benefits in two or more successive years. For example, about 900,000 persons received one or more checks during the first year of the program in New York, in 1938. Of this group, 44% also received benefits in the second year; 24% received benefits in the third year; and 12% received benefits for four successive years. The tendency for about half the beneficiaries in any one year to receive unemployment benefits also in the following year has been observed throughout the period from 1938 to 1949.

Some other patterns may be mentioned: From the data on unemployment, it is possible to obtain the distribution of the persons claiming benefits by the number of periods of unemployment in each year. Taking the year 1939 as an example, there were over 900,000 persons who filed claims for benefits. About 55% of these persons had only one period of unemployment during this year, 25% had two, 10% had three, and 10% had four or more.

Intensive analysis of the information being produced as by-products of the social insurance programs and additional studies starting from the clues provided by these data will be necessary to test the stability of the patterns that are being revealed, as well as to discover the significant relationships that may be hidden in the data available thus far. Such studies may lead to the development of a comprehensive theory to coordinate and explain the observed regularities.

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Comments and Communications

On the Persistence of 2,4-D in Plant Tissue

In a recent issue of SCIENCE, Tullis and Davis (1950, **111**, 90) have interestingly reported characteristic symptoms of 2,4-D injury during the season of 1949 on developing shoots of Chinese tallow trees (*Stillingia sebifera* Michx.) that had been subjected to 2,4-D in 1948 but not in 1949. Further, they observed no injury during the season of 1949 on chinaberry trees (*Melia Azedarach* L.) that had been severely injured in 1948 by 2,4-D. They have interpreted these results to indicate the persistence of 2,4-D in tissues of the Chinese tallow tree from one growing season to the next, and the lack of persistence in the tissues of the chinaberry tree under similar conditions. The facts are of special interest because they contribute to an understanding of the mode of action of 2,4-D.

The appearance of 2,4-D injury in perennial plants the season following treatment is, however, not uncommon. Many instances are on record of orchards and vineyards treated during one season with formulations of 2,4-D for weed control or for the prevention of premature abscission of fruit, which developed anomalous leaves, flowers, and fruits the following season (Bryant, L. R., Vincent, C. L., and Schafer, E. G. [*Proc. Amer. Soc. Hort. Sci.*, 1947, **49**, 63]; Harley, C. P., Moon, H. H., and Regeimbal, L. O. [*Proc. Amer. Soc. Hort. Sci.*, 1947, **50**, 38]; Marsh, R. S., and Taylor, C. F. [*Proc. Amer. Soc. Hort. Sci.*, 1947, **49**, 59]; Moon, H. H., Regeimbal, L. O., and Harley, D. P. [*Proc. Amer. Soc. Hort. Sci.*, 1948, **48**, 81]; and Teske, A. H., and Overholser, E. L. [*Virginia Fruit*, 1947, **35**, 15]). The responses are variously described as delayed foliation, malformed and stunted leaves, fruits with oblong shape and open core, double fruits, and fruits with only rudimentary seeds.

Also, an experience has been reported by Tukey and Hamner (*Proc. Amer. Soc. Hort. Sci.*, 1949, **49**, 95) in a mixed planting of sweet and sour cherry trees (*Prunus avium* L. and *P. cerasus* L.), which was sprayed the fall of 1946 with a mixture of naphthalene acetic acid and 2,4-D. The following season many leaves were dwarfish, narrow, and sharply serrate; both pits and fruits were markedly elongate and pointed; receptacles were much enlarged; strong vascular development occurred in both fruit and pedicel; flesh was strongly adherent to the pit; and chemical composition of the fruit was altered. However, repeated applications of various growth regulators to cherry trees by Tukey (unpublished data) in the spring and midsummer produced no such visible effects the following season.

The facts suggest that there are critical or sensitive periods in the growth of the cherry, and that applications of growth regulators made in the fall may produce a striking effect upon carpel development, which may in turn be reflected in the developing fruit the following season. Applications made at other times may, however, fail to produce a response, because critical parts may be already formed, not yet formed, or in a state of physiological insensitivity or inactivity.

Studies by D. P. Watson (*Amer. J. Bot.*, 1948, **35**, 543) on modification of bean leaves as a result of treatment with 2,4-D bear on this point. They show delayed expression of the effect of growth regulators, associated with the stage of development of a leaf at the time the treatment is made. Watson concludes: "Frequently, plants that exhibit what appears to be delayed injury have received leaf injury during the formation of buds which did not expand until some time later."

Similarly, Arthur J. Eames (*Amer. J. Bot.*, 1949, **36**, 571), working with nut grass (*Cyperus rotundus* L.)

has concluded: "The opinion that in many plants the stimulus of various growth-regulating substances continues for various periods of time is probably based on (1) the continuing activity of the abnormal meristems; and/or (2) the development, long after treatment, of dormant buds injured (while growing) before dormancy. New tissues and organs formed after treatment are not affected."

Taken all together, the present information suggests that distinctions must be made between (*a*) persistence of 2,4-D in plant tissues, and (*b*) delay in visible expression of effects of 2,4-D.

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Concept of Complementarities

In the interest of accuracy and fairness, the following remarks aim to correct erroneous impressions given by the historical introduction to the interesting paper of A. M. Schechtman and T. Nishihara in SCIENCE, April 7, 1950.

Four years prior to the publication of the paper of Breinl and Haurowitz (1930), I had advanced the concept of antibodies as units complementary to their antigens in addresses before the American Chemical Society and elsewhere. In these talks a coin was used to illustrate the antigen surface, and a piece of tin foil pressed against it formed the specific reverse pattern, illustrating the specific antibody. I pointed out that the top surface of the foil, away from the coin, formed a duplicate of the coin surface, illustrating reproduction at the molecular or near-molecular level of structure. Since some years of public and private discussion developed no objection or alternative view of antibody formation, I sent a paper to an American scientific journal briefly outlining the view. After some consideration, the paper was rejected. It was then sent to another American journal, whose editor, to justify his refusal to publish it, showed me the letter of a prominent "referee," who wrote "there are an infinite number of similar speculations possible." The paper, entitled "Some Intracellular Aspects of Life and Disease," was finally sent to *Protoplasma*, which published it (1931, **14**, 296), with illustrations much like those of Schechtman and Nishihara, except that the latter include the later, more detailed concepts of Linus Pauling.

My *Protoplasma* paper was reviewed in an editorial by Stephen Miall in *Chemistry and Industry* (London, 1932), in which he used the apt engineering term "template" (or templet) to describe the function of the antigen. This term, as well as the coin-foil analogy mentioned above, has become common usage.

Furthermore, "the possibility of applying concept of complementariness to the more general problem of specificity in biological synthesis" had been suggested long before the references quoted by Schechtman and Nishihara; e.g., in a paper by J. Alexander and C. B. Bridges on "Some Physico-chemical Concepts of Life, Mutation, and Evolution" in Vol. II of *Colloid Chemistry* (1928), where still earlier views of Leonard Troland on catalysis are in part reprinted (see also Alexander and Bridges, *Science*, 1929, **70**, 508). Much of the earlier work, with its bearing on embryonic differentiation, is given in *Life, Its Nature and Origin* (1948), by J. Alexander.

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Mr. Alexander's comments on the origin of the idea of complementariness as applied to antigen-antibody relationships will be of interest to persons concerned with the evolution of this line of thought. Our paper (*Science*, 1950, **111**, 357) is not, nor was it meant to be, a comprehensive review; the introductory statement concerning the literature was condensed and presented as a minimal background necessary for the exposition of the experiments described. Nevertheless, several recent review papers by Haurowitz, Pauling, and Tyler (references 4, 10, and 12, respectively) were selected for mention to provide more extensive guides to the literature than was possible in the paper. The references provided by Mr. Alexander will doubtless be a welcome addition for future reviewers who may wish to decide whether the essentials of the idea of molecular complementariness as applied to biological synthesis are rightly attributed to Breinl and Haurowitz.

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Our Flat Planet

Nearly 25 years ago, in Spokane, Washington, a highly reputable and very opinionated local businessman issued a defiant challenge to the entire region in which he lived. His local reputation, he felt, had been endangered by several public arguments in which he stoutly and steadfastly maintained, against all opposition and contradictory to much evidence, that the earth was flat. His challenge to the community was climaxed by an ultimatum published in the forum columns of the leading local newspaper, the *Spokesman-Review*. In effect, his ultimatum told his critics to either "prove they were right or shut up." To back his arguments, he announced in the column that he was placing $1,000 on deposit in the Old National Bank of Spokane and would pay it to any person who could prove that the earth was round.

As long as his mind had to be convinced that the earth was round, his $1,000 remained entirely safe, and the money remained on deposit in the bank for a number of years. Then he triumphantly announced, again in the forum column of the same newspaper, that—having given everyone a chance to submit proof that the earth was round and everyone having failed—he felt deeply grateful that he had been able to prove so conclusively to the entire world that the earth was flat.

Fortunately, not many were affected by his reasoning. The only bad feature about this incident lies in the fact that he is a strong religious leader. Some of the children