On the calendar reform by Johann Heinrich Mädler

T. Viik

1. Introduction

We know that all the problems with the calendars which are based on the movement of the Sun stem from the fact that the tropical year does not contain integer number of days. To be quite clear what we mean under the term of „tropical year" we give the definition of it here:

Tropical year is the time interval between two successive transits of the Sun through the vernal equinox.

Thus the length of the tropical year is 365.24220 days or 365 days 5 hours 48 minutes and 46 seconds. Actually the length of the tropical year depends basically on the precession of the Earth's rotational axis. One of the possible formulas for the length of the tropical year is as follows:

t=365.242189669781-6.161870E-6*T-6.44E-6 *T*T, kus T=(JD-2451545)/36525

(Borkowski, 1991).
In the following we stick to the classical length of the tropical year.

2. The Julian calendar

Since the fractional part of the length of the tropical year is close to 0,25 Julius Caesar established a calendar under his own name in 46 B.C. suggested by Alexandrian astronomer Sosigenes. This calendar is very simple – all the years are equal and 365 days long. But each fourth year is 366 days long. To make the matter still simpler it was decided that the year of 366 days or the so-called leap year happens at those years whose number is divisible by four. Though the error we make each year according to this calendar is only 11 minutes and 14 seconds, this system is not good because the error cumulates quickly and in one thousand years it is already 7.8 days. In reality this is not important since many oriental nations celebrate their new year on different dates every year and this does not bring along any problems but the Christian religious feasts started to happen at very odd dates.

3. The Gregorian calendar

Christianity has had many problems during its long history, espcially in the beginning. To avoid one type of problems and, perhaps, to avoid the scission of Western and Eastern Roman empires the First Council of Nicaea was held where the Christian bishops convened in Nicaea by the Roman Emperor Constantinus I in AD 325. This council decided that spring must begin on March 21st and that the Easter Sunday must be the first full-moon Sunday after the beginning of spring. Very good, but in 1582 the spring began already on March 11th. Such a horrible thing did not suit some nations and Pope Gregorius XIII who was an intelligent man having founded even universities issued the papal bull *Inter gravissimas* of 24 February 1582 that the day after Thursday, 4 October 1582 would be not Friday, 5 October, but Friday, 15 October 1582. In doing it Pope Gregorius XIII was helped by a Jesuit priest and astronomer Christopher Clavius but the basis of the reform was elaborated by an Italian mathematician Luigi Lilio. This reform said that the leap years are those whose number is divisible by four but the years whose number is divisible by 100 are excluded. These years are leap years only if the hundreds of this number are divisible by four. For instance, year 2000 was a leap

year but 1900 was not.

This calendar which got the name of the Gregorian calendar was more accurate since one-day error cumulates in 3300 years. And we are using this calendar up to now.

Most probably the people who had to get used to the new calendar were very angry because as they thought they had lost 11 days of their lives!. Almost all catholic countries came under the new calendar but England and Russia resisted. Reputedly they later also succumbed to the new style (as the Russians say even now) but Russia only in 1918 – this is the reason why the so-called Great Socialist October Revolution took place in November. But the Russian orthodox church uses still the julian calendar and they celebrate the church feasts two weeks later than other Christian nations.

4. Mädler calendar and others

Back to Mädler.

The students of Mädler oeuvres have claimed that he had published astronomical data in "Dörptscher Kalender" (published in Tartu, or Dorpat at that time) already since 1820. But in 1858 while he was living and working in Tartu he published a paper "Der Julianische und Gregorianische

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Kalender" about his new calendar system in the journal „Inland". Fair enough, this paper was anonymous but as far as he later was talking about his calendar in public it is clear that the author of the paper was no other than Mädler.

Johann Heinrich Mädler, since 1840 the director of the Tartu Observatory and the ordinary professor of astronomy in the University of Tartu had already long time thought that perhaps by introducing his own calendar system he could kill two birds with one stone – getting Russia out of its reactionary calendar and into using the most accurate calendar in the world. Indeed, his calendar would have been the most accurate, even by far accurate than the Gregorian calendar. The point was that Mädler had observed that if we expand the fractional part of the length of tropical year 0.24220 in continued fractions then we have as the approximations to it: ¼, 7/29; 8/33; 31/128; 132/545 etc. Looking at this series we see that the first term gives us the Julian calendar – once in every four year we have a leap year. Such a calendar where after every 29 years there are seven leap years nobody have even considered to say nothing about proposing it. Eight leap years during 33 years was the essence of the Omar Hajjam calendar reform and this was in use in Persia from 1079 up to the middle of the XIX century (some have doubts, though).

The next approximation is that of Mädler – during 128 years there are 31 leap years or in

other words after every 128 years in Julian calendar there will be one year with 365 days. That is once in every 128 years the leap year must be substituted by a normal year.

5. About the accuracy of calendars

Let us look at the accuracy of different calendars by ascertaining how many years it would take to err by a day.

Fraction	Error in one day (years)	Name	Author
1/4	128	Julian	Sosigenes
7/29	1220		
97/400	3300	Gregorian	Lilio
8/33	4500	Persia	Omar Hajjam
218/900	43 500	New-Julian	Milanković
31/128	80 000	Mädler	Mädler
132/545	545 000		

As we see in the Table there are two non-system calendars – the Gregorian and another that of the Serbian engineer, mathematician and geophysicist Milutin Milanković (1879-1958). It is interesting that those two are in use - the Gregorian calendar is used in most western countries, the Julian calendar is used by the Russian orthodox church and the New-Julian is used by the Greek and Romanian orthodox churches (Google data).

6. About the fate of the Mädler calendar reform

The German scientific society "Das freie Hochstift für Wisssenschaften, Künste und allgemeine Bildung in Goethe's Vaterhause" had set as their aim to enforce an identical and accurate calendar everywhere in their meeting in 1863. In order to achieve this noble objective the society addressed many scienticists for suggestions. Among others Mädler, too, responded to that appeal and he proposed to use his calendar. Approximately at the same time the representative of Russia had promoted Mädler's reform at the world conference of statisticians. Nobody from the Russian government took Mädler's propositions seriously. In the official publication of the Russian ministry of public education we may learn that an actual state councellor Johann Heinrich Mädler had indeed proposed a calendar reform to the government in order to take Russia into the family of progressive countries but these propositions had been made previously, too. In 1830 a proposition was made to change over to the Gregorian calendar in Russia.

Tsar Nicholas I made quickly up a committee composed of academicians Vishnevski, Krug, Collins, Kupffer, Parrot and Tarhanov and adjuncts Bunjakovski and Ostrogradski. The committee discussed the proposal and gave a report to the ex-president of the academy S. Uvarov They declared in their report that:

1. The committee believes that introducing the Gregorian calendar in Russia is necessary and very useful for simplifying the relations with the western world where this calendar long time works.

2. If the government condescenses to introducing the reform then the committee thinks that it is more useful to introduce it all at once, e.g. that August 19th should be counted as September 1st. It is needed to make respective changes in calendars in proper time.

3. Since the new calendar reform involves inevitably the change of the church calendar then this must be done by the sacred sinod. It must be taken into account that the perpetual "mesjatseslov" must be changed in church books, too.

This opinion of the academy was announced to the emperor Nicholas I who informed in his decision that for such a serious change one has to weigh possible benefits against the possible disadvantages. In principal the emperor agreed with the proposal since the new „style" would remove the

discrepancies with other countries both in commerce and science and the strange situation in Russia would pass away.

The accuracy of the calendar would be better, too. But … these benefits do not compensate the emergent disadvantages. If to go over to the new style according to the suggestion of the academy in August then in this year of change some of the church festive days will disappear. What the rank-and-file people will think? There would be no Day of the Vladimir Virgin nor the Day of the Liberation of Moscow (August 26th) nor the Day of decapitation of the John the Baptist (August 29th) nor the Day of the Saint Alexander Nevski (August 30th). There will be no Day for preying for the Health of the Successor to the Throne? There will be no Day of the Obituary for Alexander I? What the village priests will think? What the Old Believers will say who accuse the government in apostasy of the fathers religion anyway?

In addition to all that the academy says that the whole circle of church, that is the dates of the moving church festive days will change. But this circle as a part of the book is in each village church or even in homes of merchants. It may bring along such a schism which is worse than that of the Nikon time. The number of Old Believers will grow drastically! The orthodox nations in Greece, Moldavia and Valahia receive a wrong signal that Mother Russia will not protect them any more!

Thus we won't speak about the reform of some Mädler any more. And everything remained as before until the bolsheviks introduced the Gregorian calendar in Russia in 1918 without anybody as much as squeaking.

7. Acknowledgements

Literature

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This paper was written in 1994.

I recommend to read the paper by F. Biraud and M. Heydari-Malayeri in L'Astronomie, no 68, pp. 28-33, January 2014.