thyrotropic, adrenocorticotropic, or growth-promoting activities, indicating that at this high level the preparation was free of other pituitary hormones.

Reference

1. Li, C. H., Evans, H. M., and Simpson, M. E. *J. biol. Chem.*, 1945, **159**, 353.

Preliminary Report on the Circumpolar Distribution of *Neoechinorhynchus rutili* (Acanthocephala) in Fresh Water Fishes

Harley J. Van Cleave and James E. Lynch

Department of Zoology, University of Illinois, and Department of Fisheries, University of Washington

Early attempts on the part of American helminthologists to establish the identity of individuals of the acanthocephalan genus Neoechinorhynchus found in fishes of the Atlantic coast and species found in Europe have all been repudiated. For many years the writers have been accumulating evidences on the continuous dispersal of *Neoechinorhynchus rutili* in fresh water and migratory fishes throughout the circumpolar regions of Europe and North America. Previously unpublished observations, resulting from examinations of fishes of the northern states, the north Pacific area, Alaska and the arctic regions, furnish a chain of evidence on which broad geographical distribution is established. There is no confirmation of the possibility of this species' extending its distribution through the Atlantic fauna.

The most difficult obstacle encountered in the study has been the inadequate morphological description of *N. rutili*, which has been commonly regarded as a distinctively European species. Detailed studies have demonstrated the identity of specimens from Sweden, Finland, and central Europe, and those taken from Wisconsin, Washington, Alaska, and various regions in Canada, including materials from within the Arctic Circle of the Canadian Northwest Territories.

This constitutes the first authentic demonstration of the occurrence of the same species of an acanthocephalan in fresh water fishes of both Europe and North America. Inhabitants of brackish water and migratory fishes are included in the host list for both continents. There is no evidence to indicate that this widely dispersed species has developed any tendency toward the establishment of distinct varieties or subspecies in the various parts of its range or in its adaptation to a highly diversified list of definitive hosts.

A full morphological and taxonomic description of *N. rutili* is possible on the basis of the present study. This, together with a full account of the geographical and host distribution, will be presented in a full account of the investigation which is to be published elsewhere.

A Photographic Technique for the Detection of Presumptive Biochemical Mutants

Rosa Meyersburg, Seymour Pomper,[1] and Victor M. Cutter, Jr.

Osborn Botanical Laboratory, Yale University

A recent article by Wagner (*2*) describing the photographic recording of Petri plate cultures of microorganisms suggested the possibility of a similar technique for detecting biochemical mutants in colonial microorganisms. The layer plate detection technique of Lederberg and Tatum (*1*), as customarily used in this laboratory, involves the laborious hand-marking of individual wild type colonies to enable the later detection of mutant organisms. Cells or spores treated to induce mutation are plated on a minimal agar medium and the wild type colonies allowed to grow up. These colonies are marked by spotting a drop of India ink on the glass surface of the plate directly below the colonies. Thereupon a layer of agar, containing whatever supplements the investigator is interested in, is poured over the agar surface containing the treated cells. Cells requiring the supplements are thus enabled to grow up. The procedure is concluded by picking the unmarked colonies, which develop after the addition of the supplemented media, and testing them further to determine their mutant status. In crowded plates the individual spotting of colonies is very time-consuming and occasional colonies may be overlooked, or the indicator spots rubbed off in handling.

In the photographic method developed here, the treated cells are prepared and plated in the usual way. When the wild type colonies have grown up, the plate is placed upon a piece of high speed, high contrast photographic printing paper with the emulsion side of the paper in contact with the underside of the plate. The plate is momentarily uncovered and exposed to a strong light, and the exposed paper then developed in the usual manner for contact prints. With proper exposure a positive print is obtained in which the white colonies stand out against a dead black background, since the agar layer with colonies acts as a negative. The plate from which the print was made is layered with supplemented media. After an appropriate interval to allow growth of deficient cells the plate is superimposed on the print. The new colonies which grow up are readily detected by comparison with the colonies already visible on the photograph of the original layer, and these putative mutants are picked and tested further. Reference lines and markers to permit easy orientation of plate and print may be drawn on the lower surface of the plate with India ink before photographing. In practice we find Kodabromide F-4 and F-5 to be very satisfactory papers used in conjunction with the light from an enlarger. The exposure time under these conditions is less than 1 sec, and the entire develop-

[1] Standard Brands, Inc. fellow in microbiology.

ment time about 5 min. A number of plates may be exposed and developed simultaneously by using large sheets of paper.

The only necessary precautions are the use of an agar layering medium which does not contain granules of undissolved material which might be mistaken for microcolonies, and the selection of Petri plates with unscratched glass bottoms. Ordinary care should be taken to prevent contamination when the plates are uncovered for photographing. It is felt that this method possesses advantages over the usual marking procedure in saving time, increasing accuracy, and providing a permanent record of each plate.

References

1. LEDERBERG, J., and TATUM, E. L. *J. biol. Chem.*, 1946, **165(1)**, 381.
2. WAGNER, K. A. *Turtox News*, 1948, **26(1)**.

Sentential and Propositional Generalizations of Salivary Conditioning to Verbal Stimuli

Gregory Razran

Department of Psychology, Queens College, and The John Simon Guggenheim Memorial Foundation

While conditioned responses to single words have been established by a few investigators, no one, to the writer's knowledge, has studied the course of true conditioning to whole sentences, or propositions. In the present study, salivary CRs were formed in four adult human subjects to three short sentences—"Poverty is degrading," "Roosevelt will be elected," and "Socialism is desirable"—and the generalization of the conditioning to sentences, with reversed "subjects" and/or "predicates" and/or "copulas," was mapped out.[1] The writer's technique of salivary conditioning has been previously described (*1*). It consists essentially of measuring saliva by weighing increments in dental cotton rolls (Johnson and Johnson, No. 3, 0.5/15 in) inserted under the subjects' tongues for a short period of time, usually for 1 min. Since the cotton-in-the-mouth is by no means a totally inactive stimulus, periods of control salivation must be rotated with experimental periods; and, again, to prevent evaporation, scale-corrosion, and absorption, the rolls are weighed in small cellophane envelopes, and reweighed in the envelopes immediately after their removal from the subjects' mouths. Other characteristics of the technique are: (1) multiple intermittent 1-sec presentations of stimuli-to-be-conditioned, during single continuous eating periods of 2–4 min, so as to provide maximum attention for the stimuli and to make the entire task more "molar" and meaningful; (2) misinforming the subjects about the nature of the experiment, so as to forestall disrupting subjective attitudes; and (3) varying the food—small pretzels, tea, sandwiches, lollipops and peppermint candy—in the different eating periods of the experimental sessions, and scheduling the sessions in the late morning or afternoon, so as to insure adequate psychophysiological motivation.

[1] "Wealth is degrading," "Wealth is uplifting," "Poverty is uplifting," "Wealth is not degrading," "Poverty is not degrading," "Poverty is not uplifting," "Wealth is not uplifting"; "Dewey will be elected," "Dewey will be defeated," "Roosevelt will be defeated," "Dewey will not be elected," "Roosevelt will not be elected," "Roosevelt will not be defeated," "Dewey will not be defeated"; "Capitalism is desirable," "Capitalism is undesirable," "Socialism is undesirable," "Capitalism is not desirable," "Socialism is not desirable," "Socialism is not undesirable," "Capitalism is not undesirable."

TABLE 1

GENERALIZATION OF CONDITIONED SALIVATION TO SENTENCES: "POVERTY IS DEGRADING," "ROOSEVELT WILL BE ELECTED," AND "SOCIALISM IS DESIRABLE"*

Generalization sentences†	Logical formula	Percent of generalization	Mean of percent
We ⊕ Ul ; De ⊕ Df ; Ca ⊕ Ud	S′CP′ ○	59 ; 53 ; 63	58
We × Dg ; De × El ; Ca × Ds	S′C′P ○	49 ; 50 ; 58	52
Po × Ul ; Ro × Df ; So × Ud	SC′P′ ○	44 ; 41 ; 51	45
We ⊕ Dg ; De ⊕ El ; Ca ⊕ Ds	S′CP ●	38 ; 31 ; 39	36
Po × Dg ; Ro × El ; So × Ds	SC′P ●	37 ; 28 ; 34	33
Po ⊕ Ul ; Ro ⊕ Df ; So ⊕ Ud	SCP′ ●	33 ; 36 ; 30	33
We × Ul ; De × Df ; Ca × Ud	S′C′P′ ●	19 ; 28 ; 27	25

* Each entry in the third column is a mean of 64 measurements, 16 for each of the four subjects in the experiment.

† Abbreviations and symbols: We = wealth, Ul = uplifting, De = Dewey, Df = defeated, Ca = capitalism, Ud = undesirable, Dg = degrading, El = elected, Ds = desirable, Po = poverty, Ro = Roosevelt, So = socialism; ⊕ = *is* or *will be*, × = *is not* or *will not be*; S′ = reversed subject, P′ = reversed predicate, C′ = reversed copula; ○ = proposition affirmed, ● = proposition negated.

In this particular experiment, each of the three to-be-conditioned sentences was flashed 30 times, in random order, on a screen for 2 sec—with random intervals of 1 to 2 sec between flashes—during eating periods of 3 min. Ten such eating periods, with random rest periods of ½–1½ min between them, constituted an experimental training session; and after the first two training sessions, came eight training-testing sessions. Each training-testing session consisted of six 3-min eating periods, during which the three sentences were presented, and of six 16-min testing periods, during which the amount of conditioned salivation (1-min experimental minus 1-min control salivation in mg), to the conditioned and to the generalization sentences, was ascertained. Testing periods alternated with eating periods, and in each testing period the CRs of only one conditioned sentence and of its appertaining generalization sentences were determined, so that each sentence—conditioned as well as generalization—was tried twice in each experimental training-testing session and 16 times in the entire experiment. The four subjects were undergraduate college students, and they were divided into two equal subgroups, the procedures for the subgroups differing, however, only in the sequences of testing the CRs.

The results are presented in Table 1. They are given in percent of generalization, that is, the conditioned