IN NATURE of October 11, p. 436, Lord Cherwell calculates, by considerations of probability, the number of primes in an interval Δ and finds that the correct answer is about 11 per cent smaller than his results.

Having myself calculated the number of primes by the probability method some time ago, I think I can give an explanation of the difference.

The probability for a number to be prime

$$\omega_n = (1 - \frac{1}{2})(1 - \frac{1}{3})(1 - \frac{1}{5})(1 - \frac{1}{7})(1 - \frac{1}{11}) \dots (1 - \frac{1}{p_n})$$

is valuable only for the whole interval between p_n and $(p_{n+1})^2$. But Lord Cherwell applies it—or one derived from it—to an interval which is only part of the preceding. And the different parts of the $p_n - (p_{n+1})^2$ interval are not equally rich in primes. The higher parts are comparatively poor in primes. Thus, applying to the higher parts of the interval a

of primes in his interval would be approximately $li(p_{n+1})^2 - li p_n$. In the region he has examined in his table this happens to be about 10 per cent bigger than

$$\frac{p_{n+1}}{2 \log p_{n+1}} \text{ and therefore nearly equal to } \frac{p_{n+1}}{e^{\gamma} \log p_{n+1}}$$

But this is because he chanced to stop at 97. If he had proceeded to larger numbers the agreement would vanish and he would find a discrepancy just as serious as the one to which I directed attention.

Incidentally, my use of the word 'avoid' seems to trouble the "Free French Scientist" unnecessarily. Perfect squares avoid one another more and more the further we go, but there is nothing mysterious about this.

While I can sympathize with Prof. Haldane's very human wish to begin a metaphysical discussion, I had not expected him to reveal the urge quite so soon after his letter extolling utilitarian studies as

Prime numbers		Interval $\Delta_n = (p_{n+1})^2 - p_n$	Probability of being prime for a number in the interval Δ_n $\omega_n = (1 - \frac{1}{2})(1 - \frac{1}{3})(1 - \frac{1}{5}) \dots (1 - \frac{1}{p_n})$	Number of primes in the interval Δ_n		Difference %
p_n	p_{n+1}			Calculated by $N = \omega_n \Delta$	Actual	
2	3	9 - 2 = 7	0.5	3.5	3	+16.7
3	5	25 - 3 = 22	0.3333...	7.333...	7	+4.6
5	7	49 - 5 = 44	0.2666...	11.733...	12	-2.2
7	11	121 - 7 = 114	0.2286	26.055	26	+0.2
11	13	169 - 11 = 158	0.2078	32.830	34	-3.4
13	17	289 - 13 = 276	0.1918	52.936	55	-3.8
17	19	361 - 17 = 344	0.1805	62.097	65	-4.5
19	23	529 - 19 = 510	0.1710	87.216	91	-4.2
23	29	841 - 23 = 818	0.1636	133.80	135	-0.9
29	31	961 - 29 = 932	0.1579	147.20	150	-1.9
31	37	1369 - 31 = 1338	0.1528	204.50	202	+1.2
37	41	1681 - 37 = 1644	0.1487	244.02	244	+0.008
41	43	1849 - 41 = 1808	0.1455	263.01	262	+0.4
43	47	2209 - 43 = 2166	0.1421	307.77	307	+0.25
47	53	2809 - 47 = 2762	0.1391	384.10	385	-0.25
53	59	3481 - 53 = 3428	0.1364	467.71	461	+1.5
59	61	3721 - 59 = 3662	0.1341	491.18	491	+0.03
61	67	4489 - 61 = 4428	0.1319	584.18	580	+0.7
67	71	5041 - 67 = 4974	0.1300	646.43	646	+0.07
71	73	5329 - 71 = 5258	0.1281	673.70	673	+0.1
73	79	6241 - 73 = 6168	0.1264	779.47	777	+0.3
79	83	6889 - 79 = 6810	0.1248	849.70	848	+0.2
83	89	7921 - 83 = 7838	0.1233	966.18	966	+0.02
89	97	9409 - 89 = 9320	0.1219	1136.0	1129	+0.6

formula which is valuable only for the comparatively richer whole interval, Lord Cherwell very naturally finds a number of primes which is slightly too great.

On the contrary, when the formula is applied to the correct interval $[p_n \text{ to } (p_{n+1})^2]$ the agreement becomes rapidly very good as p_n increases, as is shown by the accompanying table.

Of course the probabilities of divisibility are strictly independent and it cannot be any question of a mysterious tendency of the factors to avoid each other.

A FREE FRENCH SCIENTIST.

October 13.

"A FREE FRENCH SCIENTIST" appears to use the word 'probability' in an unconventional sense. The probability that a number in the neighbourhood of a large number A should be a perfect square tends to $\frac{1}{2\sqrt{A}}$; this is an obvious property of numbers in the neighbourhood A ; it is not a matter of intervals. A "Free French Scientist's" expression does not give the probability of a number in the neighbourhood of a large number N^2 being prime, but the average value of the probabilities between p_n and $(p_{n+1})^2$.

The agreement he finds is unfortunately spurious. According to well-established theory the number

opposed to pure science. Unfortunately, I do not feel I ought to indulge him, since his difficulties are quite irrelevant to the point at issue. The discrepancy to which I directed attention can be derived perfectly well by choosing a number at random from a finite class.

CHERWELL.

Christ Church,
Oxford.

Penetration of a Water-soluble Sulphonamide, Sodium Sulphacetamide (Albucid-soluble) into the Eyes of Rabbits

RECENT work has shown that the local application of sodium sulphacetamide can control the development of experimental corneal ulcers in rabbits (Robson and Scott¹). This sulphonamide is also being used clinically in concentrations up to 30 per cent for the treatment of various ocular infections, and especially of hypopyon ulcers, and it became of interest to determine the concentration attained in the various ocular tissues, when solutions are applied locally to the conjunctival sac.

Experiments were performed on twenty-eight mature rabbits. Under ether anaesthesia, celluloid