Two New Clusters of 18 Primes

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1	13	190623083504664829329004**3**	-284537254250991186826687**7**
2	17	190623083504664829329004**7**	-284537254250991186826687**3**
3	19	190623083504664829329004**9**	-284537254250991186826687**1**
4	23	190623083504664829329005**3**	-284537254250991186826686**7**
5	29	190623083504664829329005**9**	-284537254250991186826686**1**
6	31	190623083504664829329006**1**	-284537254250991186826685**9**
7	37	190623083504664829329006**7**	-284537254250991186826685**3**
8	41	190623083504664829329007**1**	-284537254250991186826684**9**
9	43	190623083504664829329007**3**	-284537254250991186826684**7**
10	47	190623083504664829329007**7**	-284537254250991186826684**3**
11	53	190623083504664829329008**3**	-284537254250991186826683**7**
12	59	190623083504664829329008**9**	-284537254250991186826683**1**
13	61	190623083504664829329009**1**	-284537254250991186826682**9**
14	67	190623083504664829329009**7**	-284537254250991186826682**3**
15	71	190623083504664829329010**1**	-284537254250991186826681**9**
16	73	190623083504664829329010**3**	-284537254250991186826681**7**
17	79	190623083504664829329010**9**	-284537254250991186826681**1**
18	83	190623083504664829329011**3**	-284537254250991186826680**7**

In this table the second column contains the sequence of the 18 consecutive primes beginning at 13 and ending at 83 (i.e. 18 primes occupying an interval of 71 consecutive integers). This is one of two possible patterns of clusters of 18 primes with maximum density that can occur repeatedly. The other pattern is its mirror image; an obvious instance of the mirror image is the sequence of negative primes beginning at -83 and ending at -13.

The third column (18 25-digit numbers) of the table contains the first repetition of the pattern [13, 17, ..., 83] within the sequence of primes. The numbers in the fourth column are consecutive negative primes in increasing order in the same pattern, the first repetition in terms of negative primes. The list of occurrences of this pattern is complete in the range $(-3 \cdot 10^{24}, 3 \cdot 10^{24})$.

The cluster near $-2.8 \cdot 10^{24}$ was discovered on November 13, 2000 after 100 days of computation with up to 450 processors located in the Beowulf cluster and in the Seminar for Applied Mathematics of ETH Zürich. The other cluster (near $1.9 \cdot 10^{24}$) unexpectedly popped up on January 31, 2001 after only 44 days of computation on the same hardware.

These are the longest nontrivial prime clusters of maximum density found so far (August 2006). The algorithm used is based on Chinese remaindering, sieve techniques and robust parallelization; it was developed by Jörg Waldvogel and Peter Leikauf.