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thanks are also due to Miss T. Clay, who identified *T. crassiuspis*.

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¹ Steiner, I. F., Arnold, C. H., and Summerland, S. A., *J. Econ. Ent.*, **37**, 156 (1944). Schneider, F., *Schweiz. Z. Obst. u. Weinb.*, **54**, 143 (1945). Lord, F. T., *Canad. Ent.*, **81**, 202 (1949).
² Salt, G., and Hollick, F. S. J., *Ann. App. Biol.*, **31**, 52 (1944).

Effects of DDT and BHC on Soil Arthropods

UNDESIRABLE changes in the composition of animal communities after applications of insecticides have become increasingly common phenomena since the widespread use of the more persistent chlorinated hydrocarbons¹. With the view of throwing further light on this problem, the insecticidal treatment of soil was considered to be a convenient experimental technique, as special attention could be paid to the effects of the insecticides on the dominant soil arthropods, namely, Collembola and Acari.

Replicated plots were treated with (1) 2 oz. per sq. yd. of 2 per cent DDT (75-80 per cent *p,p'* isomer); (2) 2 oz. per sq. yd. of 2 per cent BHC (13 per cent γ isomer); and (3) a combination of these. The insecticides were incorporated to a depth of 9 in., and after treatment the plots were resown with perennial rye grass (*L. perenne*). Samples were taken periodically to a depth of 6 in. and the arthropods extracted with an apparatus similar to that described by Salt and Hollick².

The census of total Collembola taken seven months after treatment is of special interest. Treatment totals and the standard error of their differences (all expressed as a percentage of the control population) were:

DDT	BHC	DDT plus BHC	0	S.E.*
118	76.1	106	100	6.38

* 9 d.f.; $t = 2.26$, $p = 0.05$; $t = 3.25$, $p = 0.01$

A significant increase and a significant decrease in the population of Collembola occurred in the plots treated with DDT and BHC, respectively. The population of the plots receiving both insecticides, however, did not differ significantly from that of the control, but was significantly higher than the population of the plots receiving BHC alone.

In previous investigations, phenomena of this kind have been explained on the basis of predator-prey interaction, and it is probable that the latter may provide an explanation for the results of the present investigation. On the other hand, the results may be wholly or partly explained by the reduction of competition for a common food supply. More conclusive evidence on these points is being sought, and it is hoped to publish a detailed account of the investigation in the near future.

It was also noted that in two of the plots treated with DDT the dominant species included *Tullbergia crassiuspis* Gisin, a species hitherto unrecorded for Britain.

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Investigation of Nuclear Motion by Electron Diffraction

It has long been known that the amplitude of nuclear vibrations in free molecules could be studied by electron diffraction if sufficiently accurate intensity measurements were made. Several years ago, Karle and Karle¹ developed the first successful experimental procedure for investigating nuclear motion. Since that time results for a number of molecules have been obtained, both by the Karles and by this laboratory. It is hoped that such information will prove useful in studies of potential fields of molecules, and will also serve to help in the interpretation of diffraction patterns of more complicated molecules with similar interatomic linkages.

In a recent communication in *Nature*, Schomaker and Glauber² discussed for the first time the effect of the variation with scattering angle of the phase shift of electron waves scattered by atoms. In particular, they showed that conventional procedures which neglect phase shift on scattering in the interpretation of electron diffraction data may incorrectly deduce an unsymmetrical structure for a symmetrical gas molecule containing a heavy atom.

We should like to point out that atomic phase shifts must be taken into consideration in the calculation of vibrational amplitudes also, even for light atoms. No values in the literature are corrected for this source of error. According to Schomaker and Glauber, the effect upon the molecular intensity is a factor of the form $\cos s\delta$, where $s\delta = |\eta_i(\vartheta) - \eta_j(\vartheta)|$, the phase difference introduced by the scattering processes at the atoms i and j .

We note that, if the atoms are light, that is, if δ is small, Fourier analysis of the molecular diffraction terms for non-rigid molecules including the phase shift factor,

$$|f_i(\vartheta)| |f_j(\vartheta)| \cos s\delta \int_0^{\infty} P_{ij}(r) \frac{\sin sr}{sr} dr,$$

will lead to an apparent distribution function of the form $\exp\{- (r-r_0)^2 / 2(\bar{l}_{ij}^2 + \delta^2)\}$ for the separation of nuclei i and j , rather than the true $P_{ij}(r)$ of the form $\exp\{- (r-r_0)^2 / 2\bar{l}_{ij}^2\}$. The real vibrational amplitude $(\bar{l}_{ij}^2)^{1/2}$ can be obtained from the apparent amplitude $(\bar{l}_{ij}^2 + \delta^2)^{1/2}$ if δ is known. Schomaker and Glauber considered the case for $s\delta$ larger than $\pi/2$, in which the apparent distribution splits into two peaks separated by 2δ .

The atomic pairs treated by Schomaker and Glauber each contain a fairly heavy atom, and for these pairs δ is approximately equal to $1.8 \times 10^{-3} \Delta Z_{ij}$ for 40-kV. electrons. A rough calculation for argon at this laboratory indicates that the formula $\eta(\vartheta)/s \sim 2 \times 10^{-3} Z$ also holds for lighter atoms. If only small