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Allan Wilke

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2 seqs

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Allan Wilks

Did anyone ever send you the sequence we were talking about in the tea room on Monday? If not, here are the first 100 terms of it. The nth term, when expressed in binary, is the base -2 representation (with digits from {0,1}) of n.

1, 6, 7, 4, 5, 26, 27, 24, 25, 30, 31, 28, 29, 18, 19, 16, 17, 22, 23, 20, 21, 106, 107, 104, 105, 110, 111, 108, 109, 98, 99, 96, 97, 102, 103, 100, 101, 122, 123, 120, 121, 126, 127, 124, 125, 114, 115, 112, 113, 118, 119, 116, 117, 74, 75, 72, 73, 78, 79, 76, 77, 66, 67, 64, 65, 70, 71, 68, 69, 90, 91, 88, 89, 94, 95, 92, 93, 82, 83, 80, 81, 86, 87, 84, 85, 426, 427, 424, 425, 430, 431, 428, 429, 418, 419, 416, 417, 422, 423, 420

Here are the numbers for the negatives from 1 to 100:

3, 2, 13, 12, 15, 14, 9, 8, 11, 10, 53, 52, 55, 54, 49, 48, 51, 50, 61, 60, 63, 62, 57, 56, 59, 58, 37, 36, 39, 38, 33, 32, 35, 34, 45, 44, 47, 46, 41, 40, 43, 42, 213, 212, 215, 214, 209, 208, 211, 210, 221, 220, 223, 222, 217, 216, 219, 218, 197, 196, 199, 198, 193, 192, 195, 194, 205, 204, 207, 206, 201, 200, 203, 202, 245, 244, 247, 246, 241, 240, 243, 242, 253, 252, 255, 254, 249, 248, 251, 250, 229, 228, 231, 230, 225, 224, 227, 226, 237, 236

And here is an S function to compute it for the number N:  
I was surprised at how hard it was to write this function.

```
f <- function(N) {
  if(N > 0)
    nbit <- 2 * ceiling(log(3 * N + 1, 4)) - 1
  else if(N < 0)
    nbit <- 2 * ceiling(log(1 - (3 * N)/2, 4))
  else nbit <- 1
  pow <- 2^(0:(nbit - 1))
  alpha <- N + 2 * rep((pow^2 - 1)/3, rep(2, nbit))[1:nbit]
  beta <- ifelse(alpha < 0, pow - alpha - 1, alpha)
  sum((beta %/% pow) %% 2 * pow)
}
```

So f(1) gives 1, f(-1) gives 3, and so on.