SPIRALLING PRIMES

Well, if we have spiralling inflation, why can't we have spiralling primes? It seems this idea first occurred to S. Ulam some years ago during a boring scientific meeting. Draw up a grid as shown in the figure and number the squares, starting in the centre and moving out in an anticlockwise spiral. Then circle the prime numbers. Isn't it incredible how the primes seem to cluster in straight lines? The computer pictures below show the patterns formed by spirals of primes up to about 8000 (left) and up to about 25000 (right). Even near the outer limits of the pictures, the primes continue to fall obediently into line.

64	63	62	61	60	59	58	57
37	36	35	34	33	32	31	56
38	17	16	15	14	13	30	55
39	18	5	4	3	12	29	54
40	19	6	1	2	11	28	53
41	20	7	8	9	10	27	52
42	21	22	23	24	25	26	51
43	44	45	46	47	48	49	50

Can you think of any reasons why the primes should fall in some lines and not in others? Can you find the equations of some lines which are rich in primes? For example, what is the equation of the diagonal which begins 1, 5, 17, 37, . . . ? What about the line 5, 19, 41, 71, . . . ? Is it possible to find a line which consists entirely of primes? Perhaps you can suggest some other interesting prime patterns. Happy doodling.