113 – Appeared in *AMS Abstracts* 10(1989), 89T-11-73

RICHARD P. BRENT, Australian National University, Canberra, ACT 2601, Australia. Factorization of the Eleventh Fermat number. Preliminary report.

Of the Fermat numbers $F_n = 2^{2^n} + 1$, only F_1 to F_4 are known to be prime; certainly F_5 to F_{21} are composite. However, the only complete factorizations known until now are those of F_5 (Euler), F_6 (Landry), F_7 (Morrison and Brillhart, 1975), and F_8 (Brent and Pollard, 1981). This abstract announces the complete factorization of the 617-digit Fermat number $F_{11} = 2^{2^{11}} + 1$. In fact

$$F_{11} = 319489.974849.167988556341760475137.3560841906445833920513.p_{564}$$

where the two 6-digit factors were already known (Cunningham, 1899), the 21-digit and 22-digit prime factors were found using the two-phase elliptic curve algorithm on a Fujitsu VP100 computer, and p_{564} is a 564-decimal digit prime (primality proof by F. Morain, using the method of Atkin). The provision of computer time by the ANU Supercomputer Facility is gratefully acknowledged.

[Submitted to *AMS Abstracts* 21 December 1988.]