences with an unified, unambiguous means of recording, reporting and displaying, including on maps and through standard data-base and GIS software, geological, geophysical, geochemical, geomorphic, geographic and other information in most of the widely-used Latin-Greek-Cyrillic alphabets. In addition, the Chinese phonetic Bo-Po-Mo-Fe font is included: Chinese Wade-Giles and Pin-Yin are fully enabled through the Latin fonts. Others are *in-process*. Finally, any client can suggest changes or additions to the MIG Font™©, all of which suggestions will be received with gratitude and sincerely evaluated for possible incorporation herein.

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***Dedication:***

This work is dedicated to those who assisted the author, in various way, in developing the skills necessary to enable such a project to proceed to fruition: **Dr. Anthony R. Barringer** {Geologist deceased}; **Dr. Victor C. Miller** (Photogeologist {deceased}); **Dr. Benjamin Moulton** (Geographer {deceased}); **Dr. Paul Mausel** (Geographer); **Dr. Henry S. Brown** (Geologist); **Dr. Hampapuram K. Ramapriyan** (Scientist) and my old friend, **Clarence Dillard** (retired, U.S. State Department). **Clive Cussler** encouraged my continued interest in the resources and history of Asia. My maternal grandfather, **Cyrus Milton Griffin** (Deputy Sheriff) and maternal grandmother, **Eula Susan Mercer Griffin** (Lookout Tower Operator), both deceased, welcomed my mother, brother and myself back into their home when my parents divorced: without their love and assistance, I doubt that my present would have been as agreeable as it is. My brother, **Thomas Lee Maness**, always offered encouragement and believed in me. As a child, I greatly respected **Mr. Eddie** **&** **Ms. Cassie Philyaw** and **Mr. Leroy & Ms. Frances Philyaw**, deceased farmers all, not for their money, because they didn’t have any, but for their solid values: their words were more dependable than any contract written by any attorney. I still treasure their memories and their examples. My friend, **Tony Grampsas** (deceased), whom I admired as a person, and whose political philosophy I found most agreeable, logical and rational, is worthy of being remembered for his many services to the people of Jefferson County and to the State of Colorado. If every state had at least one Tony Grampsas, we would be even more blessed as Americans: unfortunately, there was only one Tony Grampsas. Most important of all, however, this is dedicated to my wife, Mrs. **Pin-Ching Chen Maness** (Micro-Biologist), who told me to stop complaining and do something productive about the problem of lettering geological maps for computer applications. She also encouraged me to address another of my pet peeves, that of inadequate font lettering for multilingual reports. My *True Type* MIG Font™© solves both problems.

**Acknowledgments (in approximate order of utility):**

The ***Leroy Lettering Set (Leroy)*** was the standard used by most American geologists throughout the 20th Century. While the “*hardware*” was analogue, and the means of generation a laborious entry of ink on paper, the hoary “***Leroy***” is deserving of mention as the first widely-adopted standard for the geological professions. Many of the symbols and letters herein were adapted for optimal modern computer usage from the original standard, “***Leroy***.” It is hoped that this new font has been well-enough designed and implemented to become the modern-day equivalent of the “***Leroy***.”

The ***Kroy Lettering Machine (Kroy)*** was used by me to generate map lettering and some adapted symbols for over 100 geological exploration maps during the early-mid 1980s. Kroy management was very responsible and professional and admitted intermittent failings of Kroy devices, and made good on all valid complaints. Kroy was very interested in creating a geological font to my specifications but their prices and terms rendered the effort not feasible, even though protracted good-faith negotiations were undertaken by both sides. While our efforts were not successful, the people at Kroy taught me a great deal of practical and applied value about specialized technical fonts. In a very real sense, the analogue Kroy machine was a near-ideal transition from the traditional manual Leroy to modern digital fonts.

**Lahee**’s book, ***Field Geology***, provided the best example of how a geological instructional book should be organized. In particular, Lahee quoted origins, in the actual languages used, for many of the tools and techniques still used by geologists today.

***United States Geological Survey (USGS)***. In regards to mapping issues, the ***USGS*** is usually considered to employ the “*Gold Standards*” of the profession. Notwithstanding, the ***USGS*** is severely constrained by legacy, administrative, regulatory, large-scale publishing and other mandates not shared by most in the earth sciences. In consequence, what is optimal for the ***USGS*** can and does diverge from what is practical and needed by others. Many general ideas were adapted from published ***USGS*** standards, only in a far more usable form, in a far more intuitive manner of application, and with significantly less ambiguity. In particular, I thank Dr. Wallace “*Wally*” Griffitts, Dr. “*Hal*” T. Morris, Dr. Reinhard “*Bud*” Wobus, Dr. Ogden Tweto {deceased}, Dr. Bruce Bryant and the many other unnamed USGS professionals, in particular in the USGS Library, who have assisted me in the past.

Other national geological surveys, and equivalents, in several countries and American states, were likewise referenced for worthwhile standards different from those of the USGS. In particular, the display of igneous units in lower-case Greek lettering has great practical and theoretical utility: this is more-or-less standard for many European and Asian geological surveys. For example, alpha = andesite, beta = basalt, gamma = granite, delta = diorite, and gammadelta = grano-diorite have been adopted herein as a standard, even though this is not at present an universally accepted standard. Deserving of special mention are the geological standards employed by (in alphabetical order) Australia, China, France, Italy, Russia, the United Kingdom, and of the USA, all of which contributed one or more desirable features for an integrated international geological symbol/lettering set. The standards employed by the United Nations in its various mapping programs also contributed to the development of an ideal geological font. Even though sometimes quite elegant in theory, the geological formation numbering systems adopted by numerous countries are explicitly rejected herein, as being non-intuitive, difficult to use, confusing and very difficult to edit for quality control purposes; ironically, however, the MIG Font™© can be readily adapted in support of such numerical systems. The age-dating numerical system employed by China for igneous units is explained in my China Study, as described elsewhere, herein; however, my China Study replaced China’s numerical system for igneous rocks with the same lettering system used to label sedimentary units, with its many obvious advantages.

**Dr. Anthony R. (*Tony*) Barringer** {deceased} was my boss at Barringer Resources, Inc., during 1981-1982. Tony taught me a great deal, and not limited to geological mapping, over the decades we were friends. Tony’s contributions to geology, to science and to humanity are well-recognized, but I will attempt to provide a very brief synopsis of an illustrious career. Tony was a WW-II British Army paratrooper. After Tony’s release from service, he acquired his PhD (DSc) at Imperial College in London, with a dissertation entitled: “*A Study of Mineralization in the Pyritic Deposits of Spain and Portugal.*” Tony maintained close ties with Imperial College and many of its staff and graduates. From this point on, most of Tony’s accomplishments are well-known, from his dozens of patents ranging over every scientific discipline to his developments of equipment and technology in support of aerospace, geology, geophysics, geochemistry and mapping, among others. Indeed, I first met Tony at NASA/GSFC, where he advised on the development of the *Landsat Thematic Mapper* satellite and other projects. I learned a lot from Tony Barringer and will always respect him and his lasting legacy.

**Fa Han**, geologist and stratigrapher with the PRC Ministry of Geology, explained the conventions utilized by the government of China to support geological mapping. In particular, he explained the intricacies of the numerical system used to describe ages of igneous rocks on Chinese geological maps, without which my study of China’s resources would have been significantly less useful. Other Chinese geologists who contributed substantially to my understanding of PRC geologic map conventions included **Wang Xiaomu, Cao Youwei, Ren Youliang, Xia Hengren** and **Liu Jien**.

**Dr. Anatoliy G. Mironov**, Geochemist with the Russian Academy of Sciences, Siberian Branch, at the Buryat Geological Institute, RAS SD, Ulan-Ude, collaborated with me on matters of geological mapping around Lake Baikal (Bajkal Ozero), in particular, and on areas adjacent to China in general. Anatoliy convinced me that in order to understand Russian geological maps and mapping conventions, it is necessary to integrate Cyrillic characters to make clearly-correct quotes. Anatoliy related many humorous anecdotes about misunderstandings and hilarious misquotes of Russian geological documents, in general, and maps, in particular. Further, Dr. Mironov felt quite strongly that only a font which included Cyrillic characters could be considered truly international.

**Dave Crosby**, *Master Typographer*, taught me to unite the various MIG Font™© tables into a single combined entity, compatible with **Unitype, True Type** and **Open Type** standards. Dave solved numerous technical problems which enabled the MIG Font™© to be completed immediately. Without Dave’s assistance, it might have taken another year to complete the MIG Font™©. Thank you, Dave!

**Denver Mining Club (DMC)** members generously provided ongoing advice and encouragement about the needs of the profession for an usable, affordable geological font. In addition, the DMC provided a venue to present plans about the MIG Font™©: the associated question-and-answer period was particularly helpful.

**Lee R. Rice** discussed at great length advantages and disadvantages of several proposed font-generating alternatives for my already in-process geological font. In addition, Lee purchased the original software (superseded) to enable the MIG Font™© to be developed. I later purchased Font Creator’s High-Logic™© software (see below) and two updated versions.

**Dr. Jan Krason** advised on international usage, in particular for northern and eastern European countries {*i.e.*, Poland}. In addition, Jan advised on certain specialized lettering and symbological issues, with special knowledge of font utilization issues.

**Douglas C. Peters** discussed at length advantages and disadvantages of several proposed alternatives. Doug also assisted as a beta-tester and advisor.

**Richard “*Dick*” Beach** assisted as a beta-tester and advisor.

**Dr. Leo Miller**, {deceased} during the start-up of the ***Lee Creek Phosphate mine*** in Aurora, NC, in 1965-1966, showed me the reality of mining and introduced me to a robust alternative to my then preferred major of Chemistry. In addition, Leo placed in me considerable confidence for a Freshman-Sophomore in college and, insofar as was possible for someone deluged with responsibilities, introduced me both to practical geology and some management of construction personnel. Leo was clearly one the most intelligent people it has been my pleasure to meet.

**Tom Neer** discussed advantages and disadvantages of several proposed font types, with specific analyses of raster, vector, true-type and open-type fonts. Various forms of implementation of fonts on maps and in documents were also discussed.

**Dr. Walter Wornardt**, president of ***Micro-Strat Corporation***, advised me on several occasions of important, practical stratigraphic distinctions to be made based upon micro-paleontological grounds. Walt also advised about graphical depictions of fossils to be incorporated into stratigraphic sections that accompany geological maps. Walt’s advice will figure strongly in future additions of diagnostic fossils to be made available as font symbols to be inserted in stratigraphic section graphs and charts. Ultimately, Walt’s advice enabled me to create a novel font system that preserves both chronostratigraphic and lithostratigraphic information.

**Eugene “*Gene*” Moore** was my very first oil-patch client (1975-1977). Gene was an investor who focused primarily on oil plays in Louisiana and Texas, secondarily on coal properties and thirdly on everything else. Gene’s focus on ***due-diligence***, in effect what he hired me to perform for him, was an excellent introduction to the reality of the oil industry, complete with smoke-and-mirrors and, occasionally, extravagantly unsupported claims of high-potential for some properties. A critical part of my services for Gene was the generation of impartial maps showing the results of my well-log analyses (isopachous and isoplethous, permeability, porosity, *etc*.) relative to known production. This necessitated the use of a variety of geological symbols and all the problems inherent in meaningfully portraying information symbolically – in this case for investor groups seeking a second, impartial opinion. Even though Gene maintained a very low profile, at his own insistence, he was extraordinarily successful in the oil-patch game, with his investments showing a better than 70% success ratio for both step-out and wildcat wells. Gene’s philosophy was that his primary decision-making *criterium* was to invest in the man more than the play. As he expressed it, a good man who can be trusted will leave an investor far better off, even when exploration is marginal, than a crook would, with a bonanza find. Gene was a big believer in hiring a good oil-patch lawyer before you need him, to prevent problems, rather than after the fact of a problem developing, when it is usually too late to correct a problem which could have been easily avoided. It is difficult to imagine a more desirable real-world mentor for a new geologist than Gene Moore.

**Dr. Michael Pick** (retired) during the 1980s exposed me to the reality of international oil & gas exploration (primarily) and metals exploration (secondarily), complete with differing national standards and sources of information. Michael’s personal and professional standards were the very highest – and he insisted upon the same from those who worked for him, along with clear, unambiguous reports. Michael was very methodical and meticulous about acquiring as much information as possible about prospects and properties, with some of the most useful maps and documentation a century or more old in languages other than English (especially in Indonesia). Generally, Michael’s first effort at exploration was an inexpensive survey of information, in libraries and government archives. Only after he had verified potential from impartial sources did he proceed to acquisition of more expensive geophysical, geochemical, geological and remote sensing – and even then, Michael ensured that analyses utilize and integrate all available knowledge – and that verification by field geologists was absolutely necessary. What I most admired about Michael was his ability to get his staff to work together, rather than engage in the infighting especially common between geophysicists and geologists. Michael was results-oriented and his successes reflected that. Especially impressive was his use of information from disparate disciplines, in particular geophysical, well-logs, geological and remote sensing to support (or not) the others’ views. In particular, my working directly with Michael’s geophysicists, who used seismic data to view in the third (depth) dimension, enabled me to see which of the faults propagated to depth (were significant) and enabled the geophysicists to accurately map and tie together fault lines visible on both seismic lines and satellite imagery. I consider myself blessed to have worked as an exploration consultant with Michael in the USA, Indonesia, South America (various countries), Europe, Africa and the Middle East. Michael’s use of obscure imagery types, including the 1960s-era Westinghouse L-band imaging radar, X-band aerial imaging radar (and SIR-A and –B satellite imagery), Landsat, aerial photos, *etc*., were both continuing education for me and a means for Michael to conduct geological exploration and mapping most cost-effectively. When it came to geological exploration, Michael Pick had an open mind, which reflected in his extremely high success rate and comparatively low-cost exploration.

**Jack Zahn** and co-worker, **Ted Weller**, retained my consulting services (1980s) for oil & gas projects in the USA, South America (various countries), Australia, Italy and the Middle East. In terms of professionalism, their standards were in the same league as those of Dr. Michael Pick, high praise, indeed.

**Richard “*Rich*” Munn** taught me a great deal about the oil & gas industry. Rich is a real expert on the industry, with numerous wildcat discoveries and a great deal of new step-out production to his credit as the owner of an independent oil company.

**Steve Reynolds** (Geologist) and his brother, **Chris Reynolds** (Oil Man, Railroader, Draftsman & Miner) are well-known independent oil men in Colorado. Our collaboration has been mutually beneficial. Chris, in particular, taught me several better ways to accomplish analogue mapping. As is entirely necessary, but all too often neglected (takes time and effort), Steve is a real stickler for geological accuracy on maps.

**James Allen “*Al*” Gilreath** (Schlumberger), was unparalleled in his ability to conduct well-log analyses and to use the information in support of exploration for and production of oil and gas. Even though our face-to-face contacts were intermittent, Al taught me a great deal about the proper utilization and analysis of well-logs in support of oil & gas exploration. Without having heard Al’s lectures and access to Al’s tutorials on well-log analyses, my work would have been of far less value to my clients.

**Dr. William “*Bill*” Pelton**, geophysicist, expanded my intellectual horizons and financially assisted some of my efforts, in particular those in Mongolia. Bill’s professional advice has been extremely useful, in a variety of applications.

**Chester “*Chet*” Bebber** was one of the last of the old-time photogeologists. Chet contributed very significantly to photogeological mapping and symbology in support of oil & gas exploration projects in Indonesia.

**Donald “*Don*” Kidd** (deceased) was a fine geophysicist with an excellent working knowledge of geology. From the mid-1980s until the mid-1990s, Don and I evaluated the technology of ground-penetrating radar and seismology (both reflective and refractive) in support of shallow-depth mapping of strata and of igneous rocks. Don’s experience in China, anecdotes of which he freely shared, broadened my practical knowledge of Chinese geological mapping, as seen through the eyes of a geophysicist.

**James “*Jim*” Wallace** is a fine geologist who has for over a decade offered services in support of the filing of *Environmental Impact Statements*, mostly in the northwestern USA. He emphasized on several occasions the need for at least a symbol on geological maps to indicate an area of known environmental concern.

**James R. “*Jim*” Piper** discussed on several occasions advantages and disadvantages of several proposed MIG Font™© alternatives.

During the formative stages of my life, in the 1950s, my Aunt, ***Martha {Marta} Maness***, and her brother, ***Jose Luis {Pepi} Segura***, of Guadalajara, Mexico, exposed me to the reality of systemic cultural blinders. Aunt Marta and Pepi were, at the time, the most sophisticated, highly-cultured and best-educated people it had been my pleasure to meet and learn to respect. Without their very positive influence, it is unlikely that I would have been as impartial and open to potential font improvements from other nations.

**Herbert “*Herb*” Blodget** (deceased) was a fine geologist and a superior scientist at NASA/GSFC whose personal and professional ethical standards were unblemished. Herb was very painstakingly thorough in his geological mapping and formulation of statistical measurements in support of objective benchmarks for measuring the effectiveness of Landsat imagery in geological mapping. Herb’s work would have benefited immensely from the availability of the MIG Font™© and modern GIS software.

**Nimrod D. Carroll** (deceased), my High School algebra, geometry & trigonometry teacher, taught me how to think quantitatively and rationally, in spite of my youthful wilfullness. Without Mr. Carroll’s positive guidance, I would have become far less of a scientist and far less as a human being who values provable, objective truth.

**R.J. Irace**, during 1972-1974, educated me about fonts and how to choose the optimum font for specific publishing applications.

**Robert D. Boyd**, in 2009, provided a copy of the unclassified DOD transliteration (Russian to English) document used in the Cyrillic (Russian) table.

**FontCreator 6.1**© 1997-2006, by *High-Logic Software*, Tuinstraat 60, 3732 VM De Bilt, The Netherlands, **http://www.High-Logic.com**, was used to create the MIG Font™©. Other High-Logic Software products used were **MainType**© and **Scanahand**©. The High-Logic Software products (*esp*. FontCreator©) were, with few exceptions, poorly documented and very difficult to learn to use. High-Logic does **not** have any “Help Desk” *per se*, depending instead on a “Forum” available to registered licensed users. While the Forum is useful for socializing and philosophizing, my experience was that the Forum has negligible value as a replacement for a “Help Desk.” While High-Logic software is powerful and flexible, once it has been learned, users/clients would benefit immeasurably from a meaningful, detailed tutorial that would lead clients from the earliest stages of font generation through to a final, professional product. Very limited MS VOLT© capabilities were also utilized as a supplement to High-Logic products.

Mrs. **Alexandra Coleman** and Ms. **Anika Blanck**, both native German speakers, reviewed the MIG Font for accuracy, in particular regarding German language matters.

Last, but certainly not least, I gratefully acknowledge the “***G.I. Bill***,” administered by the **U.S. Department of Veterans Affairs**, without which I could not have completed my university education and could not have become a geologist. In addition, I hereby thank the doctors and staff of the **Denver VA Medical Center** for, quite frankly, saving my life, and for extending my life at least a decade. While saving the lives of veterans and making their quality-of-life better is routine for the VA docs, it is far from routine for those of us who have benefitted from their professionalism and genuine care.

**Introduction:**

The MIG Font™© is designed to fulfill all the ordinary needs of international geologists for both geological letters & symbols and a multilingual Latin-Greek-Cyrillic alphabets font. In addition, the Chinese phonetic Bo-Po-Mo-Fe font is included. Other Asian phonetic alphabets are *in-process*.

The word “Table” herein refers to individual lettering, symbol, *etc.*, glyphs created in an associated True-Type font, identified by title and number {*e.g.*, “MIG Font™©  Latin & Geological Lettering (Tables 00 & 01)}.

The symbols, letters, characters and glyphs in each font are optimized to approximate and improve widely-accepted geological conventions in a manner best suited for near-identical (smaller, more transparent footprint, *etc.*) entry on geological and other maps. **Ambiguity is minimized by creating unique symbols for concepts and items with differing meanings, including alphabetical, temporal, lithological, structural, degree of metamorphism and environmental interest, *etc*.** Recommended forms/conventions for expressing font characters in what amounts to “*GIS attributes*” in a consistent, usable form for computer software are specified. Of great importance is that this font will be equally usable on all major hardware operating system (O/S) platforms: Microsoft, Mac (OS-X), Linux and UNIX.

Ultimately, it is hoped that the provision of an intuitively-clear unified means of recording and describing geological information will assist in bringing together the various earth science disciplines, which are gradually fragmenting and developing often inconsistent and incompatible usages. Further, the provision of this font *via* the internet with desirable price and usage terms for a copyrighted product should be widely adopted by national geological surveys, private resources firms, consultants, professors and students of geology who are seeking a readily-usable *true-type/open-type font* with all its advantages in modern computer (*i.e.*, ***Geographic Information Systems*** {*GIS*}) applications. Note that initial efforts are focused on developing a True-Type font, with Open-Type font compatibility to be enabled later. A preliminary form of Unicode usage has been implemented herein. Most (probably all) applicable software already supports Open-Type fonts, anyway.

The MIG Font™© enables use on maps and in documents of letters, numbers, symbols, *etc.*, with a wide variety of very desirable characteristics of interest to geologists and other earth scientists. For example, size can be specified, along with color, regular or bold, italicized, *etc*. This ease of flexibility of publishing is a great advance for the profession.

Another advantage of this method of providing the MIG Font™© is the ease with which recursive, iterative improvements can be made, and provided quickly over the internet.

Ultimately, in a fundamental sense, the MIG Font™©’s purpose is to communicate truly and to truly understand. Languages, symbology, GIS, mathematics, statistics and logic are all at the heart of modern technology. To integrate all, in one package, is fundamentally important to mankind in order to discover, inventory and evaluate the earth’s resources.

At this time, it is intended for the following separate “Tables” (*aka* “Planes” on some systems) to be included in the MIG Font™©, with Tables 00, 01, 02, 03, 04, 05, 06, 07 and 08 already completed to the Version 1.00 level.

•Multi-lingual letters (Tables 00 & 01 {almost all of these alphabets are complete in Table 00.})

•Croat

•Dutch

•English

•French

•German

•Italian

•Polish

•Portuguese

•Serbian

•Spanish

•Extended mutli-lingual letters (Tables 00 & 01)

•Afrikaans “Boer” [Dutch] dialect

•Celtic (Gaelic)

•Czech

•Danish

•Estonian

•Finnish (including Sami [Lapp] dialects)

•Flemish

•Gaelic [Celtic]

•Hawaiian

•Hungarian

•Icelandic

•Latvian

•Lithuanian

•Norwegian

•Romanian

•Swedish

•Turkish

•Walloon

In addition, many other non-European languages have adapted the Latin alphabet to approximate phonetic (or syllabary) usage, using equivalents of the glyphs herein. Also see Phonetic Alphabets. A prominent example is Chinese, through the following phonetic alphabets:

•Pin-Yin

•Wade-Giles

•Other European alphabets/letters (Tables 02, 03 & 04)

•Greek letters (Table 02)

•Cyrillic (Russian) letters (Table 03), plus Cyrillic variants below (Tables 03-04):

•Abazin

•Abkhaz

•Adyghei

•Aleut

•Altai

•Avar

•Azerbaijan

•Bashkir

•Bulgarian

•Buryat

•Belorussian (*aka* Byellorussian or “White Russian”)

•Chechen

•Chukcha

•Chuvash

•Dargin

•Dolgan

•Dungan

•Even [Lamut]

•Evenk [Tungus]

•Enets

•Gagauz

•Hakass

•Hanty [Kazym & Vahov]

•Ingush

•Inuit [Eskimo]

•Itelmen

•Kabardin [Cherkess]

•Hakass

•Kalmuk

•Kalmyk [Mongol]

•Karachay-Balkar

•Karakalpak

•Kazakh

•Kirgiz

•Ket

•Komi-Permyak

•Komi-Zyrian

•Koryak

•Kurdish

•Lack

•Lezgin

•Macedonian

•Mansi

•Mongolian

•Mountain Mari (also see Valley Mari.)

•Nanai

•Nenets

•Nganasan

•Nivh

•Osetin (*aka* Osetian)

•Russian (the “Standard” Cyrillic of today)

•Sami [Lapp]

•Selkup

•Serbian

•Shor

•Tabasaran

•Tadjikh

•Tatar

•Tofalar

•Turkmen

•Tuva

•Udmurt

•Uighur (pronounced Wee-gur)

•Ukrainian

•Ulch

•Uzbekh

•Valley Mari “*aka* Mari” (also see Mountain Mari.)

•Yakut

•Yukagir

•Geological symbols (Table 05)

•Geological lettering (Table 06)

•Mathematical, statistical and logic letters (Table 07)

•**Phonetic** alphabets for selected Asian languages (Later Tables, to be decided)

•Chinese

•Bo-Po-Mo-Fe (*aka* Bo-Po-Mo-Fo & Bopomofo) A true phonet/syllabary alphabet.

•Pin-Yin A Latin-based phonetic alphabet.

•Wade-Giles A Latin-based phonetic alphabet.

•Japanese (Hiragana)

•Korean (Hangeul, *aka* Hangul)

The Chinese Bo-Po-Mo-Fe phonetic alphabet is already completed as Table 08, which will contain a tutorial on the history and usage of various Chinese phonetic alphabets. In short summary, the various Chinese phonetic alphabets all have advantages and disadvantages. The Bo-Po-Mo-Fe, while an unique phonetic alphabet not appearing on keyboards, does render the best pronunciation scheme for Chinese; however, most usage of Bo-Po-Mo-Fe is in Taiwan (Republic of China). Pin-Yin is the official phonetic alphabet of Mainland China (People’s Republic of China) and has both the advantages and disadvantages of being based upon the Latin (*aka* Roman) alphabet, whose pronunciations are notoriously flexible and ambiguous. The Wade-Giles phonetic alphabet is the original widely-accepted Latin-based standard, which has become practically obsolete in the modern world. Notwithstanding, many Chinese family names, *etc.*, in the West are spelled using Wade-Giles: for example, the common name “Chen” (or “Chin”) is derived using Wade-Giles guidelines. The Pin-Yin equivalent is “Qin,” which, while still unusual outside the PRC, is becoming steadily more common. In addition, and quite significantly, most documents and maps (*e.g.*, the ONC and ANC series of aeronautical charts) published by US and NATO/SEATO governments used variants of the Wade-Giles phonetic alphabet until quite recently, with many probably still in official use. For example, I possess numerous pre- and post-WWII resources maps of China which use the Wade-Giles phonetic alphabet.

•Additional tables, to be determined. At special request, phonetic (alphabetic or syllabary) tables for minority and aboriginal languages (*e.g.*, Cherokee) will be considered. Even though not falling, *sensu strictu*, within this description, Hindi is of special interest, since it is a majority language in India. Another eventual probable separate table is “Computer Sciences.” Alphabets which read from right-to-left, including Hebrew and Arabic, are also being considered; however, it would be the sole responsibility of users to have appropriate software to enable proper input, display and printing. No tutorial on inputting right-to-left reading alphabets is presently contemplated.

It is intended that this MIG Font™© will be supplemented with additional computer-compatible products enabling the easy and straightforward assignment of patterns, colors, and paleontological symbols, *etc.*, primarily for use on maps. As GIS attributes, *true-type/open-type* formation symbols within polygons can be automatically programmed to display the areas within the polygons in specified patterns, colors, *etc*. For one specific example, a polygon labeled with the prefix indicating “*Very Metamorphosed*” can be programmed to automatically display on a map a specific pattern indicating the stated degree of metamorphism, as well as automatically calculate statistics (*e.g.*, areas) and other correlations (*e.g.*, amount of tungsten mined relative to degree of metamorphism). Literally, such correlations are only limited by the imaginations of the analyst and the information entered as (GIS) attributes on the map(s) being analyzed. In addition, the ability to specify different line types, thicknesses, colors, 3-D display, *etc.*, on maps, using standard off-the-shelf computer software is separately *in-process*. These capabilities are a major practical advance for the geological profession and will continue to grow as geologists become more aware of how powerful such modern analytical tools are.

No two geologists agree on everything. An example of a trivial difference over which geologists could come to blows is how to differentiate fractures from joints, or even whether such a differentiation has meaning. I, personally, feel that fractures and joints are one-and-the-same; however, to accede to the demands of those who think otherwise, entirely different symbols for fractures and joints are included. Every symbol herein can be similarly disputed, in every aspect: mapping, usage, descriptors, **everything**. For another prominent example, I think of a vein as a mineralized fault or fracture or formation contact; however, others define veins differently. Ultimately, it is up to the users to determine and define for themselves how these geological symbols and letters will be used. I cannot do more than provide a viable international geological font with recommend usage(s).

Due to prior outrageous abuses, in particular the **Bre-X fraud** which cost Canadian investors billions of dollars, the Canadian government imposed reasonably stringent reporting requirements (National Instrument 43-101) on all those who wish to raise capital on the Canadian exchanges, with reporting requirements varying somewhat among provinces. Among the goals of NI 43-101 was the ability to readily perform *due-diligence* on ostensible facts presented: a continuing problem has been the reliance on (often subjective) translations of documents and maps from foreign languages into English and French. Canadian NI 43-101 has been so successful at minimizing abuses that NI 43-101 standards have been adopted internationally, even when no intent to raise capital on the Canadian exchanges is contemplated. The MIG Font™© enables the ready *verbatim* quotation of all major European and Cyrillic languages directly into NI 43-101 reports, meaning that recipients can easily and quickly do their own impartial translations. In others words, one of the advantages of the MIG Font™© will be to enable users to more easily comply with at least some legal and investor requirements.

This is an iterative document, subject to change without notice. Users are advised to ensure that this reference document is the latest available, as determined by the date under the Heading on the first page.

**MIG Font™© Design Criteria**

The MIG Font™© was designed specifically for the use of international geologists who are at least somewhat computer literate, and have a need for a *true type/open type geological font* that can be used both for multilingual report generation, and for direct entry on digital maps and within data bases.

Characters for insertion in map polygons need to be geometrically optimized specifically to enable efficient usage, which means a reasonable trend towards characters incorporating vertical and horizontal lines while avoiding curved line segments. In general, since there can be several letters to define a specific geological formation, it is better to design font characters that are compressed horizontally, while retaining clarity. In addition, all characters are optimized for presentation in as small a space as reasonably possible, both as individual characters and in association with other, adjacent, characters (*i.e.*, Kerned). In other words, the spacing between kerned letters varies with the shape of the letters: a capital letter V would nestle close to a capital letter A, for example, rather than being a set distance apart as in an old-fashioned typewriter.

Characters must retain an optimally small “*footprint*” to enable viewing a satellite image or photo, *etc.*, through the characters on the overlying digital or hard-copy map. At present, a major hindrance to photogeological interpretation is the inability to clearly view the underlying image through the overlying map. Within this same principle, the usage of patterns on maps (*e.g.*, to denote metamorphism) has always been a very substantial hindrance to efficient analyses, while multiplying errors. In consequence, a special set of narrow characters to denote relative amount of metamorphism has been created within the MIG Font™©: this enables the retaining of information about metamorphic grade while enabling efficient viewing and less cluttered analysis through the overlying digital map.

Whenever reasonably possible, straight lines (horizontal and vertical) composing characters, numbers and symbols (*i.e.*, in the font glyphs) are used to replace curves, when to do so follows an existing MIG Font™© convention and does not lessen legibility. Straight lines are easier to program in fonts, occupy less disk space, run faster, are less cluttered when displayed on maps, are more easily and accurately recognized by ***Automatic Character Recognition (ACR)*** {*aka* ***Optical Character Recognition (OCR)***} software, *etc*.

Font letters are kept simple, with a minimum of unnecessary embellishing curlicues, *etc*. This minimizes size and clutter, optimizes clarity, and enables good viewing through a digital map to the imagery, *etc.*, beneath, while optimizing discriminability by ACR software.

**Ambiguity Minimization: Letters**

When letters, symbols, *etc.*, are properly (uniquely) crafted and positionally organized to avoid ambiguity, problems with misinterpretation are minimized: that is one of the primary purposes of the MIG Font™©. Diacritical marks, like cedilla and ogonek are included; however, proper usage is complex and a matter for users to implement as users desire. Many identical, duplicative letters exist across languages. When these are observed, a “*standard*” is referenced, in most cases for European languages, English. Duplicate letters in Russian (Cyrillic) are referred to the English or Greek equivalents, as appropriate. When unique letters occur in a language, for example the slashed-L in Polish, an additional unique letter is created in the appropriate table(s) in the font. In a very rough sense, the MIG Font™© is somewhat similar in concept to the simple and clear font used on automobile license plates.

**The lower-case letter “l,” the number one “1,” *etc*.**

Regarding the problem of ambiguity between the number 1 = one, and the lower-case letter = l, this has been solved in the MIG Font™© by creating a clearly different separate font number 1 = one. Unfortunately, the *Helvetica* font has been frequently adopted by organizations (*e.g.*, the USGS) as **the default** for geological work. While the *Helvetica* font is a beautiful work of art and has many positive features, this absolute ambiguity between the lower-case letter “l” and the number one “1” is a fatal flaw, which severely limits utility.

Insofar as arbitrarily limited symbology in geology, no single example is more blatant and chronically problematic than the lower-case l, which can mean either a lower-case l (*e.g.*, a formation identified as “l”), an ZZU_l_lc00_lower = lower (in the relative stratigraphic sense), and ZZU_l_lc01_late = late (in the absolute temporal sense). The severe and frequent problem of geological ambiguity represented by the letter “l” has been solved within the MIG Font™©, with a combination of two procedures.

The first procedure is to restrict the stratigraphic “ZZU_l_lc00_lower” and the temporal “ZZU_l_lc01_late” to the position of a prefix in the formation identifier code (analogous to the p = pre): in contrast, the ordinary letter “l” as a formation identifier code is restricted to being a suffix.

The second procedure uses totally separate and distinctive letters to differentiate betweenZZU_l_lc00_lower= lower and ZZU_l_lc01_late = late. Due to prefix and suffix positioning, no ambiguity should exist among the three forms of the letter l. TheZZU_l_lc00_lower= lower is also the simplest font character: a simple vertical line, without embellishment. In stark contrast, a specific new font letter, ZZU_l_lc01_late, has been created to represent ZZU_l_lc01_late = late. This new font letter “ZZU_l_lc01_late” is composed of a single vertical line with a shorter horizontal line intersecting at the bottom and extending to the right. The only proper usage of this font character is to represent the temporal ZZU_l_lc01_late = late.

**The Lower-Case Letter “m”.**

The lower-case letter “m” has always been a significant element of ambiguity with regards to geological mapping, since it can connote either or both a relative stratigraphic position and/or a precise temporal period. This is, at least in part, the same problem as encountered with the lower-case letter “l,” and has been resolved in the same way. Two different font characters have been created to differentiate between the relative stratigraphic position and the temporal period. The relative stratigraphic position retains the straightforward lower-case “ZZU_m_lc00_middle_position”: the temporal “ZZU_m_lc01_middle_time” has a dash (or horizontal bar) through the middle bar.

**The Letter O, the Scandinavian slashed , the Greek Omicron “O” and the Number Zero “****.”**

To avoid ambiguity, the lower-case Greek letter Omicron “O” is made noticeably thinner at the top and bottom and visibly thicker at the sides.

The letter “O” is rounded: the number zero “” is compressed horizontally with a fully-contained slash.

The number zero “” is compressed horizontally and three variations (and  and ) of the number are presented. A major continuing problem is the entering of the **letter** “O” in data bases (by people lacking sufficient expertise with computers), rather than the **number zero** “.” While a clear differentiation between the number and the letter in the MIG Font™© will not guarantee more conscientious data-base behavior, at least it should minimize unnecessary work during the later Quality Control (QC) stages of projects. In addition, all letter Os in specific columns in a data-base can be automatically found and replaced with number zeroes (), using standard search and replace software features; however, all such automatic “*search and replace*” activities should be closely checked to ensure that you are actually doing what you think you are doing!

The Scandinavian slashed letter “” is present in the MIG Font™©, in both upper- and lower-case forms. It is clearly distinct from the number zero by both the angle of the slash and by the slash’s extending beyond the edges of the O. In the zero, the slash is a different angle and stops at the edge. This convention conforms with established European and other usage.

I cannot begin to convey just how frequently people experience severe problems with their computers and software because of their false assumption that a capital O is the same as the number zero (). Such problems can be particularly severe when they involve a file name, an userid, a password or other critical component of a computer-enabled operation. If you are experiencing an inexplicable computer problem, check that your letter O(s) and your number  (s) are correct.

**The letter p, the Greek letter Rho.**

In the MIG Font™© all the Greek letters have been made distinctively different from otherwise similar English letters. Among the many desirable consequences, far more igneous and volcanic units are now uniquely assignable.

**The Numbers Six “6” and Nine “9.”**

On geological (and other!) maps, it is common for lettering to be angled or even overturned. Differentiating the number six “6” from the number “9” is an occasional problem which has been resolved by creating font characters that are clearly different, regardless of orientation. Two clearly different optional versions ( and ZZT_9a) of the number nine are available in the MIG Font™©, with the strongly recommended, unambiguous  the clear preference.

**The Number Three “.”**

The number three “3” (with two curves) poses occasional problems, especially in Russian, where it can easily be confused with one of the *Cyrillic* letters, that which has an English-equivalent “z” sound. Consequently, the number three “” in the MIG Font™© is composed (top half) of two intersecting straight lines and (bottom half) a curve. This usage also conforms with the principle adopted for font generation herein, whereby straight lines are used to replace curves, when to do so follows an existing convention and does not lessen legibility. A possible problem with one of the Cyrillic minority alphabets exists even with this scheme; however, a similar, yet clearly different, Cyrillic letter with additional “flourishes” (glyphs) has been created to minimize ambiguity.

**The Number Seven “.”**

The number seven “” is provided as two separate optional font characters, the first in the simple American (or English) style and the second, alternate, , with a “horizontal dash” through the number, as is conventional in many countries (*e.g.*, Germany).

**The “Hyphen,” the “Dash,” the “Minus,” the “Emdash” and the “Endash.”**

Just as in the letter Oh (O) and the number Zero (), the Hyphen, the Dash, the Minus, the Emdash and the Endash, while superficially similar, are logically different and will be read differently by the computer.

 = hyphen

 = minus

 = dash

 = Endash

 = Emdash

Just as with those who insist on entering capital Os for zeros, such differences, while apparently innocuous, can cause programs to crash or not run properly (*i.e.*, give wrong answers) and can cause any number of hard-to-locate problems. For logical operations, in particular, it is necessary to have distinctively different letters, symbols, *etc.*, for different concepts to be numerically represented for computer operations. To be specific, a hyphen is used in grammar (*e.g.*, to separate portions of telephone numbers). The dash has an ambiguous usage, generally in positions for which neither a hyphen nor a minus are appropriate, such as to indicate in a table a lack of information. The minus is a mathematical operand, nothing more, nothing less. The emdash (or Em Dash) is technically a dash the width of a capital M, but conveys abrupt changes in thought, a digression or change of speakers, *etc*. The endash (or En Dash) is technically a shorter dash, the width of a capital N, and used to specify ranges in numbers and dates. Both the emdash and the endash are very precisely defined and delimited products derived from, and designed to support, the use of html programming code. Technically, both the emdash and the endash are **font specific**, referring to the precise widths of the letters M and N in a given font: what this means in practical terms is that the endash can be, and sometimes is, the same size as a dash or a minus! After quite a bit of nonproductive experimentation, I have arbitrarily set the length of the endash to be longer than the dash and shorter than the emdash, to reject ambiguity. Whether or not the widths of the endash and emdash herein actually correspond to any existing font is unknown at this time: if so, it is entirely accidental. However, the widths will approximate those of many existing fonts.

The “Less Than (<)” and “Greater Than (>)” symbols *versus* the visually-similar Guillemot (single) symbols.

For the reasons given above, “Less Than (<)” and “Greater Than (>)” symbols should be used only in mathematical operations. The Guillemot symbols, and other similar symbols should be used only in the appropriate grammatically-correct manners.

**Use of MIG Font™© in Documents**

As an ***Unitype/Open Type/True Type*** compatible font, the MIG Font™© is directly usable in all standard word-processing software. This portion is a simple tutorial about how to use standard software to display and print the MIG Font™©. Again, as a compatible font, once it has been installed as a font on the computer, it is available for direct access and use in precisely the same ways that other standard fonts are used.

In regards to Table 00, all the letters, numbers and special characters on a standard keyboard will print the same characters as on the keyboard. However, a lot of additional characters are in Table 00 beyond what is displayed on the keyboard. To display, print and otherwise use those additional characters is simple and follows entirely ordinary procedures, as discussed in the following.

In regards to all the other tables, 01-07, printing those characters can be done in either of two ways. The first is to press the appropriate key(s) and the second is to insert the desired characters by looking at the appropriate font table and clicking on the character desired.

MicroSoft Word Documents

In regards to Table 00, most letters print as indicated on each individual key: other tables require either learning which key(s) invoke which characters or using the “Insert” option.

The most straightforward method is to simply (1) click on the “Insert” command at the top of the screen; then (2) click on the “Symbol” option; then (3) click the down arrow under the “Font” option until the desired font scrools up; then (4) click on the desired font; then (5) click on the desired character and; then (6) click on the “Insert” key. In this entirely ordinary way, any desired character can be inserted in any desired location in a document.

**Use of MIG Font™© in Maps**

…

**Installation of MIG Font™©**

To install the MIG Font™©, the following MicroSoft instructions should be followed:

Article ID: 314960 - Last Review: September 22, 2008 - Revision: 4.1

# How to install or remove a font in Windows

[View products that this article applies to.](http://support.microsoft.com/kb/314960#appliesto)

This article was previously published under Q314960

This article replaces 130233 (Q130233) for Microsoft Windows 95, Microsoft Windows 98, and Microsoft Windows 98 Second Edition.

[**On This Page**](javascript:void(0);)

* [[http://support.microsoft.com/library/images/support/kbgraphics/public/en-us/downarrow.gif](http://support.microsoft.com/kb/314960)Introduction](http://support.microsoft.com/kb/314960)
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  + [[http://support.microsoft.com/library/images/support/kbgraphics/public/en-us/downarrow.gif](http://support.microsoft.com/kb/314960)To reinstall the standard fonts included with Windows](http://support.microsoft.com/kb/314960)

[Expand all](javascript:void(0);) | [Collapse all](javascript:void(0);)

[Introduction](javascript:void(0);)

**This article describes how to add and remove fonts in Microsoft Windows. Note If...**

This article describes how to add and remove fonts in Microsoft Windows.   
  
**Note** If your computer runs Windows NT 4.0, Windows 2000, Windows XP, or Windows Server 2003, you must be an administrator to add or remove fonts. To verify that you are logged on to Windows with a user account that is a computer administrator, visit the following Microsoft Web site:

<http://support.microsoft.com/gp/admin> (http://support.microsoft.com/gp/admin)

[[http://support.microsoft.com/library/images/support/kbgraphics/public/en-us/uparrow.gif](http://support.microsoft.com/kb/314960#top)Back to the top](http://support.microsoft.com/kb/314960#top)

**To add a new font**

**Note** To reinstall standard Windows fonts, go to the "[To reinstall the standard fonts included with Windows](http://support.microsoft.com/kb/314960#3)" section.   
  
**Important** To install fonts, you must have them on a floppy disk, CD, or your hard disk.   
  
To install a font, follow these steps:

1. Click **Start**, and then click **Run**.
2. Type the following command, and then click **OK**:

**%windir%\fonts**

1. On the **File** menu, click **Install New Font**.
2. In the **Drives** box, click the drive that contains the font that you want to add.  
     
   **Note** The floppy disk drive is typically drive A or drive B. The CD drive is typically drive D.
3. In the **Folders** box, click the folder that contains the font that you want to add, and then click **OK**.
4. In the **List of fonts** box, click the font that you want to add. To select more than one font at a time, press and hold the CTRL key while you select each font.
5. Click to select the **Copy Fonts To Fonts Folder** check box. The new font is saved in the **Windows\Fonts** folder.
6. Click **OK**.

**Note** Windows supports TrueType fonts or fonts that are designed especially for Windows which can be purchased separately. Some programs also include special fonts that are installed as part of the program installation. Additionally, TrueType or special Windows fonts are frequently included with printers. Follow the directions that are included with these products to install these fonts.

[[http://support.microsoft.com/library/images/support/kbgraphics/public/en-us/uparrow.gif](http://support.microsoft.com/kb/314960#top)Back to the top](http://support.microsoft.com/kb/314960#top)

**To remove a font**

To remove a font from the hard disk, follow these steps:

1. Click **Start**, and then click **Run**.
2. Type the following command, and then click **OK**:

**%windir%\fonts**

1. Click the font that you want to remove. To select more than one font at a time, press and hold the CTRL key while you select each font.
2. On the **File** menu, click **Delete**.
3. When you receive the "Are you sure you want to delete these fonts?" prompt, click **Yes**.

**Note** You can prevent a font from loading without removing it from the hard disk. To do this, move the font from the **Windows\Fonts** folder to another folder.

[[http://support.microsoft.com/library/images/support/kbgraphics/public/en-us/uparrow.gif](http://support.microsoft.com/kb/314960#top)Back to the top](http://support.microsoft.com/kb/314960#top)

**To reinstall the standard fonts included with Windows**

If any of the standard fonts that are included with Windows are missing, you can run Windows Setup again. Setup replaces missing or changed files. If the standard fonts are missing, other Windows files may also be missing. Setup also reinstalls these files.  
  
**Warning** If you run Windows Setup, you may lose programs and hardware drivers that you have installed since the last time Windows was set up on your computer. If you need more information about the files you could lose, you might want to contact Support. For information about how to contact Support, please visit the following Microsoft Web site:

<http://support.microsoft.com/contactus> (http://support.microsoft.com/contactus)

The following fonts are included with Windows and are installed on every computer:

* Courier New (TrueType, including Bold, Italic, and Bold Italic variations)
* Arial (TrueType, including Bold, Italic, and Bold Italic variations)
* Times New Roman (TrueType, including Bold, Italic, and Bold Italic variations)
* Symbol (TrueType)
* Wingdings (TrueType)
* MS Serif
* MS Sans Serif

[[http://support.microsoft.com/library/images/support/kbgraphics/public/en-us/uparrow.gif](http://support.microsoft.com/kb/314960#top)Back to the top](http://support.microsoft.com/kb/314960#top)

**APPLIES TO**

* Microsoft Windows Server 2003, Enterprise Edition (32-bit x86)
* Microsoft Windows Server 2003, Datacenter Edition (32-bit x86)
* Microsoft Windows Server 2003, Standard Edition (32-bit x86)
* Microsoft Windows Server 2003, Web Edition
* Microsoft Windows Server 2003, Enterprise x64 Edition
* Microsoft Windows Server 2003, 64-Bit Datacenter Edition
* Microsoft Windows XP Professional
* Microsoft Windows XP Home Edition
* Microsoft Windows XP Tablet PC Edition
* Microsoft Windows 2000 Advanced Server
* Microsoft Windows 2000 Datacenter Server
* Microsoft Windows 2000 Professional Edition
* Microsoft Windows 2000 Server
* Microsoft Windows Millennium Edition
* Microsoft Windows NT Server 4.0 Standard Edition
* Microsoft Windows NT Workstation 4.0 Developer Edition

**Keyboard Language Control**

<http://www.ehow.com/how_6014792_change-keyboard-language-windows.html>  
  
**How to Change the Keyboard Language on Windows**  
By Christopher Mathew Burt, eHow Member  
  
Difficulty: Easy. Instructions, Things You'll Need: \* Computer,  \* Windows OS  
  
Step 1: Click the "Start" button at the bottom-left of your screen.  
  
Step 2: Choose the "Control Panel." It will be on the right side of the box above the "Start" button.  
  
Step 3: Click "Clock, Language, and Region."  
      Under the "Region and Language" header, choose "Change keyboards or other input methods."  
      A new box ("Region and Language") will appear. Under the "Keyboards and Languages" tab, click "Change keyboards..." The "Text Services and Input Languages" box will open.  
  
Step 4: Go to the "Language Bar" tab first.  
      Choose if you want the language bar on your desktop, in your taskbar, or hidden. If this is a one-time action of typing in a different language, leave it hidden and do it manually. If you are going to do this often, choose one of the first two options. (I personally like the docked in the taskbar option.)  
      Click "Apply."  
  
Step 5: Go to the "General" tab and click "Add..." under the "Installed Services" section.  
      Choose your language. Make sure to expand (+) the language to choose the correct dialect. (For instance, I am learning Ancient Attic Greek so I need "Greek Polytonic" instead of just Greek.) The correct dialect will have the necessary characters.  
      After you've checked the language and dialect you want, click "OK."  
      Click "Apply" at the bottom of the "Text Services and Input Languages" box.  
  
Step 6: Test if you've followed the steps correctly:  
      Open up Word or somewhere you can type.  
      There should now be an "EN" at the bottom-right side of your taskbar to the right of the "Start" button.  
      Click the "EN" and choose the language you want to write in. If you type and you see the letters expected then you have done it right.  
  
Tips & Warnings:  
    \*   When you exit the program the keyboard will default to its original language.  
    \*   If you choose a different application, the language will go back to the default. When you go back to the program you were using when you changed the language, the language will still be on your new language.  
    \*   If you would like to change your default language go through the above steps and when you get to the "Change keyboards..." option, there will be an option to change the default language.

**MIG Font™© Characters**

MIG Font™© Characters, provided in three forms, regular, **bold** and *italic*, are divided for convenience into three general categories: **Numbers**, **Letters** and **Special Characters**. Numbers occur in more than one division, as letter. Letters include not just the ordinary, common, ABCs, but also international letters with intrinsic accent marks (*e.g.*, acute) and unique MIG Font™© letters denoting ages of rocks. Special Characters also include all punctuation marks, *per sé*, but not modifications to letters (accent marks) or modified letters.

**MIG Font™© Latin & Geological Letters**

Tables 00, 01 & 06

All countries have been influenced by the lettering usage of other countries. All western countries which use Latin letters show an origin tracing back to the Greek, or at least an influence: this is especially true of the Russian (*i.e.*, Cyrillic) alphabet. Some Latin alphabet countries (*e.g.*, Finland/Sami) have even officially adopted portions of the Cyrillic alphabet: the same is true of some countries with Cyrillic-based alphabets (*e.g.*, the letter “J”).

Any language with a long history has variants. Celtic or Gaelic, with its “dot ascenders,” is no different. All have Latin alphabet equivalents, which are often the only version in normal use today. Among the official Gaelic alphabets are:

•Irish

•Standard

•Connacht

•Munster

•Ulster

•Manx

•Scottish

•Standard

•Lewis

Most languages, including English, have variants, analogous to Celtic or Gaelic.

Letters which incorporate diacritical marks are usually followed with a list of the using countries, bounded by //.

Letters which define a geological time interval or a comment are bounded by a below \\.

In general, the organizational scheme employed for geological letters is first alphabetical, by letter, and second, within a letter, from younger to older. For example, pre-Cambrian U is listed before (in alphabetical order) than pre-Cambrian Z, which is younger. However, within the pre-Cambrian U, the sequence is Uz, which is youngest, to Uu, which is oldest. Lower-case letters follow the same upper-case (uc) letters. Specialty geological time intervals are only one case, equivalent to upper-case; however, modifiers (e, l, m, p, u, y, *etc.*) are all lower-case.

In order to insert a specific desired geological letter, for example of the “Cambrian,” just type the indicated letter, while using the appropriate font table/ASCII Equivalent, in this case 06:$0018, which is five. To rephrase, **if you are using font table 6 and type 5 (the 5 key), the Cambrian letter will print in your document, map**, *etc*. For further instructions, reference the tutorial herein.

“Intermediate File Names” change frequently, in consequence of changes in names with progress in generation of the MIG Font™©. The original file name was that of a raster image generated as a temporary expedient until the actual font character becomes available at which time it isn’t really a “file” name, *per se*., generally indicated by an ellipsis (…). The fundamental purpose of an intermediate file name is to keep everything organized alphanumerically: the ellipsis space will eventually be used for the final character “*file*” name, with, again, a major function being to define alphabetical order.

uc = Upper Case

lc = lower case

Postscript/Caption columnar information follows a “From Name”:“To Name” convention, except where the name (always in the 00 Table) is the default. Those “To Names” in the 00 Table which differ from the “From Name” (*i.e.*, are not the default) list both. In essence, the 01 Table is an extension of the 00 Table: those letters which do not fit in the 00 Table are relegated to the 01 Table.

Note: the preferred postscript numbers in the MIG Font™© are zero (with the slash), seven (plain) and nine (with the straight bar).

Code

Numbers Intermediate File Name Equivalents

**** zero\_old $E000

**** zero\_apos $E001

**** zero\_slash (zero) $0030 & $E253

(**Note: The zero-slash is wholly contained.**)

 one $0031 & $E254

 two $0032 & $E255

 three $0033 & $E256

 four $0034 & $E257

 five $0035 & $E258

 six $0036 & $E259

 seven $0037 & $E25A

**** seven\_dash $E002

 eight $0038 & $E25B

 nine $0039 & $E25C

**** nine\_old $E009

The following alphabetical list, which includes both alphabetical letters and commonly-recognized and frequently-used geological time intervals, is only a very small portion of the total from the literature. Indeed, many chronostratigraphers would have every described rock outcrop assigned its own name! The real problem confronting the geological professions is where to draw the line, or lines, on additional names for time intervals. Possibly, the only time boundaries that are almost universally accepted are the pre-Cambrian with the Cambrian, the Permian with the Triassic and the Cretaceous with the Tertiary, all for reasons of drastic worldwide changes in numbers and types of fossils. Some might add the Archeozoic (the uppermost [youngest] part of the pre-Cambrian Archean) with the Proterozoic, but, due to lack of obvious fossils, I do not concur. These are, at any rate, often a matter of personal preference based upon university training and practical/applied experience.

Code

Letters Intermediate Name Equivalents

 A\_uc $0024, $0041 & $E17D

\\(Archean = Conventionally, the oldest portion of the pre-Cambrian.)\\

 Agrave\_uc $0080

//Celtic (Gaelic), Dutch, French, Italian, Portuguese.//

 Aacute\_uc $0081

//Celtic (Gaelic), Dutch, French, Hungarian, Italian, Portuguese, Spanish.//

 Atilde\_uc $0083

//Portuguese.//

 Acircumflex\_uc $0082

//Dutch, Finnish, French, Portuguese, Romanian.//

 Acaron\_uc $0...

//…//

 Adieresis\_uc $0084

//Danish, Dutch, Estonian, Finnish, French, German, Portuguese, Swedish.//

 Amacron\_uc $0...

//Latvian.//

 Abreve\_uc $007D

//Romanian.//

 Acedilla\_uc $E004

//…//

 Aogonek\_uc $0...

//Lithuanian, Polish.//

 Aring\_uc $0085

//Danish, Finnish, Norwegian, Swedish.//

 AE\_uc $0086

//Danish, French, Norwegian, Swedish.//

 A\_Aquitanian $E17E

\\Aquitanian (Tertiary/Uppermost Oligocene through Lower Lower Miocene)\\

 A\_Albian $E17F

\\Albian (lowest subdivision of the Upper Cretaceous of Europe)\\

 A\_Aptian $E180

\\Aptian (Lower Cretaceous, between Barremian and Albian)\\

 A\_AAlenian $E181

\\Aalenian (Lowermost Middle through through Uppermost Lower Jurassic)\\

 A\_Anisian $E182

\\Anisian (Triassic)\\

 A\_Artinskian $E183

\\Artinskian (Upper Lower Permian)\\

 A\_Asselian $E184

\\Asselian (Permian)\\

 A\_Ashgillian $E185

\\Ashgillian (Upper Upper Ordovician)\\

 A\_Arenigian $E186

\\Arenigian (Upper Lower Ordovician)\\

 A\_Unassigned $E187

\\…\\

 a\_lc $0044(?) & $0061

//all Latin languages.//

 agrave\_lc $00A0

//Celtic (Gaelic), French, Portuguese.//

 aacute\_lc $00A1

//Celtic (Gaelic), Hungarian, Portuguese, Spanish.//

 atilde\_lc $00A3

//…//

 acircumflex\_lc $00A2

//Dutch, Finnish, French, Portuguese, Romanian.//

 acaron\_lc $0...

//…//

 adieresis\_lc $00A4

//Estonian, Finnish, French, German, Danish, Portuguese, Swedish.//

 amacron\_lc $0…

//Latvian.//

 abreve\_lc $0…

//Romanian.//

 acedilla\_lc $E005

//…//

 aogonek\_lc\_Polish $0…

//Lithuanian, Polish.//

 aring\_lc $00A5

//Danish, Finnish, Norwegian, Swedish.//

 ae\_lc $00A6

//Danish, French, Norwegian, Swedish.//

 B\_uc $0025, $0042 & $E18A

\\Burdigalian (Tertiary/Upper Lower Miocene)\\

 Bdot-ascender\_uc $0…

//Celtic (Gaelic)//

 Bblank\_uc $…

//special computer character.//

 B\_Bartonian $E18B

\\Bartonian (Tertiary/Upper Upper Eocene)\\

 B\_Barremian $E18C

\\Barremian (Lower Cretaceous, between Hauterivian and Aptian)\\

 B\_Berriasian $E18D

\\Berriasian (Cretaceous)\\

 B\_Bathonian $E18E

\\Bathonian (Upper Jurassic, below Callovian)\\

 B\_Bajocian $E18F

\\Bajocian (Middle Middle through Lower Middle Jurassic, above Aalenian)\\

 B\_Bashkirian $E190

\\Bashkirian (Pennsylvanian)\\

 b\_lc $0045 & $0062(?)

 bdot-ascender\_lc $...

//Celtic (Gaelic)//

 bblank\_lc (bslash) $...

//special computer letter signifying a blank, or no character.//

 C\_uc $0026, $0043 & $E193

\\Carboniferous\\

 Cacute\_uc $0…

//Polish.//

 Ccaron\_uc $0…

//Czech, Finnish, Latvian.//

… Cmacron\_uc $0… & $E38B

//… (used as “with” in Medical & Pharmaceutical Symbology.)//

 Cbreve\_uc $0…

//Lithuanian.//

 Ccedilla $0087

//French, Portuguese, Turkic.//

 Cogonek\_uc $E008

//…//

 Cdot-ascender\_uc $0…

//Celtic (Gaelic)//

 CF\_uc $0…

//Finnish-Skolt Sami. Same as Cyrillic letter “Zeh.”//

 CFcaron\_uc $E028

//Finnish-Skolt Sami. Same as Cyrillic letter “Zeh-caron.”//

 C\_Cambrian $E194

\\Cambrian1\\

 C\_Cenozoic $E195

\\Cenozoic\\ (**Redone with better z.**)

 C\_Chattian $E196

\\Chattian (Tertiary/Upper Oligocene)\\

 C\_Unassigned $E197

\\…\\

 C\_Campanian $E198

\\Campanian (Cretaceous: Upper Middle Senonian)\\

 C\_Coniacian $E199

\\Coniacian (Cretaceous: Lower Senonian)\\

 C\_Cenomanian $E19A

\\Cenomanian (Lower Upper Cretaceous)\\

 C\_Callovian $E19B

\\Callovian (Jurassic)\\

 C\_Carnian $E19C

\\Carnian (Lower Upper Triassic)\\

 C\_Caradocian $E19D

\\Caradocian (Lower Upper Ordovician)\\

 c\_lc $0046 & $0063.

 cacute\_lc $0…

//Polish.//

 ccaron\_lc $0…

//Czech, Finnish, Latvian.//

… cmacron\_lc $0…

//…//

 cbreve\_lc $E007

//Lithuanian.//

 ccedilla\_lc $00A7

//French, Portuguese, Turkic.//

 cogonek\_lc $E009

//…//

 cdot-ascender\_lc $0…

//Celtic (Gaelic)//

 cf\_lc $0…

//Finnish-Skolt Sami. Same as Cyrillic letter “zeh.”//

 cfcaron\_lc $E029

//Finnish-Skolt Sami. Same as Cyrillic letter “zeh-caron.”//

 D\_uc $0027, $0044 & E1A0

\\Devonian\\

 D-Eth\_uc $0090

//Finnish (Sami), Icelandic & Old English.//

 Dcaron\_uc $0…

//Czech.//

 Ddash\_uc $0…

//Hungarian.//

 Ddot-ascender\_uc $0…

//Celtic (Gaelic)//

 D\_Danian $E1A1

\\Danian (Tertiary/Lowermost Paleocene and sometimes Uppermost Cretaceous)\\ (Generally from the K-T boundary through the lowermost Paleocene. The type section is at El Kef, Tunisia.)

 D\_Delmaran $E1A2

\\Delmaran (Cambrian)\\

 D\_Dyeran $E1A3

\\Dyeran (Cambrian)\\

 d\_lc $0047 & $0064

 dcaron\_lc $0…

//Czech.//

 d-dash\_lc $0…

//Hungarian.//

 d-eth\_lc $0…

//Finnish, Icelandic & Old English//

 ddot-ascender\_lc $0…

//Celtic (Gaelic)//

 E\_uc $0028, $0045 & $E1A6

\\Eocene (Tertiary)\\

 Egrave\_uc $0088

//Celtic (Gaelic), French, Italian.//

 Eacute\_uc $0089

//Celtic (Gaelic), French, Italian, Portuguese, Spanish.//

 Etilde\_uc $0…

//…//

 Ecircumflex\_uc $008A

//French, Portuguese.//

 Ecaron\_uc $0…

//Czech.//

 Edieresis\_uc $008B

//French, German(?). Two native German speakers, one from Germany and the other from Austria, state that this is not a standard character in the German alphabet.//

 Emacron\_uc $0…

//Latvian.//

 Ebreve\_uc $0…

//…//

 Ecedilla\_uc $0…

//…//

 Eogonek\_uc $0…

//Lithuanian, Polish.//

 Ering\_uc $E00A

//Lithuanian.//

 E\_Eifelian $E1A7

\\Eifelian (Devonian)\\

 E\_Emsian $E1A8

\\Emsian (Upper Lower Devonian)\\

 e\_lc\_early. $0048, $0065 & $E175

\\(Note: Chronostratigraphic early: also see l, m, p, u & y.)\\

 egrave\_lc $00A8

//French, Italian.//

 eacute\_lc $00A9

//Portuguese, Spanish.//

 etilde\_lc $0…

//…//

 ecircumflex\_lc $00AA

//French, Portuguese.//

 ecaron\_lc $0…

//Czech.//

 edieresis\_lc $00AB

//French, German(?). Two native German speakers, one from Germany and the other from Austria, state that this is not a standard character in the German alphabet.//

 emacron\_lc $0…

//Latvian.//

 ebreve\_lc $0…

//…//

 ecedilla\_lc $0…

//…//

 eogonek\_lc $E00B

//Lithuanian, Polish.//

 Ering\_lc $0…

//Lithuanian.//

 F\_uc $0029, $0046 & $E1AB

\\Famennian *aka* Fammenian (Upper Upper Devonian)\\

 Fdot-ascender\_uc $0…

//Celtic (Gaelic)//

 F\_Frasnian $E1AC

\\Frasnian (Lower Upper Devonian)\\

 f\_lc. $0049 & $0066

 fdot-ascender\_lc $0…

//Celtic (Gaelic)//

 G\_uc $002A, $0047 & $E1AF

\\Gzelian (Pennsylvanian)\\

 Gcaron\_uc $0…

//Finnish.//

 Gcedilla\_uc $E00C

//Latvian.//

 Gbreve\_uc $0…

//Turkic.//

 Gdash\_uc $0…

//Finnish (Sami).//

 Gdot-ascender\_uc $0…

//Celtic (Gaelic)//

 G\_Givetian $E1B0

\\Givetian (Upper Middle Devonian)\\

 g\_lc $004A & $0067

 gcaron\_lc $0…

//Finnish.//

 gcedilla\_lc $E00D

//Latvian.//

 gbreve\_lc $0…

//Turkic.//

 gdash\_lc $0…

//Finnish (Sami)//

 gdot-ascender\_lc $0…

//Celtic (Gaelic)//

 H\_uc $002B, $0048 & $E1B3

\\Holocene (Quaternary)\\ {Time during which man has lived on earth to today.}

 Hcaron\_uc $0…

//Finnish.//

 Hdieresis\_uc $0…

//German.//

 H\_Hadean $E1B4

\\Hadean (**Oldest known portion of the pre-Cambrian**, ~4.5 billions years old.)\\

 H\_Hauterivian $E1B5

\\Hauterivian (Lower Cretaceous, between Valanginian and Barremian)\\

 H\_Hettangian $E1B6

\\Hettangian (Lowermost Lower Jurassic)\\

 h\_lc $004B & $0068

 hcaron\_lc $0…

//Finnish.//

 hdieresis\_lc $0…

//German.//

 I\_uc $002C, $0049 & $E1B9

\\Induan (Triassic)\\

 Igrave\_uc $008C

//Italian.//

 Iacute\_uc $008D

//Celtic (Gaelic), Czech, Hungarian, Italian, Portuguese, Spanish.//

 Itilde\_uc $0…

//…//

 Icircumflex\_uc $008E

//Romanian.//

 Icaron\_uc $0…

//…//

 Idieresis\_uc $008F

//German(?). Two native German speakers, one from Germany and the other from Austria, state that this is not a standard character in the German alphabet.//

 Imacron\_uc $0…

//Latvian.//

 Ibreve\_uc $0…

//…//

 Icedilla\_uc $E00E

//…//

 Iogonek\_uc $0…

//…//

 i\_lc $004C & $0069

//all Latin languages.//

 i\_dotless\_lc $00C0

//Turkic, …//

 igrave\_lc $00AC

//Italian//

 iacute­\_lc $00AD

//Celtic (Gaelic), Czech, Hungarian, Italian, Portuguese, Spanish.//

 itilde\_lc $0…

//…//

 icircumflex\_lc $00AE

//Romanian.//

 icaron\_lc $0…

//…//

 idieresis\_lc $00AF

//German(?). Two native German speakers, one from Germany and the other from Austria, state that this is not a standard character in the German alphabet.//

 imacron\_lc $0…

//Latvian.//

 ibreve\_lc $0…

//…//

 icedilla\_lc $E00F

//…//

 iogonek\_lc $0…

//…//

 J\_uc $002D, $004A & $E1BC

\\Jurassic.\\

 j\_lc $004D(?) & $006A

…

 K\_uc $002E, $004B & $E1BF

\\Cretaceous\\

 Kcaron\_uc $0…

//Finnish.//

 Kcedilla\_uc $E010

//Latvian.//

 K\_Kimmeridgian $E1C0

\\Kimmeridgian (Jurassic)\\ {The Kimmeridgian is one of the stages of the Upper Oolite series of the Jurassic in the UK, mostly in a belt from the Dorset coast to the Yorkshire coast. The Kimmeridgian is noted in the UK for its large deposits of bituminous shale and coal.}

 K\_Kungerian $E1C1

\\Kungerian *aka* Kungurian (Middle Permian)\\

 K\_Kasimovian $E1C2

\\Kasimovian (Pennsylvanian)\\

 k\_lc $004E & $006B

 kcaron\_lc $0…

//Finnish.//

 kcedilla\_lc $E011

//Latvian.//

 L\_uc $002F, $004C & $E1C5

\\Langhian (Tertiary/Miocene)\\

 Lcircumflex $E012

//French.//

 Lcedilla\_uc $E014

//French, Latvian.//

 Lslash\_uc $0063 & $E1CD

//Polish L.// \\Proterozoic to present, inclusive (lower limit controversial): **Time of life.**\\

 L\_Lutetian $E1C6

\\Lutetian (Tertiary/Middle Eocene)\\

 L\_Ladinian $E1C7

\\Ladinian (Upper Middle Triassic)\\

 L\_Lockhovian $E1C8

\\Lockhovian (Devonian)\\

 L\_Ludlovian $E1C9

\\Ludlovian (Upper Silurian, below Dowtonian)\\

 L\_Llandoverian $E1CA

\\Llandoverian (Lower Silurian)\\

 L\_Llandeilian $E1CB

\\Llandeilian (Upper Middle Ordovician)\\

 L\_Llanvirnian $E1CC

\\Llanvirnian (Lower Middle Ordovician)\\

 l\_lc $004F, $006C & $E176

\\Lithostratigraphic lower prefix. Also see e, m, p, u, y.\\

 lcircumflex\_lc $E013

//French.//

 lcedilla\_lc $E015

//French, Latvian.//

 lslash\_lc $0…

//Polish l.//

 llate\_lc $E177

\\(Chronostratigraphic sense of “late.” Also see e, l, p, u & y.)\\

 M\_uc $0030, $004D & $E1D0

\\Mississippian\\

 Mdot-ascender\_uc $0…

//Celtic (Gaelic)//

 M\_Mesozoic $E1D1

\\Mesozoic\\

 M\_Miocene $E1D2

\\Miocene (Tertiary)\\

 M\_Messinian $E1D3

\\Messinian (Tertiary/Miocene)\\

 M\_Maastrichtian $E1D4

\\Maastrichtian (Cretaceous)\\

 M\_Moscovian $E1D5

\\Moscovian (Pennsylvanian: *Sensus Strictu* Middle Upper Carboniferous)\\

 M\_Marjuman $E1D6

\\Marjuman (Cambrian)\\

 M\_Montezuman $E1D7

\\Montezuman (Cambrian)\\

 m\_lc $0050, $006D & $E178

\\middle\_lithostratigraphic-position, always in lower-case size.\\

 mdot-ascender\_lc $0…

//Celtic (Gaelic)//

 mchrono $E179

\\middle\_chronostratigraphic-position, always in lower-case size.\\

 N\_uc $0031, $004E & $E1DA

\\Neogene (Tertiary)\\

 Nacute\_uc $0…

//Polish.//

 Ntilde\_uc $0091

//French, Spanish.//

 Ncaron $0…

//Czech.//

 Ndieresis\_uc $0…

//German(?). Two native German speakers, one from Germany and the other from Austria, state that this is not a standard character in the German alphabet.//

 Ncedilla\_uc $E016

//Latvian.//

 Ntail\_uc $0…

//Finnish.//

 N\_Neocomian $E1DB

\\Neocomian (Lower Cretaceous)\\

 N\_Norian $E1DC

\\Norian (Middle Upper Triassic)\\

 n\_lc $0051 & $006E

 nacute\_lc $0…

//Polish//

 ntilde\_lc $00B1

//French, Spanish.//

 ncaron\_lc $0…

//Czech.//

 ndieresis\_lc $0…

//German(?). Two native German speakers, one from Germany and the other from Austria, state that this is not a standard character in the German alphabet.//

 ncedilla\_lc $E017

//Latvian.//

 ntail\_lc $0…

//Finnish.//

 O\_uc $0032, $004F & $E1DF

\\Ordovician\\

 Ograve\_uc $0092

//Italian.//

 Oacute\_uc $0093

//Celtic (Gaelic), Czech, Hungarian, Italian, Polish, Portuguese, Spanish.//

 Otilde\_uc $0095

//Estonian, Finnish.//

 Ocircumflex\_uc $0094

//Finnish, French, Portuguese.//

 Ocaron\_uc $0…

//…//

 odieresis\_uc $0096

//Danish, Estonian, Finnish, French, German, Hungarian, Norwegian, Portuguese, Swedish.//

 Ohungarumlaut\_uc $0…

//Hungarian.//

 Omacron\_uc $0…

//Latvian.//

 Obreve\_uc $0…

//…//

 Ocedilla\_uc $E018

//…//

 Oogonek\_uc $0…

//…//

 Oslash\_uc $0098

//Danish, Norwegian, Swedish.//

 OE\_uc $0…

//French.//

 O\_Oligocene $E1E0

\\Oligocene (Tertiary)\\

 O\_Oxfordian $E1E1

\\Oxfordian (Lowermost Upper Jurassic)\\

 O\_Olenikian $E1E2

\\Olenikian (Triassic)\\

 o\_lc $0052 & $006F

 ograve\_lc $00B2

//Italian.//

 oacute\_lc $00B3

//Celtic (Gaelic), Czech, Hungarian, Italian, Polish, Portuguese, Spanish.//

 otilde\_lc $00B5

//Estonian, Finnish.//

 ocircumflex\_lc $00B4

//Finnish, French, Portuguese.//

 ocaron\_lc $0…

//…//

 odieresis\_lc $00B6

//Danish, Estonian, Finnish, French, German, Hungarian, Norwegian, Portuguese, Swedish.//

 ohungarumlaut\_lc $0…

//Hungarian.//

 omacron\_lc $0…

//Latvian.//

 obreve\_lc $0…

//…//

 ocedilla\_lc $E019

//…//

 oogonek\_lc $0…

//…//

 oslash\_lc $00B8

//Danish, Norwegian, Swedish.//

 oe\_lc $0…

//French.//

 P\_uc $0033, $0050 & $E1E5

\\Permian.\\

 Pdot-ascender\_uc $0…

//Celtic (Gaelic)//

 P\_Paleozoic $E1E6

\\Paleozoic.\\

 P\_Pennsylvanian $E1E7

\\Pennsylvanian\\ {the upper portion of the Carboniferous.}

 P\_Paleogene $E1E8

\\Paleogene (Tertiary)\\ {Comprised of the Paleocene, Eocene and Oligocene.}

 P\_Pleistocene $E1E9

\\Pleistocene (almost the same as Calabrian)\\ {Generally that portion of the Quaternary in which continental glaciers were ubiquitous.}

 P\_Pliocene $E1EA

\\Pliocene\\

 P\_Paleocene $E1EB

\\Paleocene: oldest (lowest) portion of the Tertiary, rocks usually in contact with Cretaceous rocks, *i.e.*, at the “*K-T boundary*.”\\

 P\_Proterozoic $E1EC

\\Proterozoic\\ (The Proterozoic is the time interval of the {younger} pre-Cambrian during which life existed. From the earliest beginnings of geology, debate has raged about exactly where to draw the line for both the beginning and the ending of the Proterozoic. The beginnings of the Proterozoic are still hotly debated. Most geologists just arbitrarily choose the beginning of the Cambrian as the end of the Proterozoic because of the prolific fossils, with preserved hard parts, present. In the strictest sense, the Proterozoic clearly includes the uppermost preCambrian, approximately including the Zz {Zhen Dan} interval, herein. Several “type sections” of uppermost preCambrian rocks with well-preserved, mostly soft-bodied fossils, are now known, from most, if not all, continents. Possibly the best known uppermost preCambrian fossils with well-preserved hard parts are the *Wyattia*, which look like grains of rice, and certain rare trilobites preserved in deep oceanic sediments of the White & Inyo Mountains, Westgaard Pass area, of eastern California. Drawing firm, unequivocal, time lines is not just difficult, but always controversial. Notwithstanding, I believe that a differentiation based upon rocks which document the presence of free oxygen, obviously emitted from photosynthetic organisms, would be useful. I originally included a time-of-life symbol, the Polish Lslash, and have reinstated it, even though an objection was made.)

 P\_Piacenzian $E1ED

\\Piacenzian (Tertiary/Pliocene-late)\\

 P\_Priabonian $E1EE

\\Priabonian (Tertiary/Upper Eocene)\\

 P\_Pliensbachian $E1EF

\\Pliensbachian (Jurassic: Lower Charmouthian.)\\

 P\_Praghian $E1F0

\\Praghian (Devonian)\\

 P\_Pridolian $E1F1

\\Pridolian (Silurian)\\

 p\_lc $0053, $0070 & $E17A

(Note: pre- {as in pre-Cambrian: also see e, l, m, u & y.})

 pdot-ascender\_lc $0…

//Celtic (Gaelic)//

 C\_pre-Cambrian $1F2

\\pre-Cambrian\\

 Q\_uc\_Quaternary $0034, $0051 & $E1F5

\\Quaternary\\

 q\_lc $0054 & $0071

 R\_uc\_Rupelian $0035, $0052 & $E1F8

\\Rupelian (Tertiary/Middle Oligocene)\\ (Note: **On original Chinese maps, R is the symbol for Ruocheng (sp?) or Ruoqiang (sp?) {Himalayan Age}, which is equivalent to T = Tertiary, the internationally preferred symbol.**)

 Rcaron\_uc $0…

//Czech.//

 Rcedilla\_uc $E01A

//Latvian.//

 Rdot-ascender\_uc $0…

//Celtic (Gaelic)//

 R\_Rhaetian $E1F9

\\Rhaetian, *aka* Rhaetic. (Upper Upper Triassic, transitional into Jurasssic)\\

Rx Prescription $E038D

//… (Used in Medical & Pharmacological symbology.//

 r\_lc $0055 & $0072

 rcaron\_lc $0…

//Czech.//

 rcedilla\_lc $E01B

//Latvian.//

 rdot-ascender\_lc $0…

//Celtic (Gaelic)//

 S\_uc\_Silurian. $0036, $0053 & $E1FC

\\Silurian.\\

 Sacute\_uc $0...

//Polish.//

 Scaron\_uc $0...

//Czech, Finnish, Latvian.//

… Smacron\_uc $0… & $E038C

//… (Used as “Without” in Medical & Pharmacological Symbology.//

 Sbreve\_uc $E01C

//Lithuanian.//

 Scedilla\_uc $0...

//Romanian, Turkic.// (Sh sound in Turkic.)

 S\_Serravalian $E1FD

\\Serravalian (Tertiary/Miocene)\\

 S\_Selandian $E1FE

\\Selandian (Tertiary/Paleocene)\\

 S\_Santonian $E1FF

\\Santonian (Cretaceous: Lower Middle Senonian)\\

 S\_Sinemurian $E200

\\Sinemurian (Lower Jurassic, above Hettangian)\\

 S\_Sakhmarian $E201

\\Sakhmarian (Lower Lower Permian)\\

 S\_Serpukhovian $E202

\\Serpukhovian (Mississippian)\\

 S\_Sunwaptan $E203

\\Sunwaptan (Cambrian)\\ (**Sunwaptan is correct spelling.**)

 S\_Steptoean $E204

\\Steptoean (Cambrian)\\

 s\_lc $0056 & $0073

 sacute\_lc $0...

//Polish.//

 scaron\_lc $0...

//Czech, Finnish, Latvian.//

 sbreve\_lc $E01D

//Lithuanian.//

 scedilla\_lc $0...

//Romanian, Turkic.// (Sh sound in Turkic.)

 germandbls\_lc $009F

//German. No uc equivalent.//

 T\_uc $0037, $0054 & $E207

\\Tertiary.\\

 Tcaron\_uc $0...

//Czech.//

 Tdieresis\_uc $E01E

//German(?). Two native speakers of German, one from Germany and the other from Austria, state that this is not a standard character in the German alphabet.//

 Tcedilla\_uc $0...

//Romanian.//

 Tdot-ascender\_uc $0...

//Celtic (Gaelic)//

 Tdash\_uc $0...

//Finnish.//

 T\_Triassic $E208

\\Triassic\\

 T\_Tortonian $E209

\\Tortonian (Tertiary/Upper Middle Miocene)\\

 T\_Thanetian $E20A

\\Thanetian (Tertiary/Lower Upper Paleocene)\\

 T\_Turonian $E20B

\\Turonian (Middle Upper Cretaceous)\\

 T\_Tithonian $E20C

\\Tithonian, *aka* Portlandian (Jurassic)\\

 T\_Toarcian $E20D

\\Toarcian (Jurassic)\\

 T\_Tatarian $E20E

\\Tatarian (Permian)\\

 T\_Tournasian $E20F

\\Tournasian (Missippian: *Sensu Strictu* Lower Lower Carboniferous)\\

 T\_Tremadocian $E210

\\Tremadocian (Lower Lower Ordovician: in UK is considered Uppermost Cambrian)\\

 t\_lc $0057 & $0074

 tcaron\_lc $0...

//Czech.//

 tdieresis\_lc $E01F

//German(?). Two native speakers of German, one from Germany and the other from Austria, state that this is not a standard character in the German alphabet.//

 tcedilla\_lc $0...

//Romanian.//

 tdot-ascender\_lc $0...

//Celtic (Gaelic)//

 tdash\_lc $0...

//Finnish.//

 U\_uc $0038, $0055 & $E213

\\pre-Cambrian U, undivided.\\

 Ugrave\_uc $0099 & $0...

//French, Italian.//

 Uacute\_uc $009A & $0...

//Celtic (Gaelic), Hungarian, Italian, Portuguese, Spanish.//

 Utilde\_uc $0...

//…//

 Ucircumflex\_uc $009B & $0...

//French, Hungarian.//

 Ucaron\_uc $E020

//…//

 Udieresis\_uc $009C & $0...

//Estonian, Finnish, French, German, Hungarian, Portuguese.//

 Umacron\_uc $0...

//Latvian, Lithuanian.//

 Ubreve\_uc $0...

//…//

 Ucedilla\_uc $E022

//…//

 Uogonek\_uc $0...

//Lithuanian.//

 Uring\_uc $0...

//Czech.//

 U\_Ufemian $E214

\\Ufemian-Kazanian (Upper Permian)\\

 Uz\_pC-Uz $E215

\\pre-Cambrian Uz.\\

 Uy\_pC-Uy $E216

\\pre-Cambrian Uy.\\

 Ux\_pC-Ux $E217

\\pre-Cambrian Ux.\\

 Uw\_pC-Uw $E218

\\pre-Cambrian Uw.\\

 Uv\_pC-Uv $E219

\\pre-Cambrian Uv.\\

 Uu\_pC-Uu $E21A

\\pre-Cambrian Uu.\\

 u\_lc $0058, $0075 & $E17B

//All Latin alphabets.//(Upper lithostratigraphic position: also see e, l, m, p & y.)

 ugrave\_lc $00B9 & $0...

//French, Italian.//

 uacute\_lc $00BA & $0...

//Celtic (Gaelic), Hungarian, Italian, Portuguese, Spanish.//

 utilde\_lc $0...

//…//

 ucircumflex\_lc $00BB & $0...

//French, Hungarian.//

 ucaron\_lc $E021

//…//

 udieresis\_lc $00BC & $0...

//Estonian, Finnish, French, German, Hungarian, Portuguese.//

 umacron\_lc $0...

//Latvian, Lithuanian.//

 ubreve\_lc $0...

//…//

 ucedilla\_lc $E023

//…//

 uogonek\_lc $0...

//Lithuanian.//

 uring\_lc $0...

//Czech.//

 V\_uc $0039, $0056 & $E21D

\\pre-Cambrian V, undivided\\

 V\_Valanginian $E21E

\\Valanginian (Lowermost Lower Cretaceous)\\

 V\_Visean $E21F

\\Visean (Mississippian: *Sensu Strictu* Upper Lower Carboniferous)\\

 Vz\_pCVz $E220

\\pre-Cambrian Vz.\\

 Vy\_pCVy $E221

\\pre-Cambrian Vy.\\

 Vx\_pCVx $E222

\\pre-Cambrian Vx.\\

 Vw\_pCVw $E223

\\pre-Cambrian Vw.\\

 Vv\_pCVv $E224

\\pre-Cambrian Vv.\\

 Vu\_pCVu $E225

\\pre-Cambrian Vu.\\

 v\_lc $0059 & $0076

 W\_uc $003A, $0057 & $E228

\\pre-Cambrian W, undivided.\\

 Wdieresis\_uc $0...

//German(?). Two native speakers of German, one from Germany and the other from Austria, state that this is not a standard character in the German alphabet.//

 W\_Wenlockian $E229

\\Wenlockian (Middle Silurian)\\

 Wz\_pC-Wz $E22A

\\pre-Cambrian Wz.\\

 Wy\_pC-Wy $E22B

\\pre-Cambrian Wy.\\

 Wx\_pC-Wx $E22C

\\pre-Cambrian Wx.\\

 Ww\_pC-Ww $E22D

\\pre-Cambrian Ww.\\

 Wv\_pC-Wv $E22E

\\pre-Cambrian Wv.\\

 Wu\_pC-Wu $E22F

\\pre-Cambrian Wu.\\

 w\_lc $005A & $0077

 wdieresis\_lc $0…

//German(?). Two native speakers of German, one from Germany and the other from Austria, state that this is not a standard character in the German alphabet.//

 X\_uc $005B, $0058 & $E232

\\pre-Cambrian X, undivided.\\

 Xdieresis\_uc $0...

//German(?). Two native speakers of German, one from Germany and the other from Austria, state that this is not a standard character in the German alphabet.//

 Xmasonic\_uc $0... & $E024

//All Latin language countries have Masons.//

 Xz\_pC-Xz $E233

\\pre-Cambrian Xz.\\

 Xy\_pC-Xy $E234

\\pre-Cambrian Xy.\\

 Xx\_pC-Xx $E235

\\pre-Cambrian Xx.\\

 Xw\_pC-Xw $E236

\\pre-Cambrian Xw.\\

 Xv\_pC-Xv $E237

\\pre-Cambrian Xv.\\

 Xu\_pC-Xu $E238

\\pre-Cambrian Xu.\\

 x\_lc $005B & $0...

 xdieresis\_lc $0…

//German(?). Two native German speakers, one from Germany and the other from Austria, state that this is not a standard character in the German alphabet.//

 xmasonic\_lc $0… & $E025

//All Latin language countries have Masons.//

 Y\_uc $003C, $0059 & $E23B

\\pre-Cambrian Y, undivided.\\

 Yacute\_uc $009D & $0...

//…//

 Ydieresis\_uc $0...

//French.//

 Y\_Ypresian $E23C

\\Ypresian (Tertiary/Lower Eocene)\\

 Yz\_pC-Yz $E23D

\\pre-Cambrian Yz.\\

 Yy\_pC-Yy $E23E

\\pre-Cambrian Yy.\\

 Yx\_pC-Yx $E23F

\\pre-Cambrian Yx.\\

 Yw\_pC-Yw $E240

\\pre-Cambrian Yw.\\

 Yv\_pC-Yv $E241

\\pre-Cambrian Yv.\\

 Yu\_pC-Yu $E242

\\pre-Cambrian Yu.\\

 y\_lc $005C, $0079 & $E17C

(Chronostratigraphically younger than. Also see e, l, m, p & u.)

 yacute\_lc $00BD & $0...

//...//

 ydieresis\_lc $00BF & $0...

//French.//

 Z\_uc $003D, $005A & $E245

\\pre-Cambrian Z, undivided.\\

 Zacute\_uc $0...

//Polish.//

 Zcaron\_uc $0...

//Czech, Estonian, Finnish, Latvian.//

 Zbreve\_uc $E026

//Lithuanian.//

 Zdot\_uc $0...

//Polish.//

 Z\_Zanclean $E246

\\Zanclean (Tertiary/Pliocene—early)\\

 Zz\_pC-Zz $E247

\\pre-Cambrian Zz\_Vendian\_ZhenDan.\\

 Zy\_pC-Zy $E248

\\pre-Cambrian Zy.\\

 Zx\_pC-Zx $E249

\\pre-Cambrian Zx.\\

 Zw\_pC-Zw $E24A

\\pre-Cambrian Zw.\\

 Zv\_pC-Zv $E24B

\\pre-Cambrian Zv.\\

 Zu\_pC-Zu $E24C

\\pre-Cambrian Zu.

 z\_lc $005D & $007A

 z-acute\_lc $0...

//Polish.//

 zcaron\_lc $0...

//Czech, Estonian, Finnish, Latvian.//

 zbreve\_lc $E027

//Lithuanian.//

 z-dot\_lc $0…

//Polish.//

**Special Characters (includes Punctuation)**

(**Note: German umlauts are the same as dieresis. Two forms of umlaut are used by the Hungarians, a traditional dieresis of two dots and the Hungarian umlaut, composed with the quotedblright letter, below.**)

Code

Special Intermediate Name Equivalents

 ellipsis $00D5 & $0...

 period $0011 & $002E

 periodcentered $0077 & $0...

 bullet $00D4 & $0...

 at $0023, $0040 & $0...

(Has special computer meaning {internet}.)

 copyright $006A & $0...

 registered $006E & $0...

 trademark $00DE & $0...

 comma $000F & $002C

 colon $001D, $003A & $0...

(Has special computer meanings {DOS, internet, …}.)

 semicolon $001E & $003B

 quotedbl $0022 & $0...

 quote\_left $00CF & $0...

 quotedbl\_right $00D0 & $0...

 quotesinglbase $00CE & $0...

 quotedblbase $00D1 & $0...

 apostrophe (quotesingle) $000A & $0027

 quoteleft $00CC & $0...

 quoteright $00CD & $0...

 exclamation\_up $0021 & $0...

 exclamation\_down $0062 & $0...

 question\_up $0022 & $003F

 question\_down $007F

 parentheses\_left $000B & $0028

 parentheses\_right $000C & $0029

 bracket\_left $003E & $0...

 bracket\_right $0040 & $0...

 brace\_left $005E & $0...

 brace\_right $0060 & $0...

 guillemot-single-left $00D6 & $0...

 guillemot-single-right $00D7 & $0...

 guillemot-left $006C & $0...

 guillemot-right $007B & $0...

 slash\_forward $0012 & $002F

 slash\_back $003F & $0...

 dagger $00D2 & $0...

 daggerdbl $00D3 & $0...

 asterisk $000D & $002A

(Note: Fat ends differentiate from 5-ray volcanic cone.)

 hyphen $002D & $0...

 minus $00E3 & $0...

 dash $0...

 endash $00CA & $0...

 emdash $00CB & $0...

 underscore (underline) $0042 & $0...

+ plus $000E & $002B

< less-than $001F & $003C

= equal $0020 & $003D

> greater-than $0021 & $003E

° degree $0070 & $0...

± plusminus $0071 & $0...

x multiply $0097 & $0...

÷ divide $00B7 & $0...

/ fraction $00D8 & $0...

(Also see slash, above.)

≤ less-than-or-equal $00E8 & $0...

≥ greater-than-or-equal $00E9

 bar (vertical-line) $005F & $0...

 brokenbar $0067 & $0...

 ampersand $0031 & $0026

 section $0068 & $0...

ZPun39_paragraph paragraph $0076 & $0...

# number (pound) $0023 & $0...

 dollar $0024 & $0025

(Has special meaning for computers/software.)

ZPun40b_euro euro $00..

 grave $0043 & $0...

 acute $0074 & $0...

 tilde $00C8 & $0...

 circumflex $00C1 & $0...

 caron $00C2 & $0...

 dieresis $0069 & $0...

 Hungarian-umlaut $00C9 & $0...

 macron $006F & $0...

(Note: also see uni02C9 or $02C9.)

 breve $00C4 & $0...

 cedilla $0078 & $0...

 ogonek $00C7 & $0...

/ Polish/Norwegian Slash (*e.g.*, in letter L & l). $0...

 dotaccent $00C5 & $0...

… dot ascender $0...

(**Is this the same grammatically as dotaccent, above?**)

… dot descender $0…

 ring $00C6 & $0...

ZPun45h_Caret caret $00..

(**Note: circumflex.**)

ZPun45k_Unassigned_Symbol Unassigned-Symbol $00..

(**Note: caron.**)

% percent $0025, $2025, $2031 & $E276

%o parts per thousand $E277

**Greek Lettering**

Table 02

Note that sometimes more than one version of a Greek letter is presented herein. In part, this is because of the conventional and sometimes contradictory usages to which certain professional groups have become attached, and are well-entrenched (*e.g.*, pi) in the literature. A very significant consideration is that this also enables more categories of igneous units to be uniquely differentiated by a specific symbol (*e.g.*, different lower-case sigma symbols for kimberlite, carbonatite and lamproite, with geochemical similarities).

The variation in appended file name numbers reflects the iterative nature of this project. It has been quite common for multiple options to be tried and rejected before one (or more) has been tentatively accepted. Indeed, the variation in naming schemes (Latin -- English/European, Greek, Russian, …) followed is a direct function of the growth and systematic evolution of the MIG Font™© from its origins to the present.

Suggested usage for each symbol, as appropriate, is appended within dashes (-) after each Greek letter. When a recommended usage has not yet been decided, an ellipsis (…) is within dashes (-).

Even though many of the Greek letters are very similar to some English (and Russian!) letters, wherever possible, distinctive Greek letters have been generated, usually differing only in attached dashes or bars on the ends of the Greek letters. The Greek letters are too useful to simplify and combine with English: even omicron is made distinctly different by systematic variations in wall thicknesses, with the sides being thicker and the top and bottom of the omicron letters being thinner. Otherwise almost identical letters (*e.g.*, Kappa\_uc, Mu\_uc, Nu\_uc, Rho, …) are made distinctive by the prominent embellishments characteristic of classical Greek letters. All the Greek letters have been separately drawn, are distinctive from Latin, and are fully available for totally separate uses. Note that some Russian (Cyrillic) letters, derived from Greek, use the Greek letters.

# Define symbols for: pegmatite, …

Code

Letters Intermediate Name Equivalents

 Alpha\_uc $0...

-…-

 alpha\_lc $0...

-andesite- (**Alpha\_lc represented andesite & intermediate rocks in the China Study.**)

 Beta\_uc $0...

-…-

 beta\_lc $0...

-basalt- (**Beta\_lc represented basalts & mafic rocks in the China Study.**)

 Gamma\_uc $0...

-…-

 gamma\_lc $0...

-granite-

 Delta\_uc $0...

-…-

 delta\_lc $0...

-diorite-

 delta\_lc\_1 $2202 & $0...

-…- (**Note: Also placed in math 07 table. Most frequent use is in math to indicate a “partial differential.”**)

 Epsilon\_uc $0...

-…-

 epsilon\_lc $0...

-…-

 epsilon-alt\_lc $0… & $E02A

-…-

 Zeta\_uc $0...

-…-

 zeta\_lc $0...

-…-

 Eta\_uc $0...

-…-

 eta\_lc $0...

-Mafic undifferentiated(?)-

 Theta\_uc $0...

-…-

 theta\_lc $0...

-…-

 Iota\_uc $0...

-…-

 iota\_lc $0...

-charnockite(?) or ignimbrite(?)- (**Charnockite was used in China study.**)

 Kappa\_uc $0...

-…-

 kappa\_lc $0...

-…-

 Lambda\_uc $0...

-…-

 lambda\_lc $0...

-rhyolite- (**As represented in the China study.**)

 Mu\_uc $0...

-…-

 mu\_lc $03BC & $0...

-Porphyrite- (Note: another mu with different meaning is at $00B5.)

 Nu\_uc $0...

-…-

 nu\_lc $0...

-anorthosite(?)- (**Gabbro, anorthosite, etc., were used in China study.**)

 Xi\_uc $0...

-…-

 xi\_lc $0...

-Syenite-

 Omicron\_uc $0...

-…- (Differentiated from the Latin letter “Oh” by less circular, with thicker sides.)

 omicron\_lc $0...

-…- (Differentiated from the Latin letter “Oh” by less circular, with thicker sides.)

 Pi\_uc $0...

-…-

 Pi-alt\_uc $0...

-…- (**One of the symbols for the math … table.**)

 pi\_lc $0...

-Porphyry- (**One of the symbols for the math … table.**)

 Rho\_uc $0...

-…-

 rho\_lc $0...

-…-

 Sigma\_uc $0...

-Ultramafic Undifferentiated-

 Sigma-sum\_uc $0...

-…- (**One of the symbols, summation, primarily for the math … table.**)

 sigma\_lc $0...

-Kimberlite-

 sigma-alt0\_lc $0...

-Carbonatite-

 sigma-alt1\_lc $E02B

-Lamproite-

 sigma-int\_lc $0...

-…- (**One of the symbols, integration, primarily for the math … table.**)

 Tau\_uc $0...

-…-

 tau\_lc $0...

-trachytes- (**Tau\_lc represented trachytes & mafic rocks in the China Study.**)

 Upsilon\_uc $0...

-…-

 Upsilon-alt\_uc $... & $E02C

-…-

 upsilon\_lc $... & $E02D

-volcanics, undif- (**Upsilon\_lc represented volcanics undif in the China Study, which was Maness’ convention, not China’s.**)

 upsilon-alt\_lc $0...

-…-

 Phi\_uc $0...

-…-

 phi\_lc $0...

-…-

 phi-alt\_lc $0... & $E02E

-…-

 phi-Russian\_lc $0... & $0...

-…-

 Chi\_uc $0...

-…-

 chi\_lc $0...

-…-

 Psi\_uc $0...

-…-

 psi\_lc $0... & $E02F

-extrusives undifferentiated(?)-

 psi-alt\_lc $0...

-extrusives undifferentiated(?)-

 Omega\_uc $0...

-…- (**Asymmetrical: redraw!**)

 omega\_lc $0...

-…- (**Asymmetrical: redraw!**)

 omega-alt\_lc $0... & $E030

-plateau flood basalts- (**Asymmetrical: redraw!**) (**Omega\_lc represented plateau flood basalts in the China study.**)

**Cyrillic (Russian) Lettering**

**(Tables 03 & 04)**

Although the Cyrillic alphabet originated in Bulgaria, written by Saint Cyril to aid in the spread of Christianity to the Slavs, most people today identify Cyrillic with Russia, whose version of the Cyrillic alphabet is considered to be standard. Since the religion being spread was written in Greek, many Cyrillic letters were derived from Greek.

Wherever possible, the intermediate file names for Cyrillic letters include an approximation of the sounds as an American would pronounce the letters. Obvious exceptions would be those Cyrillic “*special characters*” without a sound, those whose pronunciation are contextual and those Cyrillic letters used by two or more non-Russian nationalities or ethnic groups (*e.g.*, Sami [Lapp]) with different languages and assigned sounds for a specific common letter.

The English letters in the left side of the French Brackets {} are an alternative approximation of the sound, as specified by the U.S. DOD in unclassified document ENM-WA-001 dated 18 Aug 1967 (copy provided by Robert D. Boyd in 2009). The DOD document also lists an ENGLISH EQUIV, which is reproduced here as a single English letter-equivalent for each sound, in the right side of the {}. Note that since the Russian alphabet has more letters than the English alphabet, certain English special characters (*i.e.*, ;, :, ?, &, and “) on American keyboards had to be used by the DOD to transliterate the additional Russian letters.

The usefulness of the transliteration is in knowing the specific Russian letter that was typed on a Russian device (*e.g.*, a teletype) and printed on an equivalent English device, or *vice-versa*. For a modern-day example, if a Russian were to send to you an E-Mail in Russian, you would have difficulty reading it if the letters appeared in English rather than in Russian, or *vice-versa*. With this transliteration, you could reformulate the original Russian and, with a Russian-English dictionary, translate and understand it: this could even be accomplished using a custom program from data generated by optical character recognition software. For a specific example, one of my Russian colleagues, a professor at an university in Irkutsk, had his secretary send me a letter, which she sent directly (without translating into English) *via* E-Mail. My last name read in the address: MAHECC, which is, of course, MANESS, in phonetic Russian; however, it appeared in the body of the E-Mail as MANECC. So, use transliterations reasonably.

Unlike English, where an individual letter might have several pronunciations, Russian letters are pronounced consistently with only occasional shadings of pronunciation in different words. Most non-Russian countries which have adopted the Cyrillic alphabet have added one or more Latin letters or Cyrillic letters with accent marks (*e.g.*, breve, acute, grave, cedilla, …) to their official alphabets to precisely define different pronunciations. In general, correct pronunciation of Cyrillic-alphabetic words is far easier than English words.

With modern computer word-processing technology, in particular this MIG Font™©, such transliteration *schema* should be rendered completely obsolete. Notwithstanding, this equivalency is presented here to enable a straightforward, accurate reverse-engineering of the many old DOD-styled documents back to the original Russian. Most old U.S. Government documents (*e.g.*, transliterations of geological reports) which were written without access to a Russian font were compiled using this specific convention, or one very similar to it.

Of course, some were not transliterated, but translated, directly from Russian to English. For reasons of accuracy and verifiability, I very much prefer the transliterated documents over the translated documents.

One of the U.S. government’s archives, **COSMIC**, preserves the results of government-funded research through a Virginia university’s non-profit (501C3[?]) subsidiary. COSMIC includes much of the original NASA documentation, including various stages in the development of sophisticated software algorithms. In addition, COSMIC includes transliterations and translations of unclassified Russian (and other!) space-science and earth-science publications from the 1950s to the present. In these regards, COSMIC represents a little-known, but fabulous archive of original scientific and contracting information about the international space effort from the early days to the present – all available at the nominal cost of reproduction.

Unfortunately, accessing/acquiring archived COSMIC information requires a request by specific COSMIC report number, page number, *etc*. So, if you already know all the general details about the report, you can easily acquire a copy; otherwise, the information is effectively inaccessible in a black hole to all except those involved in the original governmental contracting! COSMIC would benefit immensely from an openly-available, searchable, simple, meaningful computerized listing of all reports by subject and a few key words, of the type that librarians are masters at providing. If nothing else, this would enable contract monitors to avoid paying to re-invent technology already bought-and-paid-for by the U.S. government, one of the valid justifications for continuing to fund COSMIC!

The origins of scientific computing software, including the foundations and evolution of modern Remote Sensing and GIS capabilities, are preserved in COSMIC as **public-domain** information. Among other characteristics of significant value is a demonstration that much of today’s copyrighted software is, in fact, not eligible for copyright protection since the copyrights are effectively simple replications of the results of public-domain contracts paid by and the property of all Americans. Before the Carter presidency, essentially all intellectual property rights a result of government contracting were contractually placed in the public domain, where some contracted research is still placed.

Note that, both in and out of COSMIC, the Russian “***Special Character 1***” has no sound, since its use is in support of Russian grammar, and, consequently, has no DOD sound equivalent: those interested in this specific Russian letter are advised to consult standard Russian language source references for correct usage, *etc*.

Many other languages other than Russian use Cyrillic lettering with variations. An excellent, preliminary summary is to be found in: Berdnikov, A., *et al*, 1998, *Alphabets Necessary for Various Cyrillic Writing Systems (Towards X2 and T2 Encodings)*, Cahiers Gutenberg No 28-29, Congress EuroTEX, March 1998, pp. 32-43. An effort is being made to incorporate these additions into the MIG Font™© Cyrillic Table. It must be emphasized that even those Cyrillic-based languages which have added Latin letters and/or accent marks do not necessarily use the entire Cyrillic alphabet: many use only a portion. Further, different languages which have borrowed the same Latin letter (*e.g.*, “J”) may choose to place it in different places in their alphabets: consequently, I have preliminarily chosen one of the places used by at least one of the borrowing languages. Also, since the dissolution of the former Soviet Union, many such languages are still in flux regarding a choice of letters to use in their official alphabets: often, three (or more!) such official Cyrillic-based official alphabets of minority languages exist, with many of the new letters being existing letters with accent marks and/or inverted/reversed letters, sometimes adopted from the Latin alphabet, or **ligatures** (composite letters). In consequence, while this is a good-faith effort to present a complete Cyrillic alphabet, it is not infallible and will need periodic updates.

Since many countries use complete or abbreviated Cyrillic alphabets (sometimes with additional letters), the “best” single “standard” Cyrillic alphabet remains the official Russian Cyrillic alphabet. In the following Cyrillic composite alphabet, the standard Russian Cyrillic is indicated by //Russian; …//, followed by other languages/nationalities. In contrast, the added Cyrillic letters are defined by user(s). While it is clear that most non-Russian Cyrillic users have routine access to the entire Cyrillic alphabet, usually at least some of the standard letters are not part of the official minority alphabet, are in flux, or are unknown at the present time to me. The letters in the different official minority alphabets vary in order, some based upon the appearance of letters, some from phonetic criteria, some placed the new letters at the end of the standard Russian (or other reference – *e.g.*, Bulgarian) alphabet, and some placed in an apparently arbitrary order. Some of the alphabets are clearly in transition (*e.g.*, Adyghey) to the development of many additional, especially ligature, Cyrillic and Latin letters. Starting with the word “**Russian**” clearly differentiates the standard Russian Cyrillic from additional non-standard Cyrillic letters.

Political factors, both modern and ancient, contributed to the Cyrillic alphabets of today. Most people would just assume from this statement that it is directed at the Soviet system; however, it goes far, far, beyond that. For example, many of the ethnic groups with different Cyrillic alphabets today trace the locations of their present homelands to conquests made by the Mongols in the 13th-14th Centuries and are, therefore, not attributable to Russia’s control. Some of the Mongol ethnic groups’ languages and cultures were profoundly different and today’s non-Russian Cyrillic reflects that. Notwithstanding, other Mongol ethnic groups’ languages were originally one language, with, perhaps, local dialects. When the word “*Mongolian*” is used in this united Cyrillic alphabet, it refers only to the *Khalkha Mongol* dialect and the official alphabet of modern-day Mongolia: Khalkha is not otherwise specifically identified herein. Other languages (*i.e.*, Kalmyk) are still so close linguistically to Khalkha that people from the modern-day Mongolia and Kalmykia can converse with very little difficulty. Some of the minorities in western and northern China can also converse freely with Khalkha and Kalymyk Mongols. Similarly, the native languages of the Yakut people in the Republic of Sakha and of the Turks are closely affiliated: both can communicate today, at least somewhat. The purpose of these observations is to emphasize that different listed languages may or may not have obvious similarities based upon shared histories, ancient or modern. Don’t assume that just because I didn’t list a language as having a historical Mongol (or other) origin that it doesn’t! The good news is that a person who can communicate in one of these many languages may also be able to read or to converse in one or more of the other languages!

The Macedonian alphabet is a special case in that most modern-day Greeks strongly object to the adoption of the word “*Macedonian*” to describe this group. The Macedonians just as strongly argue that this word describes them, their culture and their linguistic uniqueness. I am not taking any position in this dispute, whatsoever, beyond emphasizing to users of the MIG Font™© that this dispute exists.

Please remember that additional variants continue to appear, keeping the non-Russian portion of the Cyrillic alphabet in flux. Notifications of omissions or needed corrections will be greatly appreciated.

Code

Letters Intermediate File Name Equivalents

 A\_uc $0410

//**Russian**; Adyghey, Aleut, Bulgarian, Inuit [Eskimo], Macedonian, Mongolian, Mountain Mari, Sami [Lapp], Serbian, Valley Mari.// {AH = A} (Used Greek Alpha\_uc.)

 a\_lc $0430

//**Russian**; Adyghey, Aleut, Bulgarian, Inuit [Eskimo], Macedonian, Mongolian, Mountain Mari, Sami [Lapp], Serbian, Valley Mari.// (Used English a\_lc.)

 Adieresis\_uc $04D2

//Gagauz, Hanty, Kalmyk [Mongolian], Mountain Mari, Nganasan, Sami [Lapp], Selkup.//

 adieresis\_lc $04D3

//Gagauz, Hanty, Kalmyk [Mongolian], Mountain Mari, Nganasan, Sami [Lapp], Selkup.//

 Aacute\_uc $0… & $E076

//Sami [Lapp].//

 aacute\_lc $0… & $E077

//Sami [Lapp].//

 Adieresis-macron\_uc $E031

//Sami [Lapp].//

 adieresis-macron\_lc $E032

//Sami [Lapp].//

 Amacron\_uc $E033

//Aleut, Evenk, Mansi, Sami [Lapp].//

 amacron\_lc $E034

//Aleut, Evenk, Mansi, Sami [Lapp].//

 Abreve\_uc $04D0 & $0...

//Chuvash, Hanty.//

 abreve\_lc $04D1 & $0...

//Chuvash, Hanty.//

 Aring\_uc $F0178 **(?)** & $0...

//Selkup.//

 aring\_lc $00A5 & $F0179 **(?)**

//Selkup.//

 AE\_uc $0086 & $04D4

//Osetin.//

 ae\_lc $00A6 & $04D5

//Osetin.//

 Beh\_uc $0...

//**Russian**; Adyghey, Bulgarian, Inuit [Eskimo], Macedonian, Mongolian, Mountain Mari, Sami [Lapp], Serbian, Valley Mari.// {BEH = B}

 beh\_lc $0...

//**Russian**; Adyghey, Bulgarian, Inuit [Eskimo], Macedonian, Mongolian, Mountain Mari, Sami [Lapp], Serbian, Valley Mari.// (**Made distinctive from number 6.**)

 … V\_uc $0...

//**Russian**; Adyghey, Aleut, Bulgarian, Inuit [Eskimo], Macedonian, Mongolian, Mountain Mari, Sami [Lapp], Serbian, Valley Mari.// {VEH = W} (Use Greek upper-case Beta.)

 … v\_lc $0...

//**Russian**; Adyghey, Aleut, Bulgarian, Inuit [Eskimo], Macedonian, Mongolian, Mountain Mari, Sami [Lapp], Serbian, Valley Mari.// (**Used smaller version of Greek Beta\_uc.**)

 … G\_uc $0...

//**Russian**; Adyghey, Aleut, Bulgarian, Macedonian, Mongolian, Mountain Mari, Sami [Lapp], Serbian, Valley Mari.// {GEH = G} (Used Greek Gamma\_uc.)

 … g\_lc $0...

//**Russian**; Adyghey, Aleut, Bulgarian, Macedonian, Mongolian, Mountain Mari, Sami [Lapp], Serbian, Valley Mari.// (**Used smaller version of Greek Gamma\_uc.**)

 … …\_uc $0...

//Macedonian.//

 … …\_lc $0...

//Macedonian.//

 … …\_uc $0...

//Ukrainian.//

 … …\_lc $0...

//Ukrainian.//

 … …\_uc $0...

//Azerbaijan, Bashkir, Hakass, Ket, Nivh, Shor, Tadjik, Tofalar, Uighur, Uzbek.//

 … …\_lc $0...

//Azerbaijan, Bashkir, Hakass, Ket, Nivh, Shor, Tadjik, Tofalar, Uighur, Uzbek.//

 … …\_uc $0..

//Aleut, Inuit [Eskimo], Ket, Nivh.//

 … …\_lc $0..

//Aleut, Inuit [Eskimo], Ket, Nivh.//

 … …\_uc $E035

//Azerbaidjan, Bashkir, Hakass, Karakalpak, Kazakh, Ket, Nivh, Shor, Tadjik, Tofalar, Uighur, Uzbek.//

 … …\_lc $E036

//Azerbaidjan, Bashkir, Hakass, Karakalpak, Kazakh, Ket, Nivh, Shor, Tadjik, Tofalar, Uighur, Uzbek.//

 … …\_uc $0...

//Abkhaz, Dolgan, Yakut, Yukagir.//

 … …\_lc $0...

//Abkhaz, Dolgan, Yakut, Yukagir.//

 … …\_uc $0...

//Aleut, Azerbaijan, Bashkir, Burjat, Dolgan, Kalmuk, Kazakh, Kurdish, Sami [Lapp], Tatar, Tofalar, Uighur, Yakut..//

 … …\_lc $0...

//Aleut, Azerbaijan, Bashkir, Burjat, Dolgan, Kalmuk, Kazakh, Kurdish, Sami [Lapp], Tatar, Tofalar, Uighur, Yakut..//

 … D\_uc $0...

//**Russian**; Adyghey, Aleut, Bulgarian, Inuit [Eskimo], Macedonian, Mongolian, Mountain Mari, Sami [Lapp], Serbian, Valley Mari.// {DEH = D}

 … d\_lc $0...

//**Russian**; Adyghey, Aleut, Bulgarian, Inuit [Eskimo], Macedonian, Mongolian, Mountain Mari, Sami [Lapp], Serbian, Valley Mari.// (**Used modified, smaller version of above.**)

 … …\_uc $E037

//Aleut.//

 … …\_lc $E038

//Aleut.//

 … …\_uc $E039

//Aleut.//

 … …\_lc $E03A

//Aleut.//

 … E\_uc $0...

//**Russian**; Aleut, Bulgarian, Inuit [Eskimo], Macedonian, Mongolian, Mountain Mari, Sami [Lapp], Serbian, Valley Mari.// {YEH = E} (Used Greek Epsilon\_uc.)

 … e\_lc $0...

//**Russian**; Aleut, Bulgarian, Inuit [Eskimo], Macedonian, Mongolian, Mountain Mari, Sami [Lapp], Serbian, Valley Mari.// (Used English e\_lc.)

 … …\_uc $0...

//**Russian**; Aleut, Bulgarian, Inuit [Eskimo], Mongolian, Mountain Mari, Sami [Lapp], Valley Mari, etc.//

 … …\_lc $0...

//**Russian**; Aleut, Bulgarian, Inuit [Eskimo], Mongolian, Mountain Mari, Sami [Lapp], Valley Mari, etc.//

 … …\_uc $E03B

//Aleut, Mansi, Sami [Lapp].//

 … …\_lc $E03C

//Aleut, Mansi, Sami [Lapp].//

 … …\_uc $E03D

//Chuvash.//

 … …\_lc $E03E

//Chuvash.//

 … …\_uc $0...

//Abkhaz.//

 … …\_lc $0...

//Abkhaz.//

 … …\_uc $04BE & $0...

//Abkhaz.// (**Is the ogonek actually a descender? Is this an error?**)

 … …\_lc $04BF & $0...

//Abkhaz.// (**Is the ogonek actually a descender? Is this an error?**)

 … …\_uc $04D8 & $0...

//Abkhaz, Aleut, Azerbaijan, Bashkir, Dungan, Hanty, Itelmen, Kalmyk [Mongol], Kazakh, Ket, Kurdish, Nganasan, Sami [Lapp], Tatar, Tofalar, Turkmen, Uighur.//

 … …\_lc $04D9 & $0...

//Abkhaz, Aleut, Azerbaijan, Bashkir, Dungan, Hanty, Itelmen, Kalmyk [Mongol], Kazakh, Ket, Kurdish, Nganasan, Sami [Lapp], Tatar, Tofalar, Turkmen, Uighur.//

 … …\_uc $04DA & $0...

//Hanty.//

 … …\_lc $04DB & $0...

//Hanty.//

 … ZH\_uc $0416

//**Russian**; Aleut, Bulgarian, Inuit [Eskimo], Macedonian, Mongolian, Mountain Mari, Sami [Lapp], Serbian, Valley Mari.// {ZHEH = V}

 … zh\_lc $0436

//**Russian**; Aleut, Bulgarian, Inuit [Eskimo], Macedonian, Mongolian, Mountain Mari, Sami [Lapp], Serbian, Valley Mari.// (Used smaller, modified version of above.)

 … …\_uc $04DC

//Udmurt.//

 … …\_lc $04DD

//Udmurt.//

 … …\_uc $0496

//Dungan, Kalmyk [Mongolian], Tatar, Turkmen, Uighur, Uzbek.//

 … …\_lc $0497

//Dungan, Kalmyk [Mongolian], Tatar, Turkmen, Uighur, Uzbek.//

 … Zeh\_uc $0417

//**Russian**; Abkhazian, Aleut, Bulgarian, Enets, Inuit [Eskimo], Macedonian, Mongolian, Mountain Mari, Nganasan, Sami [Lapp], Serbian, Valley Mari.// {ZEH = Z} (**Note: Differentiated from number 3!**) (The Samis define this as the “CF” letter.)

 … zeh\_lc $0437

//**Russian**; Abkhazian, Aleut, Bulgarian, Enets, Inuit [Eskimo], Macedonian, Mongolian, Mountain Mari, Nganasan, Sami [Lapp], Serbian, Valley Mari.// (**Note: Differentiated from number 3!**) (**Used smaller, modified version of above.**)

 Zeh\_caron\_uc $E028

//Sami [Lapp].// (Removed duplicate $E03F.)

 zeh\_caron\_lc $E029

//Sami [Lapp].// (Removed duplicate $E040.)

 Zeh\_dieresis\_uc $0...

//Udmurt.//

 zeh\_dieresis\_lc $0...

//Udmurt.//

 Zeh\_cedilla\_uc $E07A

//Bashkir.//

 zeh\_cedilla\_lc $E07B

//Bashkir.//

 … …\_uc $04E0 & $0...

//Abkhazian, Enets, Nganasan.//

(**Note: Due to possible confusion with the number three [3] standard herein, this –uc & -lc has been modified to be distinctly different.**)

 … …\_lc $04E1 & $0...

//Abkhazian, Enets, Nganasan.//

 … …\_uc $0510 & $0...

//Enets, Hanty.// (Note: This letter is a simple reversal of the Russian “Zeh-sound” letter\_uc.)

 … …\_lc $0511 & $0...

//Enets, Hanty.// (Note: This letter is a simple reversal of the Russian “zeh-sound” letter\_lc.)

 … …\_uc $E07C

//Hanty.// (Note: This letter is a simple reversal of the Russian “Zeh-sound” letter\_uc, with dieresis.)

 … …\_lc $E07D

//Hanty.// (Note: This letter is a simple reversal of the Russian “zeh-sound” letter\_lc, with dieresis.)

 Ee\_uc $0418

//**Russian**; Aleut, Bulgarian, Inuit [Eskimo], Macedonia, Mongolian, Mountain Mari, Sami [Lapp], Serbian, Valley Mari.// {EE = I} (Used rotated, modified version of Greek Nu\_uc.)

 ee\_lc $0438

//**Russian**; Aleut, Bulgarian, Inuit [Eskimo], Macedonia, Mongolian, Mountain Mari, Sami [Lapp], Serbian, Valley Mari.// (**Used smaller version of above.**)

 Ee\_dieresis\_uc $04E4

//**Russian**; Nganasan, Udmurt.//

 ee\_dieresis\_lc $04E5

//**Russian**; Nganasan, Udmurt.//

 Ee\_macron\_uc $04E2

//Aleut, Evenk [Tungus], Mansi, Sami [Lapp], Tadjik.//

 ee\_macron\_lc $04E3

//Aleut, Evenk [Tungus], Mansi, Sami [Lapp], Tadjik.//

 Ee\_breve\_uc $0419

//**Russian**; Aleut, Bulgarian, Inuit [Eskimo], Mongolian, Mountain Mari, Sami [Lapp], Valley Mari.// {EE (KRAHT-KOY-YEH) = J} (**Used “i” sound, above, with modified “breve.”**)

 ee\_breve\_lc $0439

//**Russian**; Aleut, Bulgarian, Inuit [Eskimo], Mongolian, Mountain Mari, Sami [Lapp], Valley Mari.// (**Used smaller, modified version of above.**)

 Palochka\_uc $0406 & $04C0

//Abezin, Adyghey, Avar, Belarus, Chechen, Dargin, Ingush, Kabardin [Cherkess], Lack, Lezgin, Tabasarin, Ukrainian.//

 palochka\_lc\_alt $F0141 **(?)** & $0...

//Abezin, Adyghey, Avar, Belarus, Chechen, Dargin, Ingush, Kabardin [Cherkess], Lack, Lezgin, Tabasarin, Ukrainian.//

 Palochka\_dieresis\_uc $0407

//Ukrainian.//

 Palochka\_dieresis\_lc $0457

//Ukrainian.//

 Palochka\_dot-ascender\_uc $E041

//Hakass.//

 Palochka\_dot-ascender\_lc $0456

//Belarus, Hakass, Ukraine.//

(**Note: Those also using the I,i variants include the Byelorussian {*aka* Belaurissian}, Hakass, Kazakh, Komi-Permyak, Komi-Zyrian, Nganasan, Tofalar and Ukrainian.**)

 … …\_uc $0408

//Altai, Azerbaijan, Hanty, Macedonian, Sami [Lapp], Serbian.//

 … …\_lc $0458

//Altai, Azerbaijan, Hanty, Macedonian, Sami [Lapp], Serbian.//

 … K\_uc $041A

//**Russian**; Aleut, Bulgarian, Inuit [Eskimo], Macedonian, Mongolian, Mountain Mari, Sami [Lapp], Serbian, Valley Mari.// {KAH = K} (**Used highly-modified Greek Kappa\_uc.**)

 … k\_lc $043A

//**Russian**; Aleut, Bulgarian, Inuit [Eskimo], Macedonian, Mongolian, Mountain Mari, Sami [Lapp], Serbian, Valley Mari.// (**Used smaller, modified version of above.**)

 … …\_uc $040C

//Macedonian.//

 … …\_lc $045C

//Macedonian.//

 … …\_uc $049A

//Abkhaz, Karakalpak, Kazakh, Tadjik, Tofalar, Uighur, Uzbek.//

 … …\_lc $049B

//Abkhaz, Karakalpak, Kazakh, Tadjik, Tofalar, Uighur, Uzbek.//

 … …\_uc $049C

//Azerbaijan.//

 … …\_lc $049D

//Azerbaijan.//

 … …\_uc $049E

//Abkhaz.//

 … …\_lc $049F

//Abkhaz.//

 …\_tail\_uc $04C3

//Aleut, Chukcha, Inuit [Eskimo], Hanty [Vahov], Itelmen, Ket, Koryak, Nivh, Selkup, Shor, Uighur.//

 …\_tail\_lc $04C4

//Aleut, Chukcha, Inuit [Eskimo], Hanty [Vahov], Itelmen, Ket, Koryak, Nivh, Selkup, Shor, Uighur.//

 … …\_uc $04A0

//Bashkir.//

 … …\_lc $04A1

//Bashkir.//

 Ell\_uc $041B

//**Russian**; Aleut, Bulgarian, Inuit [Eskimo], Macedonian, Mongolian, Mountain Mari, Sami [Lapp], Serbian, Valley Mari.// {ELL = L} (**Did not use Greek “Pi.”**)

 ell\_lc $043B

//**Russian**; Aleut, Bulgarian, Inuit [Eskimo], Macedonian, Mongolian, Mountain Mari, Sami [Lapp], Serbian, Valley Mari.// (**Used smaller version of above.**)

 Ell\_dot-descender\_uc $E042

//Hanty.//

 ell\_dot-descender\_lc $E043

//Hanty.//

 Ell\_…\_uc $04C5

//Sami [Lapp].//

 ell\_…\_lc $04C6

//Sami [Lapp].//

 … …\_uc $0409

//Adyghey, Itelmen, Macedonian, Serbian.//

 … …\_lc $0459

//Adyghey, Itelmen, Macedonian, Serbian.//

 … …\_uc $0512

//Chukcha, Hanty [Kazym], Itelmen.//

 … …\_lc $0513

//Chukcha, Hanty [Kazym], Itelmen.//

 S\_uc $0405

//Macedonian. (Same as Latin S.)//

 s\_lc $0455

//Macedonian. (Same as Latin S.)//

 … M\_uc {EM = M} $041C

//**Russian**; Adyghey, Aleut, Bulgarian, Inuit [Eskimo], Macedonian, Mongolian, Mountain Mari, Sami [Lapp], Serbian, Valley Mari.// (**Used Greek Mu\_uc.**)

 … m\_lc $043C

//**Russian**; Adyghey, Aleut, Bulgarian, Inuit [Eskimo], Macedonian, Mongolian, Mountain Mari, Sami [Lapp], Serbian, Valley Mari.// (Used smaller version of Greek Mu\_uc.)

 … …\_uc $04CD

//Sami [Lapp].//

 … …\_lc $04CE

//Sami [Lapp].//

 En\_uc $041D

//**Russian**; Adyghey, Aleut, Bulgarian, Inuit [Eskimo], Macedonian, Mongolian, Mountain Mari, Serbian, Valley Mari.// {EN = N} (Used Greek Eta\_uc.)

 en\_lc $043D

//**Russian**; Adyghey, Aleut, Bulgarian, Inuit [Eskimo], Macedonian, Mongolian, Mountain Mari, Serbian, Valley Mari.// (Used smaller version of Greek Eta\_uc.)

 En\_…\_uc $04A2

//Bashkir, Dungan, Kalmyk [Mongol], Kazakh, Kirghiz, Sami [Lapp], Tatar, Turkmen, Tuva, Uighur.//

 en\_…\_lc $04A3

//Bashkir, Dungan, Kalmyk [Mongol], Kazakh, Kirghiz, Sami [Lapp], Tatar, Turkmen, Tuva, Uighur.//

 En\_dot-ascender\_uc $E044

//Sami [Lapp].//

 en\_dot-ascender\_lc $E045

//Sami [Lapp].//

 En\_dot-descender\_uc $E046

//Hanty.//

 en\_dot-descender\_lc $E047

//Hanty.//

 … …\_uc $04A4

//Altai, Dolgan, Mountain Mari, Valley Mari, Yakut, Yukagir.//

 … …\_lc $04A5

//Altai, Dolgan, Mountain Mari, Valley Mari, Yakut, Yukagir.//

 … …\_uc $04C7

//Adyghey, Aleut, Chukcha, Enets, Even [Lamut], Evenk [Tungus], Hakass, Hanty, Inuit [Eskimo], Itelmen, Ket, Koryak, Mansi, Nanai, Nganasan, Nivh, Sami [Lapp], Selkup, Tofalar, Ulch.// (Note: There are two versions of this compound letter, with the more widely-used appearing to be that without the “line” above the “J” descender.)

 … …\_lc $04C8

//Adyghey, Aleut, Chukcha, Enets, Even [Lamut], Evenk [Tungus], Hakass, Hanty, Inuit [Eskimo], Itelmen, Ket, Koryak, Mansi, Nanai, Nganasan, Nivh, Sami [Lapp], Selkup, Tofalar, Ulch.// (Note: There are two versions of this compound letter, with the more widely-used appearing to be that without the “line” above the “J” descender.)

 … …\_uc $040A

//Adyghey, Macedonian, Serbian.//

 … …\_lc $045A

//Adyghey, Macedonian, Serbian.//

 Oh\_uc $041E

//**Russian**; Adyghey, Aleut, Bulgarian, Inuit [Eskimo], Macedonian, Mongolian, Mountain Mari, Sami [Lapp], Serbian, Valley Mari.// {OH = O} (Used Greek Omicron\_uc. Considering changing all the Cyrillic “Oh” to Latin O.)

 oh\_lc $043E

//**Russian**; Adyghey, Aleut, Bulgarian, Inuit [Eskimo], Macedonian, Mongolian, Mountain Mari, Sami [Lapp], Serbian, Valley Mari.// (Used Greek omicron\_lc. Consdiering changing to Latn o.)

 Oh\_acute\_uc $E048

//Sami [Lapp].// (**Note: This is the Cyrillic, not the Latin Oacute shown.**)

 Oh\_acute\_lc $E049

//Sami [Lapp].// (**Note: This is the Cyrillic, not the Latin Oacute shown.**)

 Oh\_dieresis\_uc $04E6

//Altai, Gagauz, Hakass, Hanty, Kalmyk [Mongol], Komi-Permyak, Komi-Zyrian, Kurdish, Mountain Mari, Nganasan, Sami [Lapp], Selkup, Shor, Udmurt, Valley Mari.//

 oh\_dieresis\_lc $04E7

//Altai, Gagauz, Hakass, Hanty, Kalmyk [Mongol], Komi-Permyak, Komi-Zyrian, Kurdish, Mountain Mari, Nganasan, Sami [Lapp], Selkup, Shor, Udmurt, Valley Mari.//

 Oh\_macron\_uc $E04A

//Aleut, Evenk [Tungus], Mansi, Sami [Lapp].//

 oh\_macron\_lc $E04B

//Aleut, Evenk [Tungus], Mansi, Sami [Lapp].//

 Oh\_dot-ascender\_uc $E04C

//Enets, Nganasan.//

 oh\_dot-ascender\_lc $E04D

//Enets, Nganasan.//

 Oh\_dot-descender\_uc $E04E

//…//

 oh\_dot-descender\_lc $E04F

//…//

 Fita\_uc $04E8

//**Old Russian**; Azerbaijan, Bashkir, Buryat [Mongol], Dolgan, Even [Lamut], Hanty, Kalmyk [Mongol], Kazakh, Ket, Kirghiz, Mongolian, Selkup, Tatar, Tofalar, Tuva [Mongol], Turkmen, Uighur, Yakut, Yukagir.//

 fita\_lc $04E9

//**Old Russian**; Azerbaijan, Bashkir, Buryat [Mongol], Dolgan, Even [Lamut], Hanty, Kalmyk [Mongol], Kazakh, Ket, Kirghiz, Mongolian, Selkup, Tatar, Tofalar, Tuva [Mongol], Turkmen, Uighur, Yakut, Yukagir.//

 Fita\_dieresis\_uc $04EA

//Hanty, Even [Lamut].//

 fita\_dieresis\_lc $04EB

//Hanty, Even [Lamut].//

 … …\_uc $04A8

//Abkhaz.//

 … …\_lc $04A9

//Abkhaz.//

 Peh\_uc $041F

//**Russian**; Adyghey, Aleut, Bulgarian, Inuit [Eskimo], Macedonian, Mongolian, Mountain Mari, Sami [Lapp], Serbian, Valley Mari.// {PEH = P} (Used Greek Pi\_uc.)

 peh\_lc $043F

//**Russian**; Adyghey, Aleut, Bulgarian, Inuit [Eskimo], Macedonian, Mongolian, Mountain Mari, Sami [Lapp], Serbian, Valley Mari.// (Used smaller version of Greek Pi\_uc.)

 … …\_uc $E050

//Abkhaz.//

 … …\_lc $E051

//Abkhaz.//

 Err\_uc $0420

//**Russian**; Adyghey, Aleut, Bulgarian, Inuit [Eskimo], Macedonian, Mongolian, Mountain Mari, Sami [Lapp], Serbian, Valley Mari.// {ERR = R} (Used Greek Rho\_uc.)

 err\_lc $0440

//**Russian**; Adyghey, Aleut, Bulgarian, Inuit [Eskimo], Macedonian, Mongolian, Mountain Mari, Sami [Lapp], Serbian, Valley Mari.// (Used modified English p\_lc.)

 Err\_caron\_uc $E052

//Nivh.//

 err\_caron\_lc $E053

//Nivh.//

 Err\_breve\_uc $E054

//Nivh.//

 err\_breve\_lc $E055

//Nivh.//

 Err\_…\_uc $048E

//Sami [Lapp].//

 err\_…\_lc $048F

//Sami [Lapp].//

 Err\_…\_uc $E056

//…//

 err\_…\_lc $E057

//…//

 … …\_uc $0034 & $051A

//Kurdish, Serbian.//

 … …\_lc $0054 & $051B

//Kurdish, Serbian.//

 Ess\_uc $0026 & $0421

//**Russian**; Adyghey, Aleut, Bulgarian, Inuit [Eskimo], Macedonian, Mongolian, Mountain Mari, Sami [Lapp], Serbian, Valley Mari.// {ESS = S} (Used Latin C\_uc.)

 ess\_lc $0046 & $0441

//**Russian**; Adyghey, Aleut, Bulgarian, Inuit [Eskimo], Macedonian, Mongolian, Mountain Mari, Sami [Lapp], Serbian, Valley Mari.// (Used Latin c\_lc.)

 Ess\_cedilla\_uc $0087 & $E058

//Bashkir, Chuvash.// (Cyrillic capital letter Ess with cedilla.)

 ess\_cedilla\_lc $00A7 & $E059

//Bashkir, Chuvash.// (Cyrillic lower-case letter ess with cedilla.)

 Ess-descender-right\_uc $E05A

//…//

 ess-descender-right\_lc $E05B

//…//

 Ess-descender-left\_uc $E05C

//Enets.//

 ess-descender-left\_lc $E05D

//Enets.//

 Teh\_uc $0422

//**Russian**; Adyghey, Aleut, Bulgarian, Inuit [Eskimo], Macedonian, Mongolian, Mountain Mari, Sami [Lapp], Serbian, Valley Mari.// {TEH = T} (Used Greek Tau\_uc.)

 teh\_lc $0442

//**Russian**; Adyghey, Aleut, Bulgarian, Inuit [Eskimo], Macedonian, Mongolian, Mountain Mari, Sami [Lapp], Serbian, Valley Mari.// (Used smaller version of Greek Tau\_uc.)

 Teh\_…\_uc $04AC

//Abkhaz.//

 teh…\_lc $04AD

//Abkhaz.//

 … …\_uc $04B4

//Abkhaz.//

 … …\_lc $04B5

//Abkhaz.//

 Yat\_uc $0462

//**Old Russian**; Bulgarian, Sami [Lapp].//

 … yat\_lc $0463

//**Old Russian**; Bulgarian, Sami [Lapp].//

 … …\_uc $040B

//Serbian.//

 … …\_lc $045B

//Serbian.//

 … …\_uc $A68A

//Serbian.//

 … …\_lc $A68B

//Serbian.//

 Oo\_uc $0423

//**Russian**; Adyghey, Aleut, Bulgarian, Inuit [Eskimo], Macedonian, Mongolian, Mountain Mari, Sami [Lapp], Serbian, Valley Mari.// {OO = U}

 oo\_lc $0443

//**Russian**; Adyghey, Aleut, Bulgarian, Inuit [Eskimo], Macedonian, Mongolian, Mountain Mari, Sami [Lapp], Serbian, Valley Mari.// (Used greatly-modified English y\_lc.)

 Oo\_acute\_uc $E05E

//Karachay-Balkar.//

 oo\_acute\_lc $E05F

//Karachay-Balkar.//

 Oo\_tilde\_uc $E060

//Chuvash.//

 oo\_tilde\_lc $E061

//Chuvash.//

 Oo\_circumflex\_uc $E062

//Adyghei.//

 oo\_circumflex\_lc $E063

//Adyghei.//

 Oo\_diresis\_uc $04F0

//Altai, Gagauz, Hakass, Hanty, Kalmyk [Mongol], Mountain Mari, Nenets, Nganasan, Sami [Lapp], Selkup, Shor, Valley Mari.//

 oo\_dieresis\_lc $04F1

//Altai, Gagauz, Hakass, Hanty, Kalmyk [Mongol], Mountain Mari, Nenets, Nganasan, Sami [Lapp], Selkup, Shor, Valley Mari.//

 Oo\_macron\_uc $04EE

//Aleut, Evenk [Tungus], Mansi, Sami [Lapp], Tadjik.//

 oo\_macron\_lc $04EF

//Aleut, Evenk [Tungus], Mansi, Sami [Lapp], Tadjik.//

 Oo\_breve\_uc $040E

//Aleut, Belorussian, Dungan, Hanty, Inuit [Eskimo], Nivh, Uzbek.//

 oo\_breve\_lc $045E

//Aleut, Belorussian, Dungan, Hanty, Inuit [Eskimo], Nivh, Uzbek.//

 … …\_uc $003C & $04AE

//Azerbaijan, Bashkir, Buryat [Mongol], Dolgan, Dungan, Kalmyk [Mongol], Kazakh, Kirghiz, Mongolian, Serbian, Tatar, Tofalar, Turkmen, Uighur, Yakut.//

 … …\_lc $04AF

//Azerbaijan, Bashkir, Buryat [Mongol], Dolgan, Dungan, Kalmyk [Mongol], Kazakh, Kirghiz, Mongolian, Serbian, Tatar, Tofalar, Turkmen, Uighur, Yakut.//

 … …\_uc $04B0

//Kazakh.//

 … …\_lc $04B1

//Kazakh.//

 Eff\_uc $0424

//**Russian**; Adyghey, Aleut, Bulgarian, Inuit [Eskimo], Macedonian, Mongolian, Mountain Mari, Sami [Lapp], Serbian, Valley Mari.// {EFF = F} (Used Greek Phi\_uc.)

 eff\_lc $0444

//**Russian**; Adyghey, Aleut, Bulgarian, Inuit [Eskimo], Macedonian, Mongolian, Mountain Mari, Sami [Lapp], Serbian, Valley Mari.// (**Added to Greek alphabet as Russian/Cyrillic variant of Greek phi\_lc.**)

 Ha\_uc $0425

//**Russian**; Adyghey, Aleut, Bulgarian, Inuit [Eskimo], Macedonian, Mongolian, Mountain Mari, Sami [Lapp], Serbian, Valley Mari.// {HA = H} (**Used Greek Chi\_uc.**)

 ha\_lc $0445

//**Russian**; Adyghey, Aleut, Bulgarian, Inuit [Eskimo], Macedonian, Mongolian, Mountain Mari, Sami [Lapp], Serbian, Valley Mari.// (Used smaller version of Greek Chi\_uc.)

 Ha\_dot-ascender\_uc $E064

//Sami [Lapp].//

 ha\_dot-ascender\_lc $E065

//Sami [Lapp].//

 Ha\_...\_uc $04FE

//Nivh.//

 ha\_…\_lc $04FF

//Nivh.//

 Ha\_…\_uc $04B2

//Abkhaz, Inuit [Eskimo], Itelmen, Karakalpak, Tadjik, Uzbek.//

 ha\_…\_lc $04B3

//Abkhaz, Inuit [Eskimo], Itelmen, Karakalpak, Tadjik, Uzbek.//

 Ha\_…\_uc $04FC

//Aleut, Inuit [Eskimo], Itelmen, Nivh.//

 ha\_…\_lc $04FD

//Aleut, Inuit [Eskimo], Itelmen, Nivh.//

 Tseh\_uc $0426

//**Russian**; Adyghey, Aleut, Bulgarian, Inuit [Eskimo], Macedonian, Mongolian, Mountain Mari, Sami [Lapp], Serbian, Valley Mari.// {TSEH = C}

 tseh\_lc $0446

//**Russian**; Adyghey, Aleut, Bulgarian, Inuit [Eskimo], Macedonian, Mongolian, Mountain Mari, Sami [Lapp], Serbian, Valley Mari.// (Used smaller version of above.)

 Tseh\_…\_uc $040F

//Abkhaz, Macedonian, Serbian.//

 tseh\_…\_lc $045F

//Abkhaz, Macedonian, Serbian.//

 Cheh\_uc $0427

//**Russian**; Adyghey, Aleut, Bulgarian, Inuit [Eskimo], Macedonian, Mongolian, Mountain Mari, Sami [Lapp], Serbian, Valley Mari.// {CHEH = ;}

 cheh\_lc $0447

//**Russian**; Adyghey, Aleut, Bulgarian, Inuit [Eskimo], Macedonian, Mongolian, Mountain Mari, Sami [Lapp], Serbian, Valley Mari.//

 Cheh\_dieresis\_uc $04F4

//Udmurt.//

 cheh\_dieresis\_lc $04F5

//Udmurt.//

 Cheh\_…\_uc $04B6

//Abkhaz, Tadjik, Tofalar.//

 cheh\_…\_lc $04B7

//Abkhaz, Tadjik, Tofalar.//

 Cheh\_…\_uc $04CB

//Hakass, Tofalar.//

 cheh\_…\_lc $04CC

//Hakass, Tofalar.//

 Cheh\_dot-descender\_uc $E066

//Hanty.//

 cheh\_dot-descender\_lc $E067

//Hanty.//

 Cheh\_…\_uc $04B8

//Azerbaijan.//

 cheh\_…\_lc $04B9

//Azerbaijan.//

 Ch\_…\_uc $04BA

//Sami [Lapp].// (Upside-down, backwards standard “Ch” sound.)

 ch\_…\_lc $04BB

//Sami [Lapp].// (Upside-down, backwards standard “Ch” sound.)

 … …\_uc $051C

//Kurdish, Serbian.//

 … …\_lc $051D

//Kurdish, Serbian.//

 Shah\_uc $0428

//**Russian**; Aleut, Bulgarian, Macedonian, Mongolian, Mountain Mari, Sami [Lapp], Serbian, Valley Mari.// {SHAH = :}

 shah\_lc $0448

//**Russian**; Aleut, Bulgarian, Macedonian, Mongolian, Mountain Mari, Sami [Lapp], Serbian, Valley Mari.// (Used smaller version of above.)

 Shchah\_uc $0429

//**Russian**; Aleut, Bulgarian, Mongolian, Mountain Mari, Valley Mari.// {SHCHAH = Q}

 shchah\_lc $0449

//**Russian**; Aleut, Bulgarian, Mongolian, Mountain Mari, Valley Mari.// (Used smaller version of above.)

 SPCHR1\_uc $042A

//**Russian**; Adyghey, Aleut, Bulgarian, Mongolian, Mountain Mari, Sami [Lapp], Valley Mari.//

 spchr1\_lc $044A

//**Russian**; Adyghey, Aleut, Bulgarian, Mongolian, Mountain Mari, Sami [Lapp], Valley Mari.// (Used smaller version of above.)

 … …\_uc $04A0

//Bashkir.//

 … …\_lc $04A1

//Bashkir.//

 Yerih\_uc $042B

//**Russian**; Adyghey, Aleut, Bulgarian, Mountain Mari, Sami [Lapp], Valley Mari.// {YERIH = Y}

 yerih\_lc $044B

//**Russian**; Adyghey, Aleut, Bulgarian, Mountain Mari, Sami [Lapp], Valley Mari.// (Used smaller version of above.)

 Yerih\_dieresis\_uc $04F8

//Mountain Mari, Sami [Lapp].//

 yerih\_dieresis\_lc $04F9

//Mountain Mari, Sami [Lapp].//

 Yerih\_macron\_uc $E068

//Aleut, Evenk [Tungus], Mansi, Sami [Lapp].//

 yerih\_macron\_lc $E069

//Aleut, Evenk [Tungus], Mansi, Sami [Lapp].//

 SPCHR2\_uc $042C

//**Russian**; Adyghey, Aleut, Bulgarian, Mongolian, Mountain Mari, Sami [Lapp], Valley Mari.// {MYA-KEY-ZNAK = X}

 spchr2\_lc $044C

//**Russian**; Adyghey, Aleut, Bulgarian, Mongolian, Mountain Mari, Sami [Lapp], Valley Mari.// (Used smaller version of above.)

 Myakeyznak\_…\_uc $048C

//…//

 myakeyznak\_…\_lc $048D

//…//

 Eh\_uc $042D

//**Russian**; Adyghey, Aleut, Bulgarian, Mountain Mari, Sami [Lapp], Valley Mari.// {EH = ?}

 eh\_lc $044D

//**Russian**; Adyghey, Aleut, Bulgarian, Mountain Mari, Sami [Lapp], Valley Mari.// (Used smaller, highly-modified version of above.)

 Eh\_acute\_uc $E06A

//Sami [Lapp].//

 eh\_acute\_lc $E06B

//Sami [Lapp].//

 Eh\_macron\_uc $E06C

//Aleut, Evenk [Tungus], Mansi, Sami [Lapp].//

 eh\_macron\_lc $E06D

//Aleut, Evenk [Tungus], Mansi, Sami [Lapp].//

 Eh\_dieresis\_uc $04EC

//Sami [Lapp].//

 eh\_dieresis\_lc $04ED

//Sami [Lapp].//

 Eh\_breve\_uc $E06E

//…//

 eh\_breve\_lc $E06F

//…//

 Eh\_dot-ascender\_uc $E070

//Nenets.//

 eh\_dot-ascender\_lc $E071

//Nenets.//

 …\_uc $0404

//Ukrainian.// (Note: This is a simple reversal of the Cyrillic “Eh-sound” letter\_uc.)

 …\_lc $0454

//Ukrainian.// (Note: This is a simple reversal of the Cyrillic “Eh-sound” letter\_lc.)

 Yoo\_uc $042E

//**Russian**; Adyghey, Aleut, Bulgarian, Mongolian, Mountain Mari, Sami [Lapp], Valley Mari.// {YOO = &}

 yoo\_lc $044E

//**Russian**; Adyghey, Aleut, Bulgarian, Mongolian, Mountain Mari, Sami [Lapp], Valley Mari.// (Used smaller version of above.)

 …\_macron\_uc $E072

//Aleut, Evenk [Tungus], Mansi, Sami [Lapp].//

 …\_macron\_lc $E073

//Aleut, Evenk [Tungus], Mansi, Sami [Lapp].//

 Va\_uc $042F

//**Russian**; Adyghey, Aleut, Bulgarian, Mongolian, Mountain Mari, Sami [Lapp], Valley Mari.// va or ya. {YA = “}

 va\_lc $044F

//**Russian**; Adyghey, Aleut, Bulgarian, Mongolian, Mountain Mari, Sami [Lapp], Valley Mari.// (Used modified, smaller version of above.)

 Va\_macron\_uc $E074

//Aleut, Mansi, Sami [Lapp].//

 va\_macron\_lc $E075

//Aleut, Mansi, Sami [Lapp].//

 …\_uc $046A

//Bulgarian.//

 …\_lc $046B

//Bulgarian.//

 Izhitsa\_uc $0474

//**Old Russian.**//

 izhitsa\_lc $0475

//**Old Russian.**//

**Geological Time**

Divisions of “***Geological Time***” have historically been based upon “***Type Sections***,” as defined by geologists who studied specific outcrops, rather than on a systematic *a-priori* basis. In other words, the profession has been overwhelmingly “*reactive*,” rather than “*pro-active*.” While this approach has resulted in meaningful and practical divisions, often based upon drastic, obvious changes in lithology and fossils, it does not work everywhere equally, nor even “*every when*,” most prominently during the longest time interval of all, the pre-Cambrian. Notwithstanding, depending upon *type sections* has ensured that geology remains both practical and based strictly upon observed phenomena, a *criterium* that was of critical importance in the early days of the discipline. Indeed, without a firm insistence upon descriptive science, it is quite probable that geology would never have progressed to its present state, but would have followed a more abstract, philosophical bent with little actual application to and for humanity. Still, geological knowledge has progressed sufficiently now to enable a more pro-active approach than was previously feasible or reasonable to expect. Clearly, the multitude of overlapping time divisions employed by geologists around the world demands a reasonable, unambiguous set of meaningful conventions.

The pre-Cambrian is generally considered the time before life, or at least the time before multi-cellular organisms with hard parts were preserved as fossils. This MIG Font™© specifically recognizes the two major divisions in geological time, the time of life (symbol “”) and the time before life, the pre-Cambrian (). Notwithstanding, the Proterozoic (a large portion of the upper preCambrian) was also a time of life as proven both by rare preserved fossils without hard parts and the presence of oxygen proven by alterations in rocks: how individual geologists will choose to use the  symbol will be a matter of personal preference. Historically, the pre-Cambrian has been defined with a hodge-podge of symbols, time intervals, *etc.*, based upon incremental studies of specific outcrops, or “*Type Sections*,” as they occur and have been described in different parts of the world. In consequence, there exist both many temporal overlaps and many time intervals not yet defined, which this MIG Font™© addresses and substantially resolves in a pro-active manner through the creation of a comprehensive set of intuitively clear pre-Cambrian symbols to supplement or to replace existing conventions.

As in most other things geological, these new pre-Cambrian symbols are an adaptation of an existing set of “conventions” which have become more popular and widely-adopted over the past 50 years. In specific, the symbol set adopted herein defines the youngest part of the pre-Cambrian as pre-Cambrian Z, becoming progressively older through Y, X, W, V and oldest in the series, pre-Cambrian U. To reflect the reality of known preserved rock ages, each of these time intervals differ, over a tremendous cumulative span of time.

In fact, the Chinese have already been using this type of system to describe portions of the pre-Cambrian. Unfortunately, as in Western geological time legends, a certain amount of ambiguity seems to exist as the Chinese system is actually used. Adapting the following Chinese system (spread over time intervals dividing the entire known pre-Cambrian), into the smaller time divisions (*e.g.*, Zz) described in the next following paragraph is a possibility worth considering, among many internationally followed conventions. Such decisions ultimately will have to be determined by usage by geologists; however, my preliminary recommendations follow.

Z = … MY Undivided (Includes Zhen-Dan Period.)

Zz = Zhen-Dan Period

Zy = …

Zx = …

Zw = …

Zv = …

Zu = …

Y = 850 MY (Qingbaiko Period & Cheng-Jiang Age “Sinian”?)

Yz = …

Yy = …

Yx = …

Yw = …

Yv = …

Yu = …

X = … MY (Chang Cheng [Great Wall] Period?)

Xz = …

Xy = …

Xw = …

Xv = …

Xu = …

W = … MY (Tong-An Age?)

Wz = …

Wy = …

Wx = …

Ww = …

Wv = …

Wu = …

V = 2025 MY (Hutuoan Period)

Vz = …

Vy = …

Vx = …

Vw = …

Vv = …

Vu = …

U = 2450 MY (Wu-Tai Period)

Uz = …

Uy = …

Ux = …

Uw = …

Uv = …

Uu = …

As more and more age dates have been acquired for specific rocks, at an ever-increasing rate, it has become not just practical but also economically desirable to sub-divide these immense time intervals. The specific contribution of this MIG Font™© to studies and mapping of the pre-Cambrian has been a systematic, intuitive subdivision based upon the same lettering system. For example, the uppermost (youngest) part of the youngest pre-Cambrian is  (approximately correlative with the Eocambrian {US} and the Vendian {Europe} and precisely correlative with the Zhen-Dan {China}), with the stratigraphically lowest (oldest) portion of the pre-Cambrian Z being, of course, the Zu. So, from youngest to oldest within the pre-Cambrian Z, the symbology would be Zz, Zy, Zx, Zw, Zv and Zu. In like manner, the very old pre-Cambrian U time interval should be divided rationally and meaningfully into the Uz (stratigraphic uppermost: youngest), the Uy, the Ux, Uw, Uv and the Uu (stratigraphic lowest: oldest). How this would fit with the Hadean remains undecided at present.

Note that many of the largest mineral deposits in China occur within the Zz, which is when free oxygen first became available on earth. In China as in other countries around the world (*e.g.*, the U.S. “Iron Formations”), the uppermost pre-Cambrian is of great economical importance. Map legends should continue to clearly define usage of symbols on maps.

**Formation Lettering:**

Organization = abcMxyz (*e.g.*, ….. pQ…a)

a Prefix = Area of Environmental Concern (if appropriate)

b Prefix = Metamorphic Grade (if appropriate)

c Prefix = Relative Lithostratigraphic and/or Chronostratigraphic Prefix (if appropriate)

M = Age (*e.g.*, K = Cretaceous) Note: the age is the only Latin-base capital letter used.

xyz = Formation and/or Stratigraphic identifier.

Greek lower-case letter(s) for igneous and volcanic units

alpha code for named units

alpha code for lithologic units:

(Note: A **named** igneous and volcanic unit begins with the relevant “Age” as a capital letter, including prefix descriptors (*e.g.*, u for upper), followed by the appropriate suffix Greek letter(s), which is followed by the appropriate alpha code: for example, the Deccan Basalt formation lettering could be in the form …{Beta}d. This scheme enables the usage of *Boolean logic* to display all basalts (everything containing a {Beta}) with a desired color, or only the Deccan Basalt with a desired color, which would be …{Beta}d. **Automated differentiation, display and mapping of igneous units, by type, is a huge step forward enabled by this font.**)

**Environmental Concern Prefix:**

 = Area of Environmental Concern

**Degree of Metamorphism Prefixes:**

= Metamorphic, Degree Unspecified

 = Metamorphic, Slightly

 = Metamorphic, Moderately

 = Metamorphic, Very

**Relative Stratigraphic Location & Absolute Age (Chronostratigraphic) Prefixes:**

Relative (Lithostratigraphic) Prefixes

ZZU_u_lc00_upper_position = upper (Relative Stratigraphic Location)

ZZU_m_lc00_middle_position = middle (Relative Stratigraphic Location)

ZZU_l_lc00_lower = lower (Relative Stratigraphic Location)

Absolute (Chronostratigraphic) Prefixes

p = pre- (older than, as in pre-Cambrian, pre-Quaternary, etc.)

y = younger-than (chronostratigraphically)

ZZU_l_lc01_late = late (Relative Defined Age)

ZZU_m_lc01_middle_time = middle (Relative Defined Age)

ZZU_e_lc00_early = early (Relative Defined Age)

**Greek Lower-Case Letter Symbols for Igneous & Volcanic Units (Suffixes):**

 = alpha\_lc = andesite

= beta\_lc = basalt

 = gamma\_lc = granite

 = gammadelta\_lc = granodiorite

 = delta\_lc = diorite

 or  = epsilon\_lc = …

 = zeta\_lc = …

 = eta\_lc = Mafic undifferentiated(?)

 = theta\_lc = …

 = iota\_lc = ignimbrite

= kappa\_lc = …

 = lambda\_lc = rhyolite

 = mu\_lc = …

 = nu\_lc = anorthosite(?)

 = xi\_lc = …

 = omicron\_lc = …

 = pi\_lc = …

 = rho\_lc = …

 = Sigma\_uc = ultramafic undifferentiated

 = sigma\_lc = kimberlite

 = sigma\_lc = carbonatite

 = sigma\_lc = lamproite

 = tau\_lc = …

 or  = upsilon\_lc = …

or  = phi\_lc = …

 = chi\_lc = …

(**Note: Make rounded ends more distinctive.**)

 or  = psi\_lc = extrusives undifferentiated(?)

 or  = omega\_lc = …

(**Igneous and Volcanic Units, Alphabetized**)

(**Note: At the present time, since distinctive symbols for all the Greek letters have been generated, I am leaning toward using upper case Greek letters for general categories {*e.g.*, mafic undifferentiated} and lower case Greek letters for specific types {*e.g.*, basalt.}**)

Acid Undifferentiated = use Greek\_uc …

(**Note: felsic [FeSi composition] and acid [pH] are not always synonymous.**)

Alkali Gabbro = xi\_lc nu\_lc

(**Used in China Study.**)

Alkali Granite = xi\_lc gamma\_lc

(**Used in China Study.**)

Andesite = alpha\_lc

(**Used in China Study.**)

Andesite Porphyry = alpha\_lc pi\_lc

(**Used in China Study.**)

Andesite Porphyrite = alpha\_lc mu\_lc

(**Used in China Study.**)

Anorthosite = probably Nu?

Aplite = …

Basalt = beta\_lc

(**Used in China Study.**)

Basic (Alkaline) Undifferentiated = use Greek\_uc …

Carbonatite = … (probably a version of sigma\_lc.)

Charnockite\_lc = iota\_lc

(**Used in China Study.**)

Dacite = …

Diorite = delta\_lc

(**Used in China Study.**)

Diorite Porphyrite = delta\_lc mu\_lc

Diorite Porphyry = delta\_lc pi\_lc

(**Used in China Study.**)

Dolerite: See Gabbro Diabase.

Extrusives Undifferentiated = probably Psi?

Felsic Undifferentiated = use Greek\_uc …

Gabbro = …

Gabbro Diabase (Dolerite) = nu\_lc beta\_lc

Granite = gamma\_lc

(**Used in China Study.**)

Granite Diorite or Granodiorite = gamma\_lc delta\_lc

(**Used in China Study.**)

Granite Diorite Porphyry = gamma\_lc delta\_lc pi\_lc

(**Used in China Study.**)

Granite Porphyry = lambda\_lc pi\_lc

(**Used in China Study.**)

Granite Syenite = gamma\_lc xi\_lc

(**Used in China Study.**)

Granite Syenite Porphyry = gamma\_lc xi\_lc pi\_lc

(**Used in China Study.**)

Ignimbrite = iota\_lc(?) [**Not iota! Change this!**]

Intermediate (Neutral) Undifferentiated = use Greek\_uc …

Intermediate to Mafic Undifferentiated = alpha\_lc beta\_lc

(**Used in China Study.**)

Kimberlite = … (probably a version of sigma\_lc.)

Lamproite = … (probably a version of sigma\_lc.)

Mafic Undifferentiated = eta\_lc.

(**Eta\_lc used in China Study: probably will change to a Greek\_uc….**) (**Note: mafic [composition] and basic [pH] are not synonymous.**)

Migmatite = …

Monzonite = nu\_lc xi\_lc

(**Used in China Study.**)

Ophiolite = … (**Use Greek\_uc….**)

Pegmatite = … (**Use Greek\_uc….**)

Peridotite = …

Plateau Flood Basalts = omega\_lc

Porphyrite = mu\_lc

(**Used in China Study.**)

Porphyry = pi\_lc

(**Used in China Study.**)

Pyroxene Porphyrite = phi\_lc mu\_lc

(**Used in China Study.**)

Pyroxene Porphyry = phi\_lc pi\_lc

(**Used in China Study.**)

Pyroxenite = phi\_lc

(**Used in China Study.**)

Quartz Diorite = lambda\_lc delta\_lc

(**Used in China Study.**)

Quartz Diorite Porphyry = lambda\_lc delta\_lc pi\_lc

(**Used in China Study.**)

Quartz Monzonite = lambda\_lc nu\_lc xi\_lc

(**Used in China Study.**)

Quartz Porphyry = lambda\_lc pi\_lc

(**Used in China Study.**)

Quartz Syenite = lambda\_lc xi\_lc.

(**Used in China Study.**)

Quartz Syenite Porphyry = lambda\_lc xi\_lc pi\_lc

(**Used in China Study.**)

Rhyolite = lambda\_lc

Serpentinite = …

Sub-Felsic (Semi-Acid: Felsic to Intermediate) Undifferentiated = probably LambdaAlpha?

Sub-Mafic (Semi-Alkaline, Sub-Basic: Mafic to Intermediate) Undifferentiated = possibly AlphaBeta? Might be better to use a Greek\_uc …?

Syenite = xi\_lc

Syenite Porphyry = xi\_lc pi\_lc

(**Used in China Study.**)

Syenite Diorite = xi\_lc delta\_lc

(**Used in China Study.**)

Tonalite = …

Trachyte = tau\_lc

(**Used in China Study.**)

Trachyte Porphyry = tau\_lc pi\_lc

(**Used in China Study.**)

Trachyte Porphyrite = tau\_lc mu\_lc

(**Used in China Study.**)

Ultrabasic Undifferentiated = use Greek\_uc …

Ultramafic Undifferentiated = Sigma\_uc.

(**Note: ultramafic [composition] and ultrabasic [pH] are not synonymous.**) (See kimberlite, carbonatite, lamproite.)

**Unassigned Other Rock Categories.**

(**General**)

batholith(s) = … (Do I want a special way of noting or specifying batholiths?)

dike(s) = … (Do I want a special way of noting or specifying dikes?)

sill(s) = … (Do I want a special way of noting or specifying sills?)

skarn = … (Actually an alteration in association with an intrusive.)

(**Glacial Features**)

Glacial features {*e.g.*, drumlins, kames, moraines …} have not yet been assigned symbols, herein (they have in the China Study proper); however, this is *in process* at a lower-priority than those geological features with direct economic significance.

(**Sedimentary Lithologies**)

**Alpha (non-Greek) Code for Sedimentary Lithologic Units (Suffix):**

ar = arkose

cg = conglomerate

do = dolomite

gn = gneiss (metamorphic)

ls = limestone

ms = mudstone

sc = schist (metamorphic)

sh = shale

sl = slate (metamorphic)

ss = sandstone

…

**Chronostratigraphy *versus* Lithostratigraphy**

Geological formations have been defined based upon two primary criteria, absolute age (Chronostratigraphy) of rock and type (Lithostratigraphy) of rock. Most geologists utilize a bit of both, for eminently practical reasons, in naming and describing rock units. Unfortunately, to the detriment of the profession, a substantial minority of geologists insist upon solely chronostratigraphic criteria, or solely lithostratigraphic criteria. The former are generally academic paleontologists: the latter are generally frontier exploration oil men. The MIG Font™© enables the best of both chronostratigraphic and lithostratigraphic criteria to be utilized to preserve and display both esoteric and practical concerns.

Igneous (and volcanic) units follow their own specific rules for defining relative and absolute (radioactive decay) times. In particular, igneous units can intrude above, below, across and within units, so relative positional location does not necessarily prove precise temporal constraints. Accurate maps of distributions can provide this, and much more.

In tectonically simple, or fairly young terrains, the younger rocks lie over (on top of) the older rocks, at least within sedimentary rocks. In tectonically complex and in older terrains, the straightforward younger rocks over older rocks relationship may not hold true, since rocks fold, break and move along faults (including thrust faults!), and overturn during geological time. Faults can move rocks over immense distances such that adjacent rocks divided by a fault (*e.g.*, along a suture) may have little history in common. Fossils, in particular micro-fossils, are used very effectively to determine fairly-precise geological time constraints for specific sedimentary formations.

This long distance transport of rock masses has long been known for strike-slip faults, but has not until recently been truly and widely recognized as a major factor with thrust faults, as well. The Himalayas Mountains, for example, are now generally recognized as being composed of numerous thrust-fault wedges, with each topographically higher wedge being composed of both older and more highly metamorphosed rocks than the rocks in the wedges below. Until fairly recently, the general view was that the Himalayas mountain range was an example of “***retrograde metamorphism***,” in which the degree of metamorphism was a maximum at the surface and became less with depth. Such an interpretation can only be formulated by ignoring, or being unaware of, the separation of each metamorphic wedge by thrust faults. Metamorphism in the Himalayas is a record of an entirely ordinary process of greater metamorphism with deeper burial. Long-term thrusting, possibly intermittently renewed, has brought (thrust!) older rocks that were more deeply buried over younger versions of the same or similar lithologies, that were themselves previously thrusted into their present positions.

It is, therefore, of utmost importance to map geological and tectonic units accurately, in every sense. Just as in the Himalayas, incorrect and incomplete mapping can lead to erroneous geological interpretations, with the consequence that both geological resources and geological hazards will be misunderstood. The reality in the Himalayas is that while the tops of the mountains are generally highly metamorphosed, the bottom of the deeper valleys (*e.g.*, Xigaze) are so little metamorphosed as to be in the “***oil window***.” Indeed, there exists excellent potential for huge (indeed, world-class!) quantities of oil and gas within the Himalayas overthrust belt, with excellent marine source rocks in large quantities, ample reservoir rocks and immense, multiply-repeated thrust-fault traps. Even so, the view of “***retrograde metamorphism***” and like ludicrous misinterpretations of the geological record, still erroneously place the Himalayas firmly within the category of “***No Oil Province***” for most oil geologists, both within China and internationally. For more information on this topic, readers are referred to Maness’ “***China and East Asia Study©***.”

Within the constraints of thorough mapping of geology (all disciplines) and tectonics, the MIG Font™© enables the clear and unambiguous mapping of geological units, using a combination of chronostratigraphic and lithostratigraphic criteria. For example, named unit “f” (say, a limestone) of Paleocene, Eocene and Oligocene age should be mapped with either *lower Tertiary formation “f”* (lTf) or the appropriate finer chronostratigraphic age divisions. In particular, it is strongly recommended that the Paleocene “f” not be named differently than the Eocene “f,” which should not be named differently than the Oligocene “f.” All are the **same** “f” lithostratigraphic formation, which can be easily recognized both in the field and in well cores, etc., both by its own characteristics and its relative position *vis-à-vis* units above and below it. To be specific, it is extremely undesirable to burden the industry and society, in general, with a plethora of formation names, each of which applies to only one outcrop or location. Taken to its logical extreme, the tendency of chronostratigraphers to insist on a different name for each lithology for each change in time will eventually lead to an infinity of names, since each formation (litho-type) usually represents a continuous gradation in time. As we become better and better at measuring precise times within the geological record, this explosion of names will become the inevitable consequence, and such entirely unnecessary confusion bodes very poorly for the future of the profession. Further, there exists a very strong tendency to rename formations across political lines, rather than keeping the name assigned at the type section and applying it to all extensions, throughout. Such an **unnecessary proliferation of formation names** hinders understanding of the geology and, therefore, economic development, and should be strongly resisted.

**Use of MIG Font™© in Maness’ “*China & East Asia Study©*”**

The compelling reason for generating the MIG Font™© was as a means of ready correction and modernization of Maness’ digital ***China & East Asia Study©***, which is presently undergoing thorough revision, based upon newly available data and modern hardware & software capabilities.

In prior versions, the lettering was not true type/open type, resulting in a great waste of time and effort. The reason for this lack was very simple: no such font existed at the time. The ***China & East Asia Study©*** is of such overwhelming magnitude that the total amount of time, effort, *etc.*, dedicated to create the needed font was far less than the resources needed such that generation of this specific item was eminently justifiable.

The recommended conventions specified for use of the MIG Font™© were those already incorporated into the ***China & East Asia Study©***. This applies both to the usage of lower-case Greek letters for specific igneous and volcanic units and to prefix *versus* suffix conventions.

While the entire ***China & East Asia Study©*** is being substantially revised, the biggest immediately obvious change will be the substitution of Korea for Heilongjiang Province as a demonstration of the digital study, using the MIG Font™©. Primarily, this is a result of an utter lack of interest within the geological resources community for information about the resources of North Korea (hence, no sales of North Korean resources data): this lack of interest among resources firms is due to the obvious reason of the extreme “***Political Risk***” inherent in doing business in North Korea. In stark contrast, high levels of interest continue for resources information about Heilongjiang Province: why make available as a sample what should be used to earn income? The secondary reason has been the frequency with which erroneous statements have been made about an ostensible lack of geological maps of North Korea: presentation of my ***China & East Asia Study©*** maps, with ancillary data, should lay to rest the **myth** of no geological maps of Korea (North and South). There are other reasons, too, for example that of my strong desire to make geological information of Korea readily available, as a free sample over the internet, for UN servicemen who are interested in studying the entirety of the Korean peninsula.

Note that similar myths of total lack of geological map coverage of other areas (*e.g*., Luzon Island in the Philippines) continue.

In short, the MIG Font™©’s first use (at least by the copyright holder) will be to revise, improve and modernize Maness’ existing ***China & East Asia Study©***.

**MIG Font™© Geological Symbols**

**Table 05**

These MIG Font™© Geological Symbols occur in only one form: Regular. No generation of **Bold** or *Italic* equivalents of MIG Font™© Symbols is anticipated. However, MIG Font™© Lettering has the full range of expression, including **Regular**, **Bold** and ***Italic***.

Considerable thought has gone into the desirability of creating separate symbols for magnitude and economics of resources, as indicated by their unique symbols. In terms of magnitude, the conventional way of expressing different magnitudes of resources has been the use of different sizes of otherwise identical symbols, with symbol size being directly correlatable with magnitude of resource, which is recommended herein. In other words, a world-class deposit could be represented by, say, a size 16, an average resource by a size 12, a barely-economic deposit by a size 9 and a sub-economic prospect by a size 6, as desired by the individual user to meet his own needs for a specific project. Of course, as commodity prices fluctuate, the sizes of the symbols could also fluctuate, based upon ore grade, size and other variables. Econometric symbology is still under evaluation as a possibility, with the use of a font color scheme to denote varying degrees of economic desirability being the probable final recommended course (*i.e.*, red being least desirable and blue being most desirable, going through the full available color spectrum red – orange – yellow – green – blue, or some variant thereof). The real ultimate differentiation will be of size *versus* grade, with common delineations being small but rich mineralized deposits *versus* large but low-grade deposits – and every possible variant of small-to-large size *versus* low-to-high grade. This symbology problem of size *versus* grade of resource is far more complex than it appears at first glance.

The former “Intermediate File Name,” below has been replaced with a similarly meaningful Caption Name (*aka* “***PostScript***” name) that is preceded with an alphanumeric code to ensure an alphabetical listing of like features together, even after additional symbols have been added. The first two numbers of the alphanumeric code are the table number, since this eases font programming. Usually, the characters in a font are listed in sequence by their ASCII Equivalents; however, it is optional to list by caption in alphanumeric order, a capability which a future tutorial will have to provide to users.

In some GIS (and other) applications it is necessary to list the ASCII Equivalent. To ease the burden on users, among other reasons, this is presented below for all MIG Font™© Geological Symbols.

For the same reasons, the Caption “Name” and Key are also provided. The Caption “Name” is the identifier for each individual glyph (symbol): it can, in some software, be used to access and use a desired symbol. The beginning of each Caption “Name” is a letter followed by two numbers: the sole purpose of this “prefix” is to alphabetize the Caption Names in the sequence desired. The “Key” is the specific key you will have to type on your keyboard to insert the desired MIG Font™© symbol into your document, map, *etc.*, relative to each table. For example, the North Arrow, with Caption Name A00Arrow\_North, is in Table 05, ASCII Equivalent $0004, which is Key exclamation, so **you would type the key (Shift 1) showing the exclamation mark to get the North Arrow symbol**. For those symbols with no visible key on a keyboard, you will have to look at the entire table visible through the MicroSoft “Insert” command and copy the desired symbols from there, as explained in the tutorial elsewhere herein. Also, many variants of keyboards exist: in those cases the ASCII Equivalent can be very helpful. Or, you could just type every individual key to see which symbol correlates with which key and make your own guide for your particular keyboard, *etc*.

Code

Symbol Caption “Name” Equivalents

 A00Arrow\_North $E085

 A01Arrow\_Long $E086

 A02Arrow\_Medium $E087

 A03Arrow\_Short $E088

 A04Arrow\_Left\_Down $E089

 A05Arrow\_Left\_Up $E08A

 A06Arrow\_Right\_Down $E08B

 A07Arrow\_Right\_Up $E08C

 B00Fault\_Lateral\_Left $E08D

 B01Fault\_Lateral\_Right $E08E

 B02Fault\_Ball\_Down $E093

 B03Fault\_Detachment $E094

 B04Fault\_Reverse $E095

 B05Fault\_Thrust $E096

 C00Fold\_Anticline\_Axis $E09D

 C01Fold\_Syncline\_Axis $E09E

 C02Fold\_Anticline\_Plunge $E09F

 C03Fold\_Syncline\_Plunge $E0A0

 C04Fold\_Anticline\_Overturned $E0A1

 C05Fold\_Syncline\_Overturned $E0A2

 C06Fold\_Dome $E0A3

 C07Fold\_Basin $E0A4

 C08Fold\_Homocline $E0A5

 C09Fold\_Monocline $E0A6

 D00Strike-and-Dip\_Bed\_Undefined … $E0AD

(Note: --D00Strike-and-Dip\_Bed\_Undefined or 3-point-solution— is either a general indication of the approximate strike-and-dip or as calculated using a 3-point solution using combined digital geological and topographic maps. In other words, a specific outcropping formation of large enough size can be sampled over at least three points and, from the xyz coordinates {using UTM coordinates} a strike-and-dip calculated for the centroid point. I have been doing this routinely since the early 1980s, originally using manual measurements, now digital, and have determined from field checking that the derived strikes and dips are reasonably accurate, usually to within about 2 degrees, if reasonable geological selection criteria for sample points are followed. Notwithstanding, in some erosional environments, depending upon the structure and lithology of the outcropping rocks, the calculated dips should be considered a minimum, with the error sometimes as much as 15 degrees more than calculated. Still, **this technique can be very useful for reliably mapping folds and fold axes in the office for later field-verification, and, in particular, in support of early-stage planning of the optimal routing of seismic survey lines.**)

 D01Strike-and-Dip\_Bed\_AP1 $E0AE

(Note: When the actual dip is known, the degrees of dip relative to the properly rotated symbol should be appended. How to accomplish this will be part of a future “how-to” tutorial to be included herein.)

 D02Strike-and-Dip\_Bed\_AP2 $E0AF

(Note: AP is short for apparent, as in an approximation acquired through photogeological analysis. Each analyst defines the range of degrees of dips for each symbol used.)

 D03Strike-and-Dip\_Bed\_AP3 $E0B0

 D04Strike-and-Dip\_Bed\_AP4 $E0B1

 D05Strike-and-Dip\_Bed\_AP5 $E0B2

 D06Strike-and-Dip\_Bed\_Contorted $E0B3

 D07Strike-and-Dip\_Bed\_Contorted\_Very $E0B4

 D08Strike-and-Dip\_Bed\_Horizontal1 $E0B5

(**Note: Possible confusion with map fiducial marks renders this choice undesirable: use recommended next choice, below. This option is presented solely because some people have strongly requested it be included.**)

 D09Strike-and-Dip\_Bed\_Horizontal $E0B6

 D10Strike-and-Dip\_Bed\_Overturned $E0B7

 D11Strike-and-Dip\_Bed\_Vertical $E0B8

 D12Strike-and-Dip\_Cleats $E0B9

 D13Strike-and-Dip\_Cleats\_Horizontal $E0BA

 D14Strike-and-Dip\_Cleats\_Vertical $E0BB



D15Strike-and-Dip\_Cleavage $E0BC

(Note: Potential confusion with thrust faults is a **significant concern**. Am considering changing this “cleavage” symbol.)

 D16Strike-and-Dip\_Cleavage­\_Horizontal $E0BD

 D17Strike-and-Dip\_Cleavage­\_Vertical $E0BE

 D18Strike-and-Dip\_Foliation $E0BF

 D19Strike-and-Dip\_Foliation\_Horizontal $E0C0

 D20Strike-and-Dip\_Foliation\_Vertical $E0C1

 D21Strike-and-Dip\_Fracture $E0C2

 D22Strike-and-Dip\_Fracture\_Horizontal $E0C3

 D23Strike-and-Dip\_Fracture\_Vertical $E0C4

 D24Strike-and-Dip\_Fracture-with-Striae $E0C5

(Note: **To me, striae {usually on slickensides} on a surface are diagnostic of a fault, not a fracture, since movement is demonstrated.** This symbol is being presented solely because of its use by other geologists on geological maps and in reports.)

 D25Strike-and-Dip\_Joints $E0C6

 D26Strike-and-Dip\_Joints\_Horizontal $E0C7

 D27Strike-and-Dip\_Joints\_Vertical $E0C8

 D28Strike-and-Dip\_Vein $E0C9

(Note: A vein usually connotes mineralization along a fault or fracture or formation contact. Also note that there are both backslash and forwardslash characters: they are not the same!)

 E00Environmental\_Concern $E0D0

 F00Metamorphosed\_Degree\_Unspecified $E0D4

 F01Metamorphosed\_Slightly $E0D5

 F02Metamorphosed\_Moderately $E0D6

 F03Metamorphosed\_Highly $E0D7

 G00Mine\_Active $E0DC

…

 G01Mine\_Inactive $E0DD

…

 G02Mine\_Inactive\_with-grill $E0DE

…

 G03Mine\_Active\_Open-Pit $E0DF

…

 G04Mine\_Inactive\_Open-Pit $E0E0

…

 G05Mine Active\_*In-Situ*\_Solution $E0E1

…

 G06Mine Inactive\_*In-Situ*\_Solution $E0E2

…

 G07Prospect\_Pit $E0E9

 G08Mine\_Adit $E0EA

(Note: An adit is a horizontal or sub-horizontal excavation into the ground which does not connect with any other accessible opening to the surface. Adits are created for any number of reasons, including as a means of everything from active mining of an isolated pocket to just gathering samples for geochemical analyses or for what amounts to an extended prospect pit, *etc*. Determining whether an adit is active is, therefore, somewhat subjective: most just assume that if the entry hasn’t been blocked, it should be considered active. Most adits are comparatively short, but some are quite long, especially those used to mine along a vein.)

 G09Mine\_Adit\_inactive $E0EB

…

 G10Mine\_Adit\_inactive-with-grill $E0EC

…

 G11Mine\_Adit\_Tunnel $E0ED

(Note: *Sensu-strictu* an adit connecting to a tunnel is by definition impossible. An adit is a horizontal or sub-horizontal excavation into the ground which does not connect with any other accessible opening to the surface. A tunnel is a horizontal or sub-horizontal man-made opening with two or more separate and discrete access points. Notwithstanding, this purist definition is occasionally ignored, probably as a result of later connections made to originally separate diggings in which the name “adit” had been already appended to one or more. In effect, this symbol is a connection of two originally separate adits or of an adit with a portal, etc. This symbol could hypothetically be confused with the traditional geochemical sampling **trench** symbol; however, the trench symbol is usually far more extended.)

 G12Mine\_Drift $E0F0

(Note: A drift is an access tunnel or way from a shaft. Several possible symbols exist, but no decision has yet been made about which symbol to adapt for use in the MIG Font. In fact, several additional mine-related symbols need to be included herein to reflect accepted usage by the mining industry.)

 G13Mine\_Stope $E0F1

(Note: A stope is a man-made underground opening that is usually at least partially filled with mine waste, usually low-grade ore. Stopes are important because what was considered to be low-grade ore or waste at an earlier date may now be quite valuable. Further, the rocks in stopes have usually undergone at least some crushing, further increasing the potential value. On most traditional mine maps, stopes are usually differentiated by a stippled {or other} pattern, only occasionally by a specific symbol. If one is to accomplish GIS work on polygons, such as calculating the volumes and thus the tonnage in a stope or stopes, it is necessary to label an attribute symbol, which can also be used to click on for more information.)

 G14Mine\_Portal $E0F4

(Note: A portal is a horizontal or sub-horizontal opening into a tunnel. A tunnel, by definition, has two or more separate access points at the surface of the earth. Some consider a portal to be the major or, occasionally, the only opening into an underground mine.)

 G15Mine\_Portal\_inactive $E0F5

…

 G16Mine\_Portal\_inactive-with-grill $E0F6

(Note: Since about the early 1980s, various federal, state and local organizations have been actively placing grills over mine openings, in particular when the person or entity with rights to the property refused to allow opening to be permanently closed. It is, therefore, reasonable to expect that a mine portal closed with a grill is thought to have more than usual value. Also, reopening a mine which has been rendered inaccessible by grills is far less expensive than reopening permanently blocked mines. Consequently, it is worthwhile to differentiate on maps and in documents those mine openings closed with grills.)

 G17Mine Air Vent $E0F7

(Note: Air vents are critical components of mines because, without them, the miners would suffocate. Some air vents are too small for human access; however, others are large enough to support emergency evacuations. Air vents are also occasionally used to support engineering infrastructure, for example, to run electrical or water lines.)

 G18Mine Air Vent with grill $E0F8

 G19Mine\_Shaft $E0FB

(Note: A mine shaft is a vertical or near-vertical access to a mine.)

 G20Mine\_Shaft\_inactive $E0FC

 G21Mine\_Shaft\_inactive-with-grill $E0FD

(Note: This is the downwards-pointing exclamation mark, as is used in Spanish-speaking countries. Most American keyboards do not show this character, so it is usually necessary for people who wish to acquire this symbol to use the MicroSoft “Insert” tool, as explained in the tutorial herein. Many of the following symbols are similar.)

 G22Mine\_Winze\_Head $E100

 G23Mine\_Winze\_Foot $E101

 G24Mine\_Plant $E102

 G25Mine\_Plant\_inactive $E103

 G26Smelter $E104

 G27Smelter\_inactive $E105

 G28Building\_Miscellaneous $E106

 G29Building\_Miscellaneous\_inactive $E107

 H00Location\_Mineral\_Commodity $E10C

 I00Location\_Mineral-Sample $E111

//Geochemical-Location\_Mineral-Sample.//

 I01Location\_Trench-Samples $E112

//Geochemical-Location\_Trench-Samples.// (Note: To be placed at all ends of trenches.)

 J00Location\_Survey-Marker\_Official-Government $E119

 J01Location\_Survey-Marker $E11A

 J02Location\_Survey-Marker\_Undefined $E11B

 K00Oil Field $E122

(Note: Beyond a certain point, which varies by map, it becomes impractical to map all individual, separate, oil and/or gas wells. So, if one is to signify such wells, it is necessary to have an oil field, *etc.*, symbol. As a GIS attribute, one could hypothetically click on such a field symbol to zoom in for a view of all the individual wells represented by that specific field symbol.)

 K01Oil & Gas Field $E123

 K02Gas Field $E124

 K03Geothermal Field $E125

…

 K04Well\_Permitted $E126

 K05Well\_Dry-Hole $E127

 K06Well\_Oil $E12A

(Note: Oil is conveniently divided into several categories, with the most frequent fundamental differentiation being asphaltic and waxy, with occasionally oil derived from coal as a third category. Other categories include specific gravity, amount of sulfur, viscosity, light crude, heavy crude, etc.)

 K07Well\_Oil\_Show $E12B

(Note: Oil shows frequently become producing wells through recompletion of the drill hole or redrilling nearby. Sometimes this is a result of improved methods of production {*e.g.*, hydro-fracturing or “*fracking*”} and/or higher prices for the crude oil. However, more frequently than many would like to admit, less than honest companies and individuals can and do fraudulently label the results of drilling as only a “*show*,” when the intent is to declare the well abandoned and six months or a year later the same people re-enter the well, with title solely in their names, claiming to use different techniques, and declare the well to be paying. Savvy investors protect themselves legally *via* contracts which make such shenanigans difficult to carry out and specify significant penalties if such occurs. Do business with ethical people and hire a competent lawyer to protect you before you encounter problems, not after!)

 K08Well\_Oil\_Stripper $E12C

(Note: Most stripper wells begin as paying wells: with steadily declining production, eventually all wells become sub-economic. Stripper wells can be considered those whose production is so low that economics of operation are only marginally profitable. When production becomes a money-losing reality, as opposed to a profit-making necessity, the wells are closed: when no further production, even with increase in price is contemplated, the drill pipes are removed and the hole permanently blocked, often with concrete. Stripper wells frequently become producing wells when the price of crude increases. Everything depends upon the economics.)

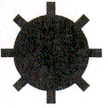
 K09Well\_Oil\_Unassigned\_Symbol $E12D

 K10Well\_Oil-Condensate $E12E

(Note: In unusual cases, wells produce almost pure condensate; however, usually, raw crude is a mixture of hydrocarbons. Often, but not always, this mixture can be separated into three components, each with its own physical and chemical characteristics and value: gas, condensate and oil. Gas is mostly methane, ethane, propane and some butane (C1 – C4), which separates very readily under low pressure. Condensate is slightly longer carbon chains, generally C4 (butane) through C6 (hexane), with some C7 (heptane) which can be readily separated under slight negative pressure, a very inexpensive and profitable operation to perform. Oil is what is left, usually composed of C6 and longer carbon chains. In many portions of the world {*e.g.*, Syria, Iran, …} condensate is separated at or near the well-head and stored separately on-site or nearby: condensate can be and often is used to fuel automobiles directly, although the octane rating is low. By the way, octane rating is a measure of optimum suitability for use in 1920s-era automobiles, with 100% C8 [octane] having a rating of 100 octane.)

 K11Well\_Oil\_Condensate\_Plugged $E12F

 K12Well\_Oil\_Plugged $E130

 K13Well\_Oil-and-Gas $E131

(Note: In practically all cases in which both oil and gas are simultaneously produced from wells, condensate is also present; therefore, it makes no sense to have a separate category for Well\_Oil-Condensate-Gas.)

 K14Well\_Oil-and-Gas\_Show $E132

 K15Well\_Oil-and-Gas\_Plugged $E133

 K16Well\_Gas $E134

(**Lacking a special request, I do not plan to have a separate symbol-category for hydrates/clathrates. Their production usually cannot be distinguished from ordinary gas wells. Notwithstanding, drilling through gas hydrates sometimes poses special safety hazards from high-pressure. If clients request a special gas hydrate well symbol, I will be happy to comply.**)

 K17Well\_Gas\_Plugged $E135

 K18Well\_Gas\_Show $E136

 K19Well\_Coal-Bed-Methane $E137

 K20Well\_Coal-Bed-Methane\_Plugged $E138

 K21Well\_Gas-and-Condensate $E139

 K22Well\_Gas-and-Condensate\_Plugged $E13A

 K23Oil-Seep $E13B

 K24Gas-Seep $E13C

 K25Oil-and-Gas\_Seep $E13D

WWW15_Well_Rig_Active L00Well\_Rig\_Active $E14A

 L01Well\_Injection $E14B

 L02Well\_Geothermal $E14C

 L03Oil\_Refinery $E151

 L04Oil\_Pumping-Station $E152

 L05Oil\_Storage (Tank-Farm) $E153

 L06Condensate\_Storage\_(Tank-Farm) $E154

 L07Gas\_Storage\_(Tank-Farm) $E155

 L08Treatment-Facility\_Oil-and-Gas $E156

 L09Sulfur Storage Area\_Oil-and-Gas $E157

 M00Spring\_Normal $E15D

 M01Spring\_Not\_Potable $E15E

 M02Spring\_Thermal (Hot Spring) $E15F

 M03Fumarole-or-Steam\_Vent $E160

 M04Geyser $E161

 N00Volcanic-Cone-Small $E166

(Note: The 120 degrees angles make this 3-ray symbol distinctively different from other 3-ray symbols in the MIG Font™©.)

 N01Volcano\_Inactive $E167

(Note: This 4-ray symbol with sharp points is distinctively and “*sharply*” different from other 4-ray symbols in the MIG Font™©.)

 N02Volcanic\_Cone\_Medium $E168

-volcanic\_cone-medium: 5-ray-

 N03Volcanic\_Neck $E169

-volcanic\_neck: 6-ray-

 N04Volcano\_Active $E16A

-volcano\_active: 7-ray-

 N05Volcano\_Active\_Large $E16B

-volcano\_active-large: 8-ray-

 O00Map\_Fiducial-Mark $E16E

**Mathematics, Statistics & Logic**

**Table 07**

This table is broken into three functional but overlapping and mutually supportive components: mathematics, statistics and logic. In reality, even though we have had practical widespread use of computers for half a century, far less exploration of the functionality and application of logic has been done with computers (the original “**logic machine**!”) than was predicated by the original 19th-Century theorists on whose work computer science is based. It is hoped that a synthesis of these various thoughts along with a means of implementation (a font, with software organization) might lead to more and better utilization of computers for logic, in general, and logical operands, in particular. It is my belief that within the lifetime of modern-day students of geology, profound changes will be made to the practice of geology in the tools of expression – enabled by the proper computerized use of mathematics, statistics and logic. Two additional necessary sub-components, computer sciences and the symbology of chemistry and physics are also included.

Even though intrinsic ambiguity and redundancy of font symbols renders many logical computer operations difficult, some productive advances have been made, in particular with the use of \*.html, \*.xhtml and \*.xml coding. In general, \*.html, being less rigorous in use of opening and closing arguments (expressed in the form: <xx> … </xx>, respectively) is not as desirable as \*.xhtml, which seems to be the optimal match of mathematical rigor with simplicity of expression. For example, to express a superscript (power function) within an integral, one can use the **<msup> … </msup>** coding. \*.xml is, perhaps, more robust, in particular in regards to accessing and analyzing large tables of data; however, the coding is far more complex. The ultimate goal of such uses of “***Markup Language***” will be to enable direct entry of mathematical constructs and formulae (*e.g.*, a triple integral) in a conventional form for automated re-expression in (invisible) \*.xhtml code for solution by the computer.

Ultimately, in order to render true (valid) results, all mathematical operations must be rigorously logical, and *vice-versa*. The truth is of ultimate importance.

###### Mathematics

Mathematics is broken into sub-components: arithmetic, algebra, geometry, trigonometry and calculus.

**Arithmetic**:

Code

Numbers Intermediate File Name Equivalent

 zero $0030 & $E253

(**Note: The zero-slash is wholly contained.**)

 one $0031 & $E254

 two $0032 & $E255

 three $0033 & $E256

 four $0034 & $E257

 five $0035 & $E258

 six $0036 & $E259

 seven $0037 & $E25A

**** seven\_alt $E002

 eight $0038 & $E25B

 nine $0039 & $E25C

 plus $2212 & $E261

 plus-or-minus $00B1 & $E262

 minus $002D? & $E263

 equal $003D & $E264

ZPun45b_not_equal not-equal $0... & $E265

 approximately-equal $0... & $E266

 greater-than-or-equal $2265 & $E267

 less-than-or-equal $2264 & $E268

 not-greater-than $0... & $E269

 not-less-than $0... & $E26A

 greater-than $003E & $E26B

 less-than $003C & $E26C

 multiply $00D7 & $E26D

 period $0011, $002E & $E26E

(**Note: This is the grammatical period, not the mathematical decimal! Must differentiate!**)

 decimal $0... & $E26F

 comma $000F, $002C & $E270

(**Note: This is the grammatical comma, not the mathematical comma! Must differentiate!**)

 comma-math $0... & $E271

 fraction $2044 & $E272

/ slash $002F & $E273

 division $00F7 & $E274

 numbersign (pound) $0023 & $275

 percent $0025 & $E276

 parts-per-thousand (ppt) $2030 & $E277

 underscore (underline) $005F & $E278

**Algebra**:

if if $E27D

iff iff $E27E

… then $E27F

 therefore $E280

… Q.E.D. $E281

 parenleft $0028 & $E282

 parenright $0029 & $E283

 asterisk $002A & $E284

 colon $003A & $E285

 semicolon $003B & $E286

 asciitilde $007E & $E287

 question $003F & $E288

 braceleft $007B & $E289

 braceright $007D & $E28A

 bar $007C & $E28B

 brokenbar $00A6 & $E28C

 section $00A7 & $E28D

 dieresis $00A8 & $E28E

 paragraph $00B6 & $E28F

 periodcenter $00B7 & $E290

 bullet $2022 & $E291

 ellipsis $2026 & $E292

**Geometry**:

… angle right (right angle) $0... & $E297

sin sine $0... & $E298

cos cosine $0... & $E299

tan tangent $0... & $E29A

cot cotangent $0... & $E29B

sec secant $0... & $E29C

csc cosecant $0... & $E29D

sinh hyperbolic sine $0... & $E2A0

cosh hyperbolic cosine $0... & $E2A1

tanh hyperbolic tangent $0... & $E2A2

coth hyperbolic cotangent $0... & $E2A3

sech hyperbolic secant $0... & $E2A4

csch hyperbolic cosecant $0... & $E2A5

 radical $221A & $E2A8

**Trigonometry**:

 degree $00B0 & $E2AD

‘ minute $0027 & $E2AE

“ second $02DD & $E2AF

**Calculus**:

~ ASCII Tilde $0... & $E2B1

 summation $2211 & $E2B2

 integral $222B & $E2B3

 dotlessi $0131 & $E2B4

 partialdifferential $2202 & $E2B5

 delta $2206 & $E2B6

 product $220F & $E2B7

 infinity $221E & $E2B8

` prime $0... & $E2B9

`` primedbl $0... & $E2BA

 … $0... & $E2BB

 … $0... & $E2BC

 … $0… & $E2BD

 … $0... & $E2BE

###### Permutations & Combinations

 exclamation $0021 & $E2BF

… Permutations $0... & $E2C0

… Combinations $0... & $E2C1

###### Statistics

Statistics is also to be broken into logical constituent parts, with emphasis being placed upon Principal Components (PC) and Canonical Correlations (CC) which offer special utility to the geological profession.

StnDev1 1st Standard Deviation $0... & $E2C2

StnDev2 2nd Standard Deviation $0... & $E2C3

StnDev3 3rd Standard Deviation $0... & $E2C4

… Analysis, Factor $0... & $E2C5

… Axis, Rotation $0... & $E2C6

… Colinearity $0... & $E2C7

… Correlation Matrix $0... & $E2C8

… Covariance $0... & $E2C9

… Distribution, Normal $0... & $E2CA

… Eigenanalysis $0... & $E2CB

… Eigenvalue $0... & $E2CC

… Eigenvector $0... & $E2CD

… Regression, Least Squares $0... & $E2CE

… Regression, Partial Least Squares $0... & $E2CF

… Mean $0... & $E2D0

… Mode $0... & $E2D1

… Random Variables $0... & $E2D2

… Redundancy Coefficient $0... & $E2D3

… Significance Test $0... & $E2D4

… Variable, Dependent $0... & $E2D5

… Variable, Independent $0... & $E2D6

… Variance $0... & $E2D7

###### Logic

In similar fashion, many forms of logic exist; however, in modern day applications, most devolve into, or are expressed in, computerized forms, which means that ultimately Boolean logic underpins all. This observation is not meant to detract from, or to demean other forms of logic, only to emphasize that a *de-facto* translation from one type to another must occur for computers to be utilized effectively, at least at present. In reality and in analogy, all valid logic is, ultimately, translatable into other forms, since all logic presupposes (explicitly assumes and tests for) an ability to differentiate between what is true and what is false, given certain specified necessary conditions. How to best express logic in valid forms to enable arriving at valid answers will be a major long-term goal of this project.

In our modern-day hubris, we often minimize or ignore older contributions, in particular with regard to logic, a fundamental precept for the advancement of humanity. The Jesuits wrote many treatises about logic in the Late Middle Ages, some of which were outstanding (some not!). Much of today’s logical precepts are direct adaptations of those earlier learned scripts. When the time presents itself, I intend to synthesize and integrate at least some of the Jesuit principles of logic, in particular that which uses logic symbols, into the MIG Font™©, ditto for some of the even older Greek, Latin and other organizations and evaluations of the principles of logic. Scientifically speaking, the person who first did the work deserves the primary credit and explicit acknowledgment.

Most logic is concerned with getting an unequivocal yes or no, true or false, 1 or 0 answer, nice when you can get it, especially regarding the use of computers, but which is an arbitrary and unrealistic limit on logic, whether inductive or deductive. Matrix logic, in particular, and matrix math, in general, will grow rapidly in the near future, simply because it is possible, is inexpensive and is so utterly necessary. Obviously, in many, perhaps most cases, about the best that can be hoped for is an estimate or probability, *i.e.*, statistics. With statistics, we can discuss correlations (positive, negative or none) and various gradations and distinctions, with some relationships blatant and others subtle, depending upon the statistical methods and subjects analyzed. One thing more-or-less universal about our modern society is our inundation in information, readily converted to statistical tables and to study by statistics. A lot of people are very interested in logic simply because they implicitly believe it can expose and define trends, a special use of applied statistics (*i.e.*, Canonical Correlations). Formal logic must be able to handle all information, all data presented, in an integrated and valid methodology, which is the justification for including Table 07 in the MIG Font™©.

**Boolean Logic/Operands**:

These categories incorporate much of modern computer functionality not present in the original theoretical presentation and definition of Boolean Logic. In particular, Boolean Logic underpins (but is not limited to) the following (formally named) logical operations and functions: Boolean Algebra, Boolean Domain, Boolean Function, Boolean-Propositional Logic, Boolean-Valued Function, Finitary Boolean Function, Heyting Algebra, Lattice (Order), Laws of Form, Lindenbaum-Tarski Algebra, Logic Minimization, Logic Gate, Logical Graph, Minimal Negation Operator, Propositional Calculus, Truth Table, Universal Algebra, Venn Diagram and Ternary Logic.

and … … $0... & $E2E3

both-and … … $0... & $E2E4

 logicalnot $00AC & $E2E5

(Note: In Boolean logic software, this is commonly referred to simply as “NOT.”)

neither-nor Neither-Nor $0... & $E2E6

nor Nor $0... & $E2E7

or Or $0... & $E2E8

xor Exclusive Or $0... & $E2E9

 emdash $2014 & $E2EA

 endash $2013 & $E2EB

 dagger $2020 & $E2EC

 daggerdbl $2021 & $E2ED

& Ampersand $0026 & $E2EE

#### Logical Constructs

Deductive Logic… … $0... & $E2FB

Inductive Logic… … $0... & $E2FC

##### Non-sequitur … … $0... & $E2FD

GIGO: Garbage in, garbage out… … $0... & $E2FE

Bias Variables: … … $0... & $E2FF

Conflict-of-interest… … $0... & $E300

Verified: Tested Impartially… … $0... & $E301

#### Computer Sciences Symbology

 Bblank\_uc $0... & $E32B

 bblank\_lc (bslash) $0... & $E32C

$ dollar $0024 & $E32D

< guillemot-single-left $2039 & $E32E

> guillemot-single-right $203A & $E32F

« guillemot-left $00AB & $E330

» guillemot-right $00BB & $E331

~ ASCII tilde $007E & $E332

© Copyright $00A9 & $E333

® Registered $00AE & $E334

#### Chemistry & Physics Symbology

 … reaction\_one-way $E35B

 … reaction\_two-ways $E35C

**Medical & Pharmaceutical Symbology**

 with (C\_macron) $0... & $E38B

 without (S\_macron) $0... & $E38C

Rx prescription (Rx) $0... & $D38D

**Bo-Po-Mo-Fe Chinese Phonetic Alphabet**

by: Lindsey V. Maness, Jr., Geologist & Owner of all Intellectual Property Rights

Table 08 of Trademarked & Copyrighted MIG Font

12875 West 15th Drive

Golden, CO 80401-3501 USA

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E-Mail: [LVManess@Comcast.net](mailto:LVManess@Comcast.net) Web-Site: <http://www.China-Resources.net>

Version: 3 June 2,010

This first, preliminary version of the Chinese Bo-Po-Mo-Fe Phonetic Alphabet follows. Each of these letters (or phonemes) also appears with either of four appropriate accent marks, grave, acute, caron and dot – as a guide to correct pronunciation. In other words, the first phoneme (character) below, if with a grave accent mark, would decrease in frequency; with an acute accent mark, would increase in frequency, etc. Further, more detailed pronunciation guides will be provided in a future version of the MIG Font.

One of the greatest advantages of the Chinese Bo-Po-Mo-Fe Phonetic Alphabet is that it can be easily used to reasonably approximate any of the Chinese dialects, not just Mandarin. While it could be argued that both the Wade-Giles and Pin-Yin are also flexible enough to accomplish the same thing, and have been so used, most Wade-Giles and Pin-Yin usage has been substantially confined to the Mandarin dialect. Of course, in Taiwan, where the Bo-Po-Mo-Fe phonetic alphabet is most used, it has been employed primarily as an educational tool to teach non-Mandarin speakers (*e.g.*, Fujien, Guangdong, Hakka, … dialects) to speak Mandarin.

Regrettably, at the present time (June, 2010), I am having considerable difficulty getting MS to accept even the basic Bo-Po-Mo-Fe font. Consequently, until this problem has been solved, the Bo-Po-Mo-Fe Table/Plane will be provided separately to those clients who request it. After I succeed in getting MS to accept the basic version, the accented versions of the phonetic symbols will be generated. At this time, there does not appear to be an available compiled/generated modern computer-compatible version of the Bo-Po-Mo-Fe font complete with minority language phonetics.

**Basic Letters**

 Bo $3105

 Po $3106

 Mo $3107

 Fe $3108

 De $3109

 Te $310A

 Ne $310B

 Le $310C

 Geh $310D

 Ke $310E

 He $310F

 Gee $3110

 Chi $3111

 Shi $3112

 Zhe $3113

 Tse $3114

 Seh $3115

 Ryeh $3116

 Ze $3117

 Tsz $3118

 Tse $3119

 Ya $311A

 Ooh $311B

 Uh $311C

 Yeh $311D

 I $311E

 Eh $311F

 Ow $3120

 Oh $3121

 Anh $3122

 Enh $3123

 Ahn $3124

 Ong $3125

 Erh $3126

 Yi $3127

(Rotate the Yi symbol 90 degrees! Incorrect, as-is!)

 Ooo $3128

 You $3129

… V (Non-Mandarin) $312A

… Ng (Non-Mandarin) $312B

… Gn (Non-Mandarin) $312C

… Ih (Miscellaneous Addition) $312D)

**Accent Marks**

 Grave

 Acute

 Caron

Dot



**Composite (Accented) Letters**

Each of the Bo-Po-Mo-Fe letters is to be separately presented with, in sequence, the grave, acute, caron and dot accent marks.

**Dictionary of Terms:**

ASCII: **American Standard Computer Interface International**. ASCII is a computer standard created during the 1960s, with the active encouragement of the United States government, by major computer manufacturers and software firms. In essence, ASCII is a convention whereby everybody agrees that certain numbers (0-255), an 8-bit byte in computers, have certain agreed meanings. Since its inception, ASCII has undergone numerous revisions, so that there are presently several “standards,” all of which vary in one or more important regards. Now that 8-bit bytes are fast becoming obsolete, ASCII “standards” have been formulated or proposed, with various degrees of acceptance, by various bodies for 16-bit, 32-bit and even 64-bit bytes. ASCII initially supplemented another standard, EBCDIC, which is clearly obsolete, even though it still appears (rarely), mostly when older software is resurrected for new purposes. In most cases, when the acronym ASCII is used herein, it would have been more precise to label it as an example of a “**Simple Glyph Index**” usage, which more-or-less approximates an ASCII form.

Automatic Character Recognition (ACR) software: Computer programs that automatically recognize from scanned printed matter the letters, numbers, symbols, *etc.*, and enter same into a computer file in digital form. See Optical Character Recognition (OCR).

Boolean Logic: …

Boolean Operands: A process designated by a font symbol that performs a specified mathematical (matrix) operation with a logic function.

Character: See discussion under Glyph for distinctions.

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Digital Form: A numeric code representing a specific letter, number, symbol, *etc*., that can be recognized and stored on computer media for later retrieval.

Earth Science: Those professions which evaluate the earth using scientific means, including geochemistry, geography, geology, geophysics, meteorology, oceanography, oceanology, paleontology, palynology and like disciplines. (Note: “Graphy” is from the Greek “to draw”; logy is from the Greek “logic” or “to reason.” In like manner, “geo” is from the Greek for the “Earth.” The composite words admirably describe the professions.)

EULA: End User License Agreement. Terms the user/licensee accepts in order to use the font.

Font:

Footprint: The virtual size and shape of a character, font, glyph, symbol, *etc.*, on the computer monitor, on a map, *etc*.

Geochemistry: See Earth Science, above.

Geography: See Earth Science, above.

Geology: See Earth Science, above.

Geophysics: See Earth Science, above.

Glyph: **From High-Logic:** “*In information technology, a glyph (pronounced GLIHF) is a graphic symbol that provides the appearance or form for a character. A glyph can be an alphabetic or numeric font or some other symbol that pictures an encoded character.*” … and “*An ideal characterization of characters and glyphs and their relationship may be stated as follows: A glyph conveys distinctions in form. A glyph has no intrinsic meaning. One or more characters may be depicted by one or more glyph representations (instances of an abstract glyph) in a possibly context dependent fashion. Glyph is from a Greek word for “carving”.*”

Kerning: **From High-Logic:** “*Kerning is the reducing/ increasing of the space between two characters.*”

Letter: See discussion under Glyph for distinctions.

Logic: …

Logical Operand: …

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Number: See discussion under Glyph for distinctions.

Open-Type Font: **From High-Logic:** “*The Open Type font is an extension of the True Type font format, allowing support for PostScript font data. Technically there are two OpenType Font flavors; TrueType based (.ttf) and PostScript based (otf). Open Type was developed jointly by Microsoft and Adobe to produce a hybrid between Type 1 and TrueType fonts, with additional features that work on Macintosh and Windows computers. OpenType fonts can include the OpenType Layout tables, which allow font creators to design better international and high-end typographic fonts.*” and “*Use VOLT (Visual OpenType Layout Tool) from Microsoft to upgrade your TrueType fonts to OpenType. VOLT is used to add OpenType features to your existing TrueType fonts.*”

Optical Character Recognition (OCR) software: Computer programs that automatically recognize from printed matter the letters, numbers, symbols, *etc.*, and enter same into a computer file in digital form. See Automatic Character Recognition (ACR).

Simple Glyph Index: See ASCII.

Symbol: See discussion under Glyph for distinctions.

Trademark: Trademarked in the United States of America and in all nations which honor trademark laws and conventions. The words MIG Font, MIG Symbol, MIG Glyph and all other components, individually, jointly or severally which include the words MIG and any component of the MIG Font are expressly forbidden. Reproduction forbidden without *a-priori* written permission of Lindsey V. Maness, Jr.

True-Type Font: See discussion under Open-Type Font for distinctions.

Type Section: In general, the outcrop location first formally described in the geological literature for a specific formation, unit, member or other stratigraphic division. The insistence by geologists on the use of “Type Sections” is largely responsible for geology remaining an applied scientific discipline as opposed to an esoteric, theoretical construct.

**Technical Specifications of MIG Font™©**

Platform = Windows Unicode BMP (UCS-2)

Language = English-United States

## Naming

√ Copyright Notice: Typeface © Lindsey V. Maness, Jr. 2009-2010. All Rights Reserved.

√ Font Family Name: MIG

√ Font Subfamily Name: Regular

√ Unique Font Identifier: MIG:Version 1.00

√ Full Font Name: MIG

√ Version String: Version 1.00 October 15, 2009, initial release

√ Postscript Name: MIG

√ Trademark: MIG® Trademark of Lindsey V. Maness, Jr.

## Advanced Naming

√ Font Vendor: Lindsey V. Maness, Jr.

√ Font Vendor Link: [www.China-Resources.net](http://www.China-Resources.net)

√ Font Designer: Lindsey V. Maness, Jr.

√ Font Designer Link: [LVManess@Comcast.net](mailto:LVManess@Comcast.net)

√ License Agreement: Not for resale, redistribution or reproduction except by duly authorized dealers. Each license allows use by one individual of the MIG Font in support of writing documents, drawing maps, GIS applications and all reasonable uses that do not infringe upon any intellectual property rights.

√ License Agreement Link: <http://www.China-Resources.net>

√ Description: Maness International Geological (MIG) Font designed for professional geologists

√ Preferred Family (Windows only): MIG

√ Preferred Subfamily (Windows only): Regular

√ Sample Text: AaBbCcDdEeFfGgHhIiJjKkLlMmNnOoPpQqRrSsTtUuVvWwXxYyZz 0123456789 -=!@#$%^&\*()\_+ <>?,./

√ Compatible Full (Macintosh only): MIG

√ PostScript CID Findfont Name: MIG

**Possible/Recommended Improvements to MIG Font™©**

First and foremost, ongoing tweaking (iterative improvements) of glyphs will have to be accepted as a necessity. In particular, the following tweaks will be necessary:

Line Thicknesses

Curves

Joins

Need to consider re-doing Table 00 to use all the default glyphs. As it is, a few of those glyphs which are more appropriate elsewhere have been replaced. The problem to be addressed by doing so is entirely speculative and hypothetical, that certain of the users would have become accustomed to finding certain symbols in the default locations represented by Table 00. For programmers, in particular, this might pose a significant or, at least, recurring, problem.

Ensure that the $ and % symbols are in both Tables 00 & 07. It is used in many non-financial (computer) operations. The assigned space for $ and % in both would be ideal. **Done!**

Shorten stems of almost all lower-case i(s). **In-process.**

Add lira and other formerly excised letters and symbols back to font listing.

Should there be specific Greek letters to indicate massive sulfides, oxides, etc.?

Much remains to be done on Tables 07 and 08!

Add minority language phonetics to Chinese Bo-Po-Mo-Fe and complete with accent marks.

**Font Attribute Information**

**Maness International Geological (MIG) Font®™©**

This attribute information is usually provided for the better known fonts currently installed on most computers to support word processing and publishing. The sole purpose of including this information is to specify for users the types of information that are commonly an integral part of fonts. Many questions have been directed to me about precisely this general topic: this list should demonstrate the reality and complexity of fonts and enable users to do further personal research.

Much of the following information about version numbers and dates & times is in error, having been automatically generated by the software. Each time changes are made, the software “updates” to the date and time of the update, even for references to prior versions! Obviously, the information herein is subject to change without notice.

I am a geologist who has been compelled to make a geological font usable to the profession to meet my own, and the profession’s needs. I am not a typographer who creates fonts, at least not by inclination or design. My success or failure, and of the numerous others who assisted in this endeavor, will be demonstrated by how well my font meets the needs of the earth sciences professions.

**General:**

Font Name = MIG

Font Family Name = MIG

Font Style = Regular

Font Type = TrueType

**Properties:**

Status = Installed

File Size = 248 KB (253,740 bytes)

File Name = MIG\_version-1.31.ttf

Folder = C:\WINDOWS\Fonts

Created = 4/26/2010 10:02:50 PM

Modified = 5/1/2010 8:36:38 PM

Font Revision Version = Version 1.00

Version = Version 1.00 May 1, 2010, initial release

**Metrics:**

Regular = Yes

Italic = No

Weight = Normal (Regular)

Width = Medium (normal)

Monospaced = No

Symbol = No

Embedding = Editable

Number of Glyphs = 6054

Number of Characters = 6058

Units per Em = 2048

Win Ascent = 1716

Win Descent = -418

Number of Kerning Pairs = 0

**Classification:**

PANOSE = 2B56622204

Family Kind = Latin Text

Serif Style = Normal Sans

Weight = Book

Proportion = Condensed

Contrast = Medium

Stroke Variation = No Variation

Arm Style = Straight Arms/Horizontal

Letterform = Normal/Contact

Midline = Any

X-height = Constant/Large

**Naming:**

Copyright = Typeface © Lindsey V. Maness, Jr. 2009-2010. All Rights Reserved

Trademark = MIG® Trademark of Lindsey V. Maness, Jr., registered in certain countries.

Description = This font was created using FontCreator 6.1 from High-Logic.com.

Font Manufacturer =

Font Vendor = HL

Font Vendor URL =

Font Designer = Lindsey V. Maness, Jr.

License Agreement = Not for resale, redistribution or reproduction except by duly authorized dealers. Each license allows use by one individual of the MIG Font in support of writing documents, drawing maps, GIS applications and all reasonable uses that do not infringe upon any intellectual property rights.

License Agreement URL = <http://www.China-Resources.net>

**Character Ranges:**

Unicode (Actual) =

Basic Latin (95 of 128)

Latin-1 Supplement (128 of 128)

Latin Extended-A (128 of 128)

Latin Extended-B (208 of 208)

Spacing Modifier Letters (9 of 80)

Greek and Coptic (144 of 144)

Cyrillic (256 of 256)

Cyrillic Supplement (48 of 48)

Georgian (96 of 96)

Mongolian (176 of 176)

Combining Diacritical Marks Supplement (64 of 64)

Latin Extended Additional (256 of 256)

Greek Extended (256 of 256)

General Punctuation (112 of 112)

Superscripts and Subscripts (48 of 48)

Currency Symbols (48 of 48)

Letterlike Symbols (80 of 80)

Number Forms (64 of 64)

Arrows (112 of 112)

Mathematical Operators (256 of 256)

Miscellaneous Technical (256 of 256)

Box Drawing (128 of 128)

Block Elements (32 of 32)

Geometric Shapes (96 of 96)

Miscellaneous Symbols (256 of 256)

Miscellaneous Mathematical Symbols-A (48 of 48)

Supplemental Arrows-A (16 of 16)

Supplemental Arrows-B (128 of 128)

Miscellaneous Mathematical Symbols-B (128 of 128)

Supplemental Mathematical Operators (256 of 256)

Miscellaneous Symbols and Arrows (256 of 256)

Latin Extended-C (32 of 32)

Coptic (128 of 128)

Georgian Supplement (48 of 48)

Reserved (32 of 32)

Supplemental Punctuation (128 of 128)

Bopomofo (48 of 48)

Bopomofo Extended (32 of 32)

Reserved (96 of 560)

Latin Extended-D (224 of 224)

Private Use Area (2 of 6400)

Alphabetic Presentation Forms (80 of 80)

Supplementary Private Use Area-A (1024 of 65535)

(**Note: Due to the inability of Windows to access the letters and symbols in the Supplementary Private Use Area-A {6 spaces, beginning with $F}, above, all of these have been moved to the generic Private Use Area {5 spaces, beginning with $} which Windows can access. This change created the already superseded Version 1.32.**)

**File Structure:**

Tables =

OS/2 – OS/2 and Windows specific metrics – 96 bytes

cmap – Character to glyph mapping – 2366 bytes

gasp – Grid-fitting/Scan-conversion – 8 bytes

glyf – Glyph data – 141212 bytes

head – Font header – 54 bytes

hhea – Horizontal header – 36 bytes

hmtx – Horizontal metrics – 24150 bytes

loca – Index to location – 24220 bytes

maxp – Maximum profile – 32 bytes

name – Naming table – 3019 bytes

post – PostScript information – 58350 bytes

**Suggested Improvements Form**

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All those who would like to see improvements to the MIG Font™© are requested to specify their request on this form and send to the above. Some suggested additions are already specified: if you would like to see these incorporated into a future version of the MIG Font™©, please so note at the appropriate category. Suggested improvements to individual letters, symbols, etc., are also solicited. Thank you.

Languages (alphabetic):

… Arabic

… Hebrew

… Hindi

… ?

Languages (phonetic):

… Japanese

… Korean

… Thai

… ?

Symbols:

… Geochemical

… Geological

… Geomorphic

… Geophysical

… ?

Other:

… ?

**Registration Form**

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Name: Last, First, Middle = …

Address:

Street = …

City = …

State = …

Country = …

Zip = …

Telephone # = …

Cell # = …

E-Mail Address = …

Web-Site Address = …

Organization/Company/Entity = …

Address:

Street = …

City = …

State = …

Country = …

Zip = …

Telephone # = …

Cell # = …

E-Mail Address = …

Web-Site Address = …

From Whom/Where Purchased = …/…

Date of Purchase = …

Version Number = …

Number of Licensed MIG Fonts = …

Registration Number(s) = 000,000,xxx