MULTILINGUAL MAP OF MARS

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Abstract: Under support of the Commission on Planetary Cartography of the International Cartographic Association and Cosmic Material Research Group of Eötvös University, Budapest, we have prepared a multilingual map of Mars [1] for use in Central European universities, in Croatian, Czech, Hungarian and Polish languages. (Fig. 1.) The map was prepared in cooperation with the geological and astronomical institutions in 5 countries, namely Russia, Hungary, the Czech Republic, Croatia and Poland. The Shade relief base map [2] - and the original idea of a multilingual map - was supported by the Moscow State University for Geodesy and Cartography (MIIGAiK). The map was made in Lambert Transversal Equiv.

Fig. 1. The Multilingual Map of Mars, Central European Edition, 2001.

The making of the map - Background: A University Planetology Group formed at the Eötvös University, Budapest in 2000. We have decided to start our activity by compiling a basic set of educational materials for the education of planetology. We understood that planetary science is taught at middle schools within the frame of physics and also within the subject of geography, but very little emphasis is placed on it. In the best case students accepted at universities can name the planets but they have no additional knowledge on this topic. In the popular science literature there is much outdated information on this subject.

We tried to follow the traditional way of teaching geography. At Eötvös University we published a small booklet "Atlas of Planetary Bodies" -- a regional planetology textbook. The basis of all geographic studies are maps and nomenclature - so we were looking for a cartographic atlas of the planets. We found partners for this work at MIIGAiK, Moscow, where The Atlas of Earth-like Planets and their Satellites was published in 1992 (see [5]).

Multilingual Map
In the frame of the above mentioned cooperation we edited a Multilingual Map of Mars in 2001.
MIIGAIK's Shade relief base map was first published in the form of a Multilingual Map, by the Institute for Cartography, Dresden University of Technology, Germany, in German, Russian, English, French and Spanish languages. We used this as a reference, but we added more text, a full nomenclature, cross-sections, colours etc. and more feature names in the map.

MIIGAIK loaned the Shade relief map to us in tracing-paper. We have scanned it by precision scanner and then worked it up digitally, adding coordinate grids also digitally.

We have wrote a general text in which we describe the main geographic features of the planet; the basic geological history; and as in geographic atlases, we added orbital and body parameters along with data of the longest/highest planetary features. This text written in English was translated to Polish, Czech, Hungarian and Croatian. All mentioned languages use the same "CE" font family, this made the publication easier.

The map includes several cross sections (Tharsis Montes etc) which were made based on recent MOLA data. Since the nomenclature changed slightly since the German version of this map was published, we used the latest IAU nomenclature and we published the full nomenclature with coordinates and diameter data for Mars [3].

We found many different height data published in various works. On the map therefore we only used the MOLA data as it appeared on the digital version of The Topography of Mars map [4]. The colouration of the map comes from the Geologic-morphologic Map of Mars, as published in [5]. As illustrations, there are HST, MGS, Mariner 7 photos of the globe of Mars. These images were downloaded from the internet. Also as illustrations several images of different geologic features are on the map, which can help better identify and imagine the basic characteristics of various features of Mars. [6]

As a historical background, we published old maps of Mars, but willingly, omitting any map with canals. The 3 "retro" maps were made by C. Huygens [7] M. Konkoly [8]. C. Flammarion [9].

Use of the Map
The map is designed in the first place for use by middle and university students. It also can be used as a wall map, which is especially useful for astronomy clubs and school classes. Our goal is to make our map a part of middle schools geographic map collection. The map will be distributed in Hungary to all members of the Hungarian Astronomical Association (MCSE) for a very low price, but individuals can also order it. There seem to be a high interest from all age groups, who knows about the map but the advertising is difficult. This map is especially useful in schools where computer projector is not available.

Translation, transcription for local use
We think that translating the planetary names is an important and necessary work, since this makes planetary science understandable for young students and the public - this is the only way of making planetology widely understood. Using only Latin names even in popular publications makes this science understandable for only the few members of the scientific community.

We found that in Hungarian there are no appropriate planetary nomenclature for terms like Sulcus or Chasma - or even ejecta - which are often used in planetology but not in geology. Since we make educational materials for elementary and secondary schools, these should not include Latin or English terms, only Hungarians so that the students understand it.

We realized that we should translate the planetary nomenclature in a way that is accepted by all members of the scientific community.

For a multilingual map, we had to publish feature names on the map in a common language. This is naturally the IAU Latin nomenclature. However, we found that in maps made for local public, generally students, (in a one language environment) the feature names may appear differently, by translating one or both elements of the geographic name.

Our observation is that even in these 4 countries involved in the making of the map we have translated terms of geologic ages using different methods: one such method is to stick to the original, English / Latin term (Amazonian, as used in Czech), other one is to translate the term (Amazoni or Amazonisz in Hungarian, Amazonsko in Croatian, Amazonski in Polish).

In Hungary, we formed a group of planetologists, geologists, cartographers and linguists to find a good translation for common names, proper names and common terms in planetary science. The basic rules and names should be officially accepted by the appropriate group of the Hungarian Academy of Sciences before it can be officially used as a part of the Hungarian ortography.

Translating a Latin name can cause problems: first the translator have to find the uninflected base of the word, then the original name (of what the feature was named), and how this original is written in the given language.

If it is a proper name, the original must be used (if it uses latin lettering), if a common name, it may be translated, but with care.

The least problem is caused by transcribing the proper names that were written originally in arabic, hindi, cyrillic etc. letters: in this case, we have to "reverse engineering" the original word, using the English, from this finding the original, and from that, transcribing it to the given language, using the ortographic instructions and rules of the local Academy of Sciences or other institution.

For other words, like Arcadia, Elysium it can be discussed whether it should remain in Latin from or using the Greek form, or should we transcript them to the given language (like Arcádia or Elízium, in the case of Hungarian). (The situation is the same with names of asteroids. In the case of Hungarian, planet names follow the Hugarian pronunciation of the word, not the latin form - in the case of other bodies, we simply use the terms accepted by IAU).
There are few feature names that has a common Hungarian form (like Mariner-völgy for Valles Marineris). A question is, whether we should use it or should we use instead Marineris-völgy (Marineris-valley) in its Hungarian form of should we use the latin version in every case. There is a (almost) commonly accepted rule that common words like vallis-valley should be translated in every case.

Of course any transcription is more complicated when it is transcribed to a language which use a non-latin based alphabet. This case is not mentionned here.

**Future works**

If one wants to extend the Earth-based cartographic / geographic approach to other planets, making them well comparable to Earth, on the maps there are several methodological works to do. For this work, on the first place one have to survey the Russian and English common usage of the given features or landforms, since these two nations mapped the planetary bodies by their own instruments. Of course other nations practice can also be important source for this work.

First we have to survey how different nations call a given landform and what these terms mean.

Than one should assign a geologic interpreative and a morphologic descriptive term for each feature. There are several examples that from earlier observations, not the appropriate term was used - the terms can be verified by more accurate observations (i.e. higher resolution images etc). Since a local language nomenclature will be mostly used by not-planetary-scientist students, and the broad public, for a well defined group of local features a better descriptive term could be used (like Volcano / Caldera / Mountain, instead of Mons/Patera)

For the features on planetary bodies, their boundaries are not well defined. It is especially true for names originating from albedo markings.

There is no or a very broadly defined hierarchic system of planetary features. These make the identification of a local feature on a planetary body mainly by its coordinates - which makes it “obscure” and impracticable for those non-scientists who are interested in planetary science and for students (of course there is no problem with the use of coordinates in the world of Planetary Science).

On Earth, landscapes cover the whole surface and are organized as a hierarchic system. On other planetary bodies such system based on topography, geology and meteorology (or other factors) can also be made. At this moment generally latin terms are used for one group of features (maria (Moon), terrae, planitiae (Mars, Venus) for large scale features (areas), and others for smaller scale features (craters, mons, fossae). English terms are also in use (Tharsis Ridge). These features do not cover the whole planetary surface (for example the terra areas on Moon) and do not form a clear hierarchy.

Such landscape system, just as the nomenclatures should be universal, that is, applicable for the Earth and other planets as well. Now sometimes different terms are used for genetically the same types of features in different planets. Albedo features should have a separate system of names.

For topographic maps there is no commonly accepted color coding.

We found that in a later local planetary nomenclature and map making, we can use the experiences from the making of the local nomenclature system of Earth seafloor topography. [10]

The making of new planetary maps may be a new thesis project for students of the Department of Cartography at Eötvös University and other Universities as well.

**Acknowledgements**

The map was created by the selfless work of several authors and is circulated - in many cases gratis - in Schools, Universities, Astronomy Associations, Astronomy Circles in several Central and Eastern European countries. We would like to thank especially to A. Rükl at the Observatory and Planetarium Prague, for his Czech translation and suggestions; to T. Marjanac at the Department of Geology of Zagreb University and to Wojciech Ozimkowski at the Tectonics and Geological Cartography Section, Faculty of Geology, Warsaw University, for their work on correcting errors and making suggestions for a better Multilingual Map of Mars.

**Supplement**

At the time of the writing of this article, the Multilingual Map of Mars has won the Special Price in the Hungarian Map Competition 2001., organized by the Lazar Déak Cartographic Foundation and the Hungarian National Széchenyi Library in the category Scientific Maps and Atlases [11]. The reasons were that “in the publication the hard and popular scientific functions are in a good harmony. Following the traditions of the representation of Earth it depicts the two hemispheres in two parts, indicating the particular topographic elements and their nomenclature (...).

**References of the map**

- Topography of Mars (MOLA Science Team, NASA)
References
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