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SCHLOSSER AND BERGMANN REPLY—McClusky and van Gent advance the same arguments that led Krusch and Galle a century ago to the assignation 'Robeola' = Arcturus. Since then we have become much better informed about the intentions Gregory pursued in his astronomical writings. We have to distinguish between two different levels, A and B.

A. In most of his writings, Gregory proved to be an enthusiastic 'amateur astronomer', as we would put it today. He made an immense number of observations (from solar eclipses to polar lights) and described them in his *Historia Francorum* and the *Seventh Wonder of the World*, the latter being the basis of the Arcturus hypothesis. As has been shown by Bergmann and Schlosser[1], Gregory generally reported correctly what he saw, but not necessarily the exact temporal circumstances.

So it is not surprising to find that the fine drawings of constellations in the Bamberg codex are not paralleled by numerical data of the same quality. This is demonstrated by van Gent's Fig. 2 and McCluskey's Table 1 (upper part), which are anything but proof for the Arcturus hypothesis. Although the slope of the 'Robeola' data in Fig. 2 corresponds somewhat better to Sirius, we never have based our identification on data like these, but on Gregory's level B (see below).

In this connection, we flatly reject van Gent's 'convincing' Fig. 1 as a non-historic discussion of mediaeval manuscripts. Gregory used (as the middle age generally) '*horae inaequales*', i.e. an 'unequal hour scheme'. The night was always divided into twelve hours, even in December, without respect to its physical length.

Krusch and Galle (and today McCluskey) assigned Sirius and some stars around to Gregory's constellation 'quino'. Not much is said about this constellation, but Gregory tells us that these stars were rising three hours after 'falx', which had its heliacal rise in early August. Since at that time Sirius had (for the latitude of Tours) its first morning-rise too, 'quino' was rising several hours after Sirius and an identification of Sirius with 'quinio' seems improbable.

These examples—and more could be given—simply demonstrate, that the *Seventh Wonder of the World* alone is not sufficient to allow a unambigous identification of Merovinglan sky with modern constellations.

B. In the first place, Gregory was a bishop rather than an 'amateur astronomer'. In AD 567 the Council of Tours took place. His predecessor, Euphronius, presided over this meeting. The minutes of this Council define in chapter 18 the number and length of the pre-dawn prayer sequences to be conducted in the monasteries. Gregory's '*De cursu stellarum ratio qualiter ad officium implendum debeat observari*' (about 'On the Course of Stars and how to use it for Divine Services') is the practical regulation of this decree. It should be kept in mind that the monks had no alarm-clocks at their disposal and were punished 'on bread and water' between one day and one week for violating this decree.

Obviously, these prayer instructions were based on observations and, indeed, no inconsistencies show up in this list arranged in monthly order. The standard phrase for 'Robeola' (several psalms to be chanted plus following matin) is repeated for other stars giving the following durations:

Vega	January	4.3 h
Vega	February	6.0 h
Capella	April	1.7 h
Capella	May	2.7 h
Capella	June	3.9 h
Hyades	August	3.6 h

All times are for $\phi = 47°$, AD 580, Sun's depression 12°, elevation of stars 7°. For Capella, which Gregory correctly notes as circumpolar, lower culmination is used. Furthermore, all dates refer to the fifth of each month to allow for a small 'jitter' in Gregory's calendar.

Crucial are the September and October apparitions of Rubeola. Whereas Sirius = 'Robeola' fits nicely into the scheme

Sirius	September	1.7 h
Sirius	October	4.4 h

Arcturus = 'Robeola' does not:

Arcturus	September	rising $\frac{1}{2}$ h after the Sun
Acturus	October	10 min.

We do not consider the 'red Sirius problem' finally solved by our paper. But we do think that our evaluation of this interesting manuscript took into account every foreseeable aspect of history and astronomy, and hope that it might stimulate further work in this field.

W. SCHLOSSER
W. BERGMANN
*Astronomisches Institut,
Ruhr-Universität Bochum,
Postfach 102148,
D-4630 Bochum 1, FRG*

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Early forest clearance and the environment in south-west Uganda

THE pollen diagram from Ahakagyezi Swamp, Uganda can be interpreted in a radically different manner from that of Hamilton, Taylor and Vogel[1]. The stable isotope readings from the two lowest dated levels clearly indicate that the swamp vegetation at those times (4,670 years BP and 3,520 years BP) was dominated by C_4 plants, most probably savanna type grasses[2]. At some point before 2,800 yr BP, the stable isotope results indicate a change to a more 'normal' C_3 type vegetation. These data suggest that below ~6-7 metres, drier climatic conditions allowed savanna type grasses to dominate the vegetation on the swamp surface. However, the stratigraphy, loss-on-ignition, charcoal and pollen analytical results provide a more detailed picture of environmental change.

The stratigraphy records two clay bands, between 10 m and 9.5 m and between 8.25 m and 7.5 m, which are reflected in matching peaks in inorganic matter content. On East African mires such bands have been found to occur during drier conditions[3,4]. The peaks of 'microscopic charcoal' in these bands would tend to suggest the natural burning of the vegetation during drier periods.

The pollen diagram in the early period shows no pollen that could be regarded as a positive indicator of anthropogenic disturbance or agriculture. The interval 10-9.5 m, which has high levels of inorganic matter and charcoal, is dominated by Gramineae pollen, reflecting the dominance of grasses on the swamp surface and in the catchment. The only other individual taxon to reach a significant percentage is *Alchornea*. This could be *A. cordifolia* or *A. hirtella*, which have different ecologies. *A. cordifolia* is found today in secondary forest, swamp forest and forest-edge situations[5-7], whereas *A. hirtella* is an understory tree of moist forest[5,7]. The site at Ahakagyezi Swamp is above the known, present-day altitudinal limit for *A. cordifolia*[8], but with a different climate, altitudinal limits would also change. A further complicating factor is that *Alchornea* is a moderately well dispersed pollen type and therefore need not necessarily be growing at or near the site