and of gastropods are essentially concerned in creeping locomotion.

The Phylogeny of the Acorn Barnacles: Rudolf Ruedemann, State Museum, Albany, N. Y. The derivation of an *Eobalanus* from a *Rhinocaris*-like phyllopod is illustrated in a set of diagrams.

Possible Derivation of the Lepadid Barnacles from the Phyllopods: John M. Clarke, State Museum, Albany, N. Y. So far as present knowledge extends, the metamorphoses of the phyllopods into the two great branches of the barnacles were essentially contemporaneous.

Refractive Index and Solubilities of the Nitrates of Lead Isotopes: Theodore W. Richards and Walter C. Schumb, Wolcott Gibbs Memorial Laboratory, Harvard University. The difference in atomic weight of the lead (207.20 and 206.41) has no appreciable effect on the refractive index or on the molal solubility of the different samples of lead nitrate.

The Purification by Sublimation and the Analysis of Gallium Chloride: Theodore W. Richards, W. M. Craig and J. Sameshima. Wolcott Gibbs Memorial Laboratory, Harvard University. The method rests on the fact that gallium trichloride sublimes and distils at a low temperature, whereas the other chlorides likely to be associated with it are much less volatile.

The Purification of Gallium by Electrolysis, and the Compressibility and Density of Gallium: Theodore W. Richards and Sylvester Boyer, Wolcott Gibbs Memorial Laboratory, Harvard University. The method of separating gallium from indium by means of the different solubilities of the hydroxides in caustic alkali was tested without success; much more promising results were obtained by the electrolytic method. The compressibility of solid gallium was found to be 2.09×10^{-6}, and of liquid gallium 3.97×10^{-6}, nearly twice as great, although its volume is less. The density of the liquid was 6.081, and of the solid 5.885.

The Growth-rate of Samoan Coral Reefs: Alfred G. Mayor, Department of Marine Biology, Carnegie Institution of Washington. the growth rate of *Acropora, Porites, Pocillopra, Pavona, Psammocora* are given; and the weight of limestone added per year to the upper surface of the Aua reef-flat is estimated as 805,000 lbs. Other similar estimates are given.

The Distances of Six Planetary Nebulæ: Adriaan van Maanen, Mt. Wilson Solar Observatory, Carnegie Institution of Washington. The nebulæ N.G.C. 2392, 6720, 6804, 6905, 7008 and 7662 are examined. The parallaxes range from 0."002 to 0."021, and the diameters from 10,000 to 1,350 astronomical units.

National Research Council: Minutes of the Meeting of the Executive Board, July 9, August 13, September 9 and October 8.

We may summarize the articles in Volume 4 of the Proceedings as follows: Mathematics, 9; Astronomy, 11; Physics and Engineering, 25; Chemistry, 5; Geology and Paleontology, including Mineralogy and Petrology, 9; Botany, 3 (see also Genetics); Zoology, including General Biology, 12 (see also Genetics); Genetics, 6; Physiology and Pathology, 10; Anthropology and Psychology, 1; a total of 91 articles.

The division of these articles between members of the Academy and non-members is 39 and 52 respectively.

The list of institutions which have contributed three or more articles is as follows: Carnegie Institution, 15, divided as follows: Solar Observatory, 7, Nutrition Laboratory, 4, Geophysical Laboratory, 1, Marine Biology, 1, Station for Experimental Evolution, 1, Tortugas Laboratory, 1; Harvard University, 15; Brown University, 7; University of Illinois, 5; Bermuda Biological Station for Research, 4; University of California, 4; University of Chicago, 4; University of Pennsylvania, 4.

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SPECIAL ARTICLES

OPPORTUNITIES FOR CONTACT INFECTION[1]

AN outstanding feature of the influenza pandemic is the remarkable infectivity of the disease. There is scarcely a community in

[1] Published by permission of the Surgeon-General of the Army.

this country that has escaped its visitation. Once introduced it has spread from person to person with truly amazing speed. This is partially accounted for by the very short incubation period, from two or four days. This furnishes new foci of infection at a much more rapid rate than is the case with certain other infectious diseases which require from five to twenty days to develop. So much for the progress of the disease, once rooted in the individual, but just how the infection is passed about so widely is a matter that is less easy to explain. Are the causative organisms transmitted from person to person by contact, or are they mixed with dust from saliva-laden streets and scattered broadcast by the wind? The trend of modern thought is to regard contact or hand to mouth transmission as by far the more important. It is only at such times as we have just experienced that there is a tendency to question the adequacy of this method. Dust holds out certain allurements because of its ubiquity and there is just enough of the mysterious associated with air-borne infection to be in keeping with a disease about which we know so little. Lest we wander too far from the truths which modern public health experience has taught us the following inventory of opportunities for contact transmision of disease is offered.

The writer recorded his chances of acquiring infections for an entire day. This list undoubtedly is typical for the average city dweller.

For the purpose of emphasis the items are recorded in detail:

1. Touched bathroom doorknob.
2. Touched toilet seat.
3. Touched toilet flush handle.
4. Touched chain on light.
5. Touched faucet handle. (Washed hands.)
6. Touched bathroom doorknob.
7. Touched knob of outside door.
8. Received paper from newsboy.
9. Grasped handle of trolley car.
10. Received transfer from conductor. (Gloves on hands from this time till entering restaurant.)
11. Grasped back of chair in restaurant.
12. Touched tumbler with hand.
13. Touched tumbler with lips.
14. Touched teaspoon with hand.
15. Touched teaspoon with lips.
16. Touched plate with hand.
17. Touched second teaspoon with hand.
18. Touched second teaspoon with lips.
19. Touched coffee cup with hand.
20. Touched coffee cup with lips.
21. Touched cream pitcher with hand.
22. Touched cereal dish with hand.
23. Touched toast with hand.
24. Placed toast in mouth.
25. Touched shredded wheat with hand.
26. Placed shredded wheat in mouth.
27. Touched second piece of toast with hand.
28. Placed second piece of toast in mouth.
29. Used handkerchief to nose.
30. Handled napkin.
31. Wiped mouth with napkin.
32. Touched back of chair.
33. Received check.
34. Received change from cashier.
35. Opened door.
36. Closed door. (Put on gloves.)
37. Used handkerchief to nose.
38. Handled toilet room door at office.
39. Touched swinging doors on toilet.
40. Touched toilet seat.
41. Touched flush handle.
42. Touched swinging doors on toilet. (Washed hands.)
43. Touched toilet room door knob.
44. Used handkerchief to nose.
45. Shook hands with visitor.
46. Received paper from visitor.
47. Used handkerchief to nose.
48. Shook hands with visitor.
49. Shook hands with second visitor.
50. Opened toilet room door.
51. Pressed toilet flush with hand.
52. Turned water faucet. (Washed hands.)
53. Opened lunchroom door.
54, 55, 56. Received three dishes from attendant.
57. Handled chair.
58. Handled water tumbler.
59. Carried glass to lips.
60. Put spoon in mouth.
61. Put fork in mouth.
62. Opened post office door.
63. Licked postage stamp handed out by clerk.
64. Opened post office door.
65. Opened office door.
66. Placed hand on rail.
67. Opened office door.

68. Grasped handle on trolley car.
69. Opened door of bank.
70. Grasped pen used by public.
71. Received bills from cashier.
72. Opened bank door.
73. Opened toilet room door.
74. Closed swinging doors.
75. Touched flush handle.
76. Opened swinging doors.
77. Touched faucet. (Washed hands.)
78. Opened toilet room door.
79. Pressed handle on drinking fountain with hand.
80. Handled toilet room door.
81. Pressed toilet flush.
82. Turned faucet handle. (Washed hands.)
83. Opened toilet room door.
84. Received newspaper.
85. Received change from newsboy.
86. Grasped car handle.
87. Received change from conductor. (Put on gloves.)
88. Opened restaurant door.
89. Handled chair.
90, 91, 92, 93. Handled knife, fork, spoon, tumbler.
94, 95, 96. Touched spoon, fork and tumbler to mouth.
97. Handled water pitcher.
98. Touched napkin.
99. Wiped mouth with napkin.
100. Grasped chair.
101. Used handkerchief to nose.
102. Handled cake.
103. Put cake in mouth.
104. Grasped chair.
105. Opened door.
106. Used handkerchief to nose.
107. Used toothpick, bringing hand to mouth.
108. Opened door to house.
109. Received paper from friend.
110. Friend laughed boisterously within spray range.
111. Used handkerchief to nose.
112. Closed bathroom door.
113. Pressed toilet flush.
114. Turned faucet handle. (Washed hands.)
115. Opened bathroom door.
116, 117. Shook hands with two people.
118. Touched light chain.
119. Passed candy to mouth with hands.

The above list shows 119 possibilities during the course of a day for acquiring infected material either on the hands, mouth or nose. We may sum up these incidents as follows:

Touching hands to articles that were or might have been touched by others immediately before	87
Shaking hands	5
Carrying to mouth articles possibly infected by others	17
Hand brought in contact with mouth directly.	2
Hand brought in contact with nose indirectly through handkerchief	7
Chances of acquiring infection through laughing of others	1
Chances of acquiring infection through sneezing of others	0
Chances of acquiring infection through coughing of others	0
Chances of acquiring infection through kissing.	0

There were 92 opportunities for infecting the hands directly with other hands or with articles just handled by others. Mere infection of the hands is of course immaterial. It is the carrying of the infected hand to the mouth or nose, which constitutes the danger. In the present instance the hand was brought in contact with the mouth or nose, either directly or through food, or through handling a handkerchief 14 times, 7 times in the case of the mouth and 7 in the case of the nose. This represents the experience of one to whom keeping hands out of the mouth is second nature. But what of the person who is unconscious of the hand to mouth habit? There is no question but that the hand travels to the mouth more frequently with the average individual.

There were seven opportunities of infecting the nose with the hand through the medium of the handkerchief. The influence of weather and climate on infection is suggested here by the fact that the colder or more changeable the weather the more frequently does the nose require attention and the opportunities for infecting the nose from the hand increase in proportion.

In making up this record of articles touched by the hands, it should be emphasized that only those instances have been recorded which offered the possibility of infection through

recent handling of the article by others. Contact with papers, pencils, etc., handled remotely by others have not been included.

Another point that stands forth is that our hands are dangerous to others only in proportion to the frequency with which we infect them with our mouth and nose. The present experience shows seven hand-to-nose contacts and but two direct hand-to-mouth contacts. The handkerchief thus looms up as a factor of importance. Through it we may infect our hands from our nose, which is dangerous to others, and also infect our nose with our hands which is dangerous to ourselves.

Several lessons of practical value suggest themselves from the above related experience. They are:

I. That we should use handkerchiefs one side of which is conspicuously colored or marked so that we may always apply the hands to one side reserving the other side for the nose. This will protect our own nose from our hands and help to prevent the infection of our hands.

II. That we should abandon the universal practise of shaking hands, substituting some other less intimate method of salutation.

III. That we should encourage means which will lessen the opportunity for public restaurant employees to handle eating utensils.

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A PRELIMINARY NOTE ON A BACTERIAL DISEASE OF FOXTAIL

DURING the month of September and up until the middle of November, 1918, a striking disease on foxtail (*Setaria glauca* (L.) Beauv.) was noticeable around Fayetteville, Ark. The disease was rather widespread in this vicinity and it is quite probable that it is prevalent throughout the state of Arkansas at least. The disease manifests itself as dark brown spots and streaks, varying in size from small, oval or roundish spots, 1–2 mm. in diameter, to elongated streaks, 2–3 cm. in length. The attacked areas are to be found on leaves, flowering stalks and glumes. The pathogen, a white, rod-shaped bacterium was isolated and obtained in pure culture. It was inoculated on healthy leaves by using a sterile, platinum needle and smearing the organism on the leaf. Within three to four days inoculated spots showed the characteristic browning of the tissue. The organism was then reisolated and obtained in pure culture from the inoculated spots.

Both by spraying and by needle smears this organism was successfully inoculated on wheat, oats, rye, barley, corn and Sudan grass; it was reisolated and obtained in pure culture from each of the above-named hosts. Infections were also obtained on sorghum and millet but no reisolations have been obtained from these up to the time of writing.[1] Judging from the appearance of infected plants in the greenhouse all the cereals mentioned, except corn and the various grasses of the *Sorghum* group, are quite seriously attacked. The effect on oats is not unlike the halo blight recently described by Miss Elliott[2] and it is likely that the organisms under discussion is the same as Mann's[3] *Pseudomonas avenæ*. However, the identity of the organism is still in doubt and the work is being continued.

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THE AMERICAN METRIC ASSOCIATION

THE following is a summary of the proceedings of the second annual meeting of the American Metric Association (156 Fifth Avenue, New York City), held in Baltimore on December 27 and in Washington on December 28.

Mr. David A. Molitor, consulting engineer, outlined his work for the C. E. Schmidt Co., of Detroit, tanners. He found that about 500 different commodities were being purchased for the use of this company and that they were received in many different units of weight and measure. It became clear that economy would be effected by entering the weight or measure of all material received in

[1] Since this article was written the organism has also been reisolated from these hosts.

[2] Elliott, C., "Bacterial Oat Blight," *Phytopath.* 8: 489, 1918.

[3] Manns, T. F., "The Blade Blight of Oats," Ohio Agri. Exp. Sta. Bul. 210, 1909.