

We might further expect that the crystallographic symmetry would be determined in a similar way by the magnetic forces due to the electrons in each atomic kernel. These electrons are drawn by mutual magnetic forces into a *space-pattern*, characteristic for each molecule, and the symmetry of this pattern is reflected in the crystalline symmetry. Thus the rigidity of the crystalline medium in different directions and the orientations of the planes of cleavage are defined in terms of the local magnetic forces (*cf. Science Progress*, No. 56, March, 1920, p. 588; *Phil. Trans. Roy. Soc.*, vol. ccxx., A, p. 247, 1920, particularly conclusion xii., p. 289; vol. ccxv., A, p. 79, 1915; vol. ccxiv., A, p. 109, 1914). The close connection between the department of crystals in a magnetic field and the disposition of the planes of cleavage, as observed by Tyndall, may then be explained.

Possibly each of the electron orbits shown in the above diagram may be identified with the ring-electron of A. L. Parson (Smithsonian Miscellaneous Collections, vol. lxx., p. 1, 1915). The conception of the hydrogen molecule and the line of argument leading up to it, as indicated by the above papers, are, however, quite distinct from those described by Parson.

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The British Cotton Industry Research Association, 108 Deansgate, Manchester, May 1.

Wasps.

If glory be known to insects; if solid glory be measured among them, as among us, by the difficulties surmounted, the female wasp is a heroine to whom the queen bee is in no way comparable.—RÉAUMUR.

HAVING spent some time in observing wasps during the past eight years, a few notes descriptive of the results may possibly have an interest at this season when the queen wasps are searching for suitable positions in which to found new colonies. The queens usually appear in the third or fourth week of April, and about a fortnight later than the humble bees. They spend a few days in feeding, and then fly about grassy banks and hedgerows, looking for a mouse's hole or some fissure or opening in the ground likely to prove desirable habitations. They are very fastidious in making a selection. I have specially constructed places for them, but hundreds of queens have declined the invitation. In twenty-seven cases, however, the queens took up residence, and the average date was May 6. The young wasps begin to show themselves in twenty-nine or thirty days, and then a few days later the queen remains at home. During the month elapsing before the small working wasps appear the queen works hard, and performs about 1136 completed journeys to procure material for constructing cells and obtaining food for herself and young. The number given is the mean derived from eight nests.

When a queen finds herself a proper site in which to build, it by no means follows that she will succeed in rearing a colony. Only one in three have overcome the difficulties (*i.e.* nine out of twenty-seven) in my garden, for trouble was occasioned by marauding intruders such as ants, earwigs, beetles, woodlice, etc. Besides, every man's hand is turned against the wasp, and numbers of queens are destroyed every spring before the embryo nests have developed.

As to the number of wasps composing a nest, this varies greatly. The strength is pretty fairly indicated by the number flying to and fro, and I have generally kept a record of the horary rate. In regard to three strong nests, the following were the figures on different dates, a wasp flying out being counted as one, and one going in as one, so that completed journeys would be half the figures given:

Date	Two nests in 1915 per hour	One strong nest in 1918 per hour
June 25	150	742
July 5	350	1,750
15	670	4,800
25	1,250	7,230
Aug. 4	2,560	8,400
14	3,900	11,150
24	5,200	12,060
Sept. 3	6,800	15,780
13	4,500	6,860
23	2,150	3,030
Oct. 3	1,250	1,620
13	650	280
23	250	very few

In September, 1918, I recorded an abnormal rainfall of 10.47 in., and this occasioned the virtual swamping of the nest I kept under observation in that year.

With regard to young queens, they begin to leave the nests at different times. In 1913 I noticed them first on August 21, in 1916 on August 19, and in 1918 on September 22. Two nests not at all abundant yielded in one case 990 queens and drones, and in the other 1400. A strong nest in 1915 yielded in all 1118 queens and 995 drones. There were ten tiers of cells in another nest, and six of the largest measured 10x8 in. These included 12,900 cells at least, and if each cell produced three generations this means an aggregate of nearly 40,000 wasps.

The most prevalent species of wasp in this locality is *Vespa germanica*, in the proportion of 3 to 1 of other varieties. Of twenty-seven nests, I had 1 *V. rufa*, 7 *V. vulgaris*, and 19 *V. germanica*. The latest colony I have seen in great activity was on November 5.

Wasps kill an enormous number of flies of all kinds. I found that the members of a moderately small nest of *V. germanica* in 1913 brought home at least two thousand flies per day. A very strong nest would account for twelve times as many. Man often misapprehends the benefits derived from certain forms of animate Nature. Birds are destroyed and noxious insects enabled to multiply. Efforts are ever being made to exterminate the wasp, and hordes of pestiferous flies naturally become the bane of our summers.

In spite of the popular belief, wasps are not nearly so bad-tempered and dangerous as they are supposed to be. If not obstructed or attacked they are quiet and harmless enough, and may be watched with entertainment. They are most industrious. Sir John Lubbock (later the first Lord Avebury) said: "I have been much struck by the industry of wasps"; and "On the whole, wasps seem to be more clever in finding their way than bees." Mr. T. A. Preston in the Phenological Report for 1887 (*Royal Met. Soc. Journal*, vol. xiv., p. 56), speaking of the wasp, stated: "It seems far superior in intelligence to the bee."

W. F. DENNING.

Dr. J. G. Bartholomew and the Layer System of Contour Colouring.

To prevent misapprehension, it would have been better if, in the sixteenth line of the obituary notice which appears on p. 238 of NATURE for April 22, the word "introduced," used by Dr. Bartholomew himself in "Who's Who," had been employed instead of "devised." Dr. Bartholomew made no claim to be the originator of the idea of indicating differences of altitude by differences of colour, but he was the first to apply this method to topographical maps.

GEO. G. CHISHOLM.