toneally become sick, but only a few of them die. Intranasal inoculations of the virus cause no visible illness in mice but immunize them against the virus injected intracerebrally. The chief lesions found in mice are a mononuclear cell meningitis, a hyperplasia of Kupffer cells in the liver, and a pneumonia similar to that caused by other filterable viruses.

The virus causes no lesions in the skin of rabbits, and when it is inoculated intracerebrally the animals only exhibit a fever of short duration. We have no definite evidence, therefore, that rabbits are susceptible to this active agent.

Guinea pigs are susceptible to both strains of the virus inoculated either intracerebrally or subcutaneously. A high continued fever (104–106° F.) and loss of weight are the striking features of the infection in this host. Death usually occurs 10 to 14 days after intracerebral inoculation and many of the pigs die after subcutaneous injections. A slight meningitis or a virus pneumonia is all that our pathological studies have revealed so far.

Monkeys (*M. rhesus*) are susceptible to the active agent introduced intracerebrally, as evidenced by high fever, loss of weight and irritability. No paralyses have been noted. From the small number of monkeys injected we judge that the disease will not as a rule be fatal for this host.

From tissues containing the active agent no ordinary bacteria that might be of etiological significance have been cultivated. Furthermore, the virus passes through Seitz pads, Berkefeld V, N and W candles, and collodion membranes possessing an average pore diameter of 210 μμ. Additional work is under way to determine the size of the virus.

The results of our experiments seem to indicate clearly that the virus was obtained from the spinal fluid collected from the two patients and that it is pathogenic for man. Two mice that received W.E.'s spinal fluid and recovered and 5 mice that received R.E.S.'s spinal fluid and did not become sick were later found to be solidly immune to virus introduced intracerebrally. We have not encountered any immune animals among our stock mice. Consequently, we believe that the immune mice mentioned above realized that state through having received an immunizing dose of virus in the spinal fluid. Furthermore, neutralization tests conducted in mice and guinea pigs show that serum collected from the patients at the beginning of their illness fails to neutralize the virus, while serum collected late in convalescence does inhibit its activity. In passing it should be noted that neutralizing antibodies appear very slowly in the sera of guinea pigs, monkeys and human beings convalescing from an infection with the virus.

Our virus is not similar to any active agent heretofore described, with the exception of those of Armstrong and Lillie[1] and Traub.[2] The former workers speak of the source of their virus in the following manner: "It is not apparent whether this virus came from the case C.G. or from one of the monkeys used in the transfer of virus from this case. In either event the virus was apparently in a latent state and was activated during successive transfers." Traub has clearly shown that he recovered his virus from stock mice. We are confident that our strains of the virus were obtained from the spinal fluids of two patients and that it is pathogenic for man. Through the cooperation of Dr. Armstrong and Dr. Traub it has been possible for us to show that the viruses recovered from the three sources mentioned above are either immunologically identical or at least very closely related.

Many filterable viruses naturally attack the central nervous system of man and lower animals, causing an encephalitis and can be recovered from the brain or spinal cord. So far no virus has been shown to produce a clean-cut picture of meningitis in man. The new agent with which we are working seems to be able to produce such a picture and to appear in appreciable amounts in the spinal fluids of affected individuals. Whether this virus produces only a picture of meningitis in man and how great a rôle it plays in diseases of the central nervous system remains to be determined.

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ON CYMAROSE

CYMAROSE is a methyl ether of a 2-desoxy hexomethylose (2-desoxymethylpentose) which occurs in the cardiac glycosides cymarin and periplocymarin. It was first obtained by Windaus and Hermanns[1] from cymarin. They noted that it gave no phenylosazone, but that it yielded acetic acid on oxidation with silver oxide and exhibited the color reactions of digitoxose. They therefore suggested that it may be a methyl ether of this desoxysugar. Attempts to demethylate it to digitoxose were unsuccessful and the position occupied by the methoxyl group as well as its precise configuration remained undetermined.

It is now possible definitely to allocate the methyl ether group at the third carbon atom of the desoxyhexose chain. When cymarose was oxidized with 50 per cent. nitric acid, a hydroxymethoxyglutaric acid

[1] C. Armstrong and R. D. Lillie, *Pub. Health Rep.*, 49: 1019, 1934.
[2] E. Traub, SCIENCE, 81: 298, 1935.
[1] A. Windaus and L. Hermanns, *Ber. chem. Ges.*, 48: 979, 1915.

was formed which was characterized by its di-N-methylamide. The latter melted at 138° and showed $[\alpha]_D^{24} = -55.3°$ ($c = 1.410$ in water).

$C_8H_{16}O_4N_2$:

Calculated.	C 47.04,	H 7.89,	OCH_3 15.19,	(N)CH_3 14.70
Found.	" 47.12,	" 7.42,	" 15.70,	" 13.41

It was also possible to isolate the lactone of this acid which melted at 150–152° and showed $[\alpha]_D^{24} = -1.2°$ ($c = 1.720$ in water).

$C_6H_8O_5$. Calculated.	C 45.00,	H 5.00,	OCH_3 19.37
Found.	" 45.15,	" 4.98,	" 19.22

On direct titration and saponification the alkali consumption corresponded to one carboxyl and one lactone group, respectively. From this it is obvious that in order that lactone formation may take place the hydroxyl group of this acid must be on a carbon atom adjacent to one of the carboxyl groups. This leaves only the β carbon atom as the position for the methoxyl group. Otherwise, the highly improbable assumption of the presence of a β lactone must be made. By reference to the cymarose molecule it follows from this that the methoxyl group is on the third carbon atom of the desoxyhexose.

Details of this work, together with the exact determination of the configuration of cymarose, will appear later.

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THE EFFECT OF PRACTICE UPON INTER-CORRELATIONS OF MOTOR SKILLS

EXPERIMENTS on the interrelations of speed[1] tests in fine motor skills have indicated quite consistently that these tests are either highly specific or at most related only within very narrow groups of movement patterns, *e.g.*, as in McCollom's tapping tests.[2] According to Seashore,[3] an intercorrelation of approximately +.25 would be a representative figure for such tests, but such results have been challenged, since learning curves have been involved, and testing may not have been done near enough to hypothetical physiological limits. The critical test is to train observers until they are making little improvement, comparing the intercorrelations between the various motor tests at the beginning and end of the practice period. If intercorrelations increase materially by the end of the practice period, it would favor the theory that a general factor or perhaps several large group factors are basic to more complex motor skills.

The Koerth Pursuit Rotor[4]—a test of simple eye-hand coordination in following with a stylus a target mounted on an insulating disk, which is revolved quite rapidly by a phonograph motor—and the Brown Spool Packer[4]—a test of eye-two-hand coordination in speed of packing spools into a tray—were selected as unlike performances. If, after practice, intercorrelations raised materially between these qualitatively very different skills, the evidence would strongly favor the theory of a general motor ability or large and overlapping group factors.

To test for a possible narrower group factor, this experiment included two tapping tests which are known to be unrelated in early trials, but which seem qualitatively enough alike to belong to a single "basic motor capacity" which might be determined by a hypothetical physiological limit of neuro-muscular arm speed. These two tests were McCollom's simple tapping of a telegraph key and the alternate tapping of two brass plates with a stylus, both for speed. If sheer physiological limits are the basic determiners of fine motor speeds, this should be shown by a raise in the intercorrelations of these two tests.

A lengthy preliminary study determined the respective learning curves and the number of trials necessary to reach approximate limits of improvement on each test. Practise periods were given by the rotating cycle method, so as to avoid fatigue. A single cycle consisted of: 5 trials of 20 revolutions each on the pursuit rotor; 3 trials of 5 seconds each on the telegraph key; 2 trials of 1½ minutes each on the Brown Spool Packer; 5 trials of 20 revolutions each on the pursuit rotor; 3 trials of 5 seconds each on alternate tapping. Three cycles per day were performed at the same hour on alternate days, so that a total of nine cycles, or about three hours of spaced practice, was had by each observer. Motor tests are usually interesting to men, and the citation of electrical counter scores after each trial added a distinct motivation to the performances.

Fifty male right-handed laboratory students acted as observers, none of them having had previous practise on these tests.

Correlations between scores on cycles 2 and 3 (first day) in each test were determined for reliabilities, and these were duplicated for cycles 8 and 9 (third day). Intercorrelations for the four tests were computed from the total of scores on cycles 2 and 3 (first day) and similarly from totals of cycles 8 and 9 (third day). Since the intercorrelations between the tests were determined from the sum of two cycles, while reliabilities were computed from the correlation

[1] The results of steadiness tests and large muscle athletic coordinations must be considered separately from *fine* motor *speed* coordinations; *cf.* Seashore and Adams, SCIENCE, 78: 2022, 285–287, September 29, 1933.

[2] I. N. McCollom, "Analysis of Factors Determining Individual Differences in Speed of Simple Repetitive Motion," unpublished thesis, University of Oregon Library.

[3] R. H. Seashore, *Jour. of Gen. Psychol.*, iii: 1, 38–66, 1930.

[4] R. H. Seashore, *Psychol. Monog.*, xxxix: 2, 51–66, 1928.