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Memorie della

SN 185 and its proposed remnants

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Abstract. Clark & Stephenson (1977) proposed to identify the SN remnant G 315.4-2.3 (RCW 86) with the historical SN seen by Chinese observers in the year 185 of the modern era. This identification is challenged e.g. by the absence of any observed plerion in RCW 86. Several authors proposed G 320.4-1.2 (RCW 89) as a better candidate, while even the very nature of the AD 185 event was questioned, leading to the hypothesis that Chinese observers had actually witnessed a comet transit or a combination of the transit of comet P/Swift-Tuttle with a Nova apparition. Evidences supporting these different hypotheses are presented, with some new hints given by... Archeology.

A passage of the Chinese source *Hou-han-shu* (Astronomical treatise, Ch.22) concerning 185 AD was translated by Clark & Stephenson (1977) as follows:

... 2nd year of the Chung-p'ing reign period [of Emperor Hsiao-ling] 10th month, day kuei-hai [December 7, 185 AD], a guest star appeared within [chung] Nan-men [α and β Centaurii]. It was as large as half a mat; it showed the five colours and it scintillated. It gradually became smaller and disappeared in the 6th month of the year after the next [hou-nien ?] ...

The positional data led the translators identify this event with the SN which originated RCW 86 (14:43:04, -62:27.7). However, in this remnant there is no established evidence of a plerion. Moreover, Sedov-phase expansion estimates lead to ages which are too large (about 7k years: see, e.g., Chin & Huang 1994; Borkowski et al. 2001, but with a contradictory result on the ionization age). More sophisticated models, including different expansion phases, i.e. varying shell velocities, allow to reconcile the age with the dynamical model of RCW 86 to some extent - e.g. when ad hoc hypotheses on the explosion energy are made (Bocchino et al. 2000). An alternative identification was made with RCW 89 (15:13:35 -59:00.2). In this case, a pulsar is present (PSR B1509-58) with an age pretty coincident with the required one (Thorsett 1992), but, again, Sedov-phase expansion estimates lead to ages which are too large (see, e.g., Kamper et al. 1995). Indeed, SNR datations through dynamical (nebula expansion) or ionization models are known to be very uncertain. Schaefer (1995, 1996) criticized both identifications arguing that the event light curve seems too short for a SN and that the term *hou-nien* is better translated by *a few years later*, thus compatible with an event occurred in 188 AD. In this case, a likely candidate would be comet P/Swift-Tuttle, whose transit was recorded by the same Chinese source (*Hou-han-shu*, Chapter 20 - Yoke 1962).

Retranslating the Clark & Stephenson (1977) citation *within (chung) Nan-men* may become *emerging from Nan-men*, thus implying a motion (Chin & Huang 1994).

Fig. 1. Fresco of the Madonna and Child with a prophet (Balaam?) in the Priscilla catacombs.

But a comet does not ”scintillate”, and a comet appearing near Nan-men must be of $m_V = -7$ to be visible to a naked eye, far too bright for a comet. Thus, the event may rather be interpreted as a combination of a Nova exploded in Centaurus in 185 AD with the transit of comet P/Swift-Tuttle, three years later (Schaefer 1995, 1996). P/Swift-Tuttle is a huge comet (2 km diameter) and in 188 AD its minimum distance from Earth was 0.6 UA only; appearing in the constellation of Corona Borealis, it must have been perfectly visible in the sky of Rome. Indeed, there is something suggesting an unexpected and impressive event took place in the sky of Rome at the end of the 2nd Century: a fresco in the Priscilla Catacomb (Fig. 1). Its style and its location (in one of the oldest areas of the cemetery) contribute in dating the image making it the oldest known image of the Mother of God. The character on the left hand side has been identified with Balaam: this biblical character is not so common in Christian painting and such unusual representation (in the act of indicating a star) may be due to an unusual astronomical phenomenon, most probably the P/Swift-Tuttle transit. Noticeably, if the 185 AD *guest star* was actually the Supernova that originated RCW 86 or RCW 89, it could not have been seen in Rome, since it was by far too South.

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