OBSERVATIONS ON

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By

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INTRODUCTION

Baghdad, situated as it is in the central part of Iraq, is as representative a place for such insects as ants as may be found in the country. Though by far the largest city, with a population exceeding 800,000 people, many parts preserve natural conditions surprisingly well and in addition the cultivated vegetation, including the date palm, creates in effect a large oasis. Consequently the ants described below represent a sampling of the ant fauna of the Tigris and Euphrates plain.

There has been no published study of the ants of Baghdad and this is hardly surprising in view of the general scarcity of insect studies in the Middle East. The present observations are highly fragmentary because of lack of time and facilities but indicate something of the opportunities any student of insects or other small animals has in this fascinating part of the world.

INSECTS AND ANCIENT CIVILIZATIONS

In Iraq, home of ancient civilizations, there has been an association between man and insects for a sufficiently long time so that the relations have become relatively stabilized. In other parts of the world where man is a comparatively newcomer, insects are often in the process of acquiring relations with man and his works. Examples would be the spread of the Colorado potato beetle in the United States in the past 80 years and in Europe within the last 10 years or the spread of the Japanese beetle in the last 30 years in the United States. In northern Alaska the common house fly has not yet arrived, but will probably be established with the advent of houses heated throughout the winter.

In Iraq, however, there have been villages for thousands of years, which in terms of insect generations is a long time. Erbil, in northern Iraq, is supposed to have existed for some 5100 years and there are many somewhat younger examples dotting the open plains. All represent oases from several points of view.

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Firstly, the villages constitute artificial hills. The houses consist of mud or clay bricks which gradually disintegrate. The next generation of houses is built upon the earlier houses so that the base level of the inhabited houses gradually rises. These hills introduce more favorable situations for insects than the sometimes flooded or water-logged surrounding plain. This human activity on a large scale suggests what termites in the tropics such as Africa do on a small scale-laboriously bring in surrounding soil (or soil from below) to create a large nest whose size depends on the age of a colony or numbers of individuals (the numbers themselves being largely dependent on the age of the colony). Both activities create a greater variety of ecological niches for other animals and plants so that they are centers of life in their regions. As a further imitation of a natural hill, the scattered bricks and other objects lying on the hill simulate natural rocks; moisture rises underneath them so that they enable more kinds of insects to live under them.

Secondly, there is a continual bringing in of water and food together with a constant casting out of wastes with a net effect of enriching the soil. The greater variety of plants thus developing feeds a greater variety of animals. The water itself when in irrigation ditches makes possible aquatic insects where they would otherwise never be.

While Baghdad is a comparatively youthful city as Iraq cities go, dating from 762 A.D., the older parts show the characteristics described above and are distinctly higher than the new parts of the city.

These man-made hills have doubtless made it possible for ants to be much more widely distributed than they would otherwise be and the actual numbers are doubtless also greater. The relationship therefore has been favorable for the ants which would otherwise be more sparsely distributed and confined to relatively few natural ridges or well vegetated sites. On the whole the relationship has also been favorable for humans since the ants prey so extensively on other insects, some of which are harmful. The most harmful effect has been the activities of the harvesting ants in gathering grain which would otherwise be consumed by humans or domesticated animals. This is particularly true of the large, shiny black harvester (Messor barbarus). The ant most commonly associated with the date palm, so important to the people of the country, is probably Camponotus xerxes which
is large and climbs trees readily. Since it is mostly nocturnal, its relationships with the palms will need to be investigated at night.

**NATURE OF THE FAUNA**

As described below, there are some dozen species of ants which are "domesticated" in the sense that they thrive in Baghdad. Of these, the common black harvester (*Messor barbarus*), the much smaller reddish-brown harvester with large-headed soldiers (*Pheidole*), the largest of the Baghdad ants (*Camponotus xerxes*), the large, spindly ant running over the hottest places with abdomen up-ended (*Cataglyphis bicolor*) and the small, black ant travelling in files (*Tapinoma nigerrimum*) appear to be the commonest. All of these are probably of general distribution in the villages and cities of Iraq south of the mountains and have probably been associated with man as long as he has been here.

In comparison, there are some dozen common tropicopolitan ants, ants distributed by commerce to all warm parts of the world, and curiously enough not one of these seems common in Baghdad. The extreme heat and aridity of the long summer probably prevents these tropicopolitan species thriving since they require moderate to high humidity. An additional factor is the coolness of the brick and tile houses in the winter. Given completely heated houses, certain of these ants may exist in such a sub-Arctic winter climate as that of North Dakota, U.S.A.

The observed ants are arranged below according to the following systematic list:

- **Dorylinae-Dorylus** (*Typhlopone*) *fulvus* Westwood - the army ant
- **Ponerinae-Ponera** (*punctatissima ?*) the moisture-loving soil ant
- **Myrmicinae-Messor barbarus** semirufa André - the large black harvester
  - *Pheidole* - the small red brown harvester
  - *Monomorium (Xeromyrmex) salomonis phaenicia* Emery - the medium black ant
  - *Monomorium (floricola ?)* - the minute, dark and shiny ant
  - *Monomorium (Holcomyrmex) evansi Donisthorpe* - the small black ant

—5—
Myrmicinae-Crematogaster-the triangular ant
   - Cardiocondyla nuda mauritianica-the inconspicuous ant
   - Tetramorium-the small soil ant
   - Trichoscapa membranifera Emery-the hidden ant

Dolichoderinae-Tapinoma nigerrimum Nylander-the black file ant

Formicinae-Acantholepis frauenfeldi Mayr-the tree ant
   - Plagiolepis pygmoea Latreille-the minute ant
   - Nylanderia jaegerskoeldi Mayr-the small black ant with long hairs
   - Cataglyphis albicans lutea-the small, yellow ant of hot places
   - Cataglyphis bicolor orientalis-the large, spidery ant of hot places
   - Camponotus (Tanaemyrmex) thoracica xerxes Forel-the big ant living under trees.

The following notes are arranged by species, following the above list, and were made October 1950 through February 1951 so that they include observations during typical fall and winter months. Since the month of October included many days in the 90°F's Fahrenheit it may well be considered late summer.

**Dorylus (Typhlophone) fulvus Westwood**

Dorylus is the typical genus of the subfamily Dorylineae, comprising the famous army ants of tropical America and the equally famous driver ants of Africa. The ants in these places travel in armies of hundreds of thousands and are one of the great scourges of the forests and veldt. They both bite and sting and are a formidable menace to any animal not able to flee. In Asia, however, they are much less conspicuous though widely distributed in the more tropical areas of India, the Phillipines, and such regions. The first record in Baghdad was brought in by a college student January 10. A centipede of twenty-two segments and a length of eight centimeters had attached to the posterior segment ventrally an ant of this species. The centipede had probably been active in some heated building and been attacked by the ants, thus bringing it to the attention of the student. These ants habitually attack small insects, lizards, and other small animals and in Baghdad should be considered
useful in driving out roaches and other pests. The second record consists of dead ants found January 28 at the entrance to several nests of *Tapinoma nigerrimum*. The ants had invaded the nests of the *Tapinoma* to rob them of brood but had suffered casualties as well. The species is probably generally nocturnal and perhaps subterranean. Some species in the tropics spend their entire lives following tunnels under ground and are completely blind.

**Ponera (punctatissima Roger?)**

One of the most widely distributed genera of ants is *Ponera*, which is however more common in the tropics than in the north. The United States has a common species in nearly every state as does Europe. The Baghdad species may be derived from a common species to the north. The ants generally live in the soil or in rotted wood and are not found in dry situations. They are slow-moving and dull colored so are not usually seen by the layman.

A dealate female, dark brown in color and with large eyes, was taken November 20 under a brick in a wet place beside an irrigation ditch in the shade of a hedge. Workers, paler in color and with tiny eyes, were taken throughout the winter (Nov. 13, 15, Dec. 4 etc.) in damp soil. A common site was under decomposing vegetation at the base of a brick wall. This species here is rarely if ever to be seen in exposed areas and lives only under cover of soil or objects resting on the soil.

**Messor barbarus semirufa André (Figures 1—2)**

*Messor* is the famous harvesting ant familiar in the folklore of the entire Middle East, where it is probably the most familiar of all ants. It is shiny and black, of medium size, and has moderate polymorphism, that is, having within the same colony workers of varying sizes. The largest ones, the maxima caste, do not have a strikingly large head. This is the species to which most of the proverbs and tales regarding the industriousness of ants refer. During most of the year the ants are constantly to be seen bringing in seeds or pieces of plants to the nest.

Like *Pogonomyrmex* in the towns of the Western United States, its congener in the Middle East is similarly adapted to civilized conditions. It may be found nesting in any plot of vacant land or on the edges of cultivated areas. The ants scavenge for anything edible in plant products and somehow secure enough food, including seeds and weeds, to maintain colonies. Arid conditions offer no hazard since they nest deeply in the soil where they are sure to obtain moisture.
During the heat of October the ants were active chiefly in the early morning and late afternoon. During December, however, they reversed their period of activity and during the coldest part of January were active above the ground only during the middle of the day.

The winged males and females appear after the first rains. They were first seen December 3, following a rain of 36.4 mm, the night of November 30—December 1 which was followed by an additional 2.1 mm the following 24 hours. The temperature December 3 reached a maximum of 69° F. and the preceding night a minimum of about 45° F. was attained. The rain was the first, other than sprinkles several times in October-November, for six months or so.

The colony from which the winged forms came was first seen at 3 p.m., at which time the city relative humidity was 69% but at this site was higher (57° F. wet bulb, 59° F. dry with a sling psychrometer). The afternoon was partly cloudy and the winged forms appeared only when sun shone on the nest openings.

The nest was at the edge of a shaded dirt road with gardens at either side. Soil from an irrigation ditch had been heaped up, as is usual, to form a ridge and the ants occupied the summit. They formed various crater entrances extending over an area of about 70 cm. in diameter. On the opposite side of the ditch bordering a garden the ants also had craters on a low, bare mound. These craters were about 3.5 m. away from the first series and at a slightly lower level. This lower site was swarming with workers but was in the shade and no alates or winged forms were to be seen. One of the smallest workers walked about without its gaster or abdomen. From 3 to 3:40 p.m. only three males appeared but at least fifty females. One of the females took flight through the shrubbery for about 2 meters where it alighted on a leaf about 60 cm. above the ground, rested a few seconds here, then took a fluttery flight into the sun to a height of about 4 meters where it was captured by a white-checked bulbul (Pycnonotus leucotis). Other females took fluttery flights, often tumbling to the ground. When clouds obscured the nest opening the females took cover.

December 5 at 3:45 p.m. there were no alates but several alate females were seen on a small flat rock in the midst of the craters. At the lower series of craters there was much seething activity, many workers carrying one another at all angles.

December 8 at 4:10 p.m. none was above the nest at a temperature of 59° F.; under the flat rock were sluggish workers.
The craters which on December 5 had extended over a diameter of 70 cm. were not occupied except in the middle of the area. At the lower level there were many more workers over a series of craters extending about 90 cm. in diameter; the ants had been active, creating a fresh symmetrical crater and several additional holes. The relative humidity was high at the site (52° F. wet bulb, 53° F. dry bulb, sling psychrometer, 4:30 p.m.).

December 17-The ants were not active at 11:15 a.m. at a ground temperature of 55° F. and none was under the flat rock. At the lower series of craters a very few were out in the sun.

December 21 at 2 p.m. one winged female and a number of workers were under the flat rock, the air temperature here in the shade being 65° F.

December 25 at 3:45 p.m. a male was under the same rock and a few workers above ground, the shade air temperature being 64° F. At the lower series of craters a very few workers were out. This series was isolated from the higher series by flowing water in the irrigation ditch.

January 13 The ants were sluggish at 4:40 p.m. with a ground temperature of 60° F. The early morning temperature had been 40° F. A very few ants were out.

January 14 There were no ants about the nest at 3:15 p.m. though a few sluggish ones were under the half-embedded flat rock. The poplar trees (Populus euphratica) which had been shading the site up to January had lost their leaves, which largely covered the nest. It was partly in the shade of the common hedge plant, Nerium oleander, locally called "Difla". Although the lower crater series was in the sun, few ants were out and these were sluggish. The early morning temperature had been 39° F.

January 21 the ants were active at a sunny crater at 10:30 a.m. but were not active at 9:45 a.m. at fresh craters also in the open sun. A half-mile away January 21 a male was taken feebly alive in an unused swimming pool. February 19 at 2 p.m. the ants were excavating during light sprinkles of a showery day.

January 28 Between 1:45 and 3:00 p.m. no ants were out at either site although both were mostly exposed to the sun. The temperature under the flat rock, where there were no ants in the chambers, was 54° F. The early morning temperature was 34° F. and the maximum during the day 60° F.
Messor harvests the year around although because of their reduced activity in the winter comparatively little must be brought in. January 28 on open flats they were harvesting seeds of Nerium oleander despite a breeze which sometimes rolled the ants over with their big fluffy burdens.

The site, which was such a beehive of activity on December 3, appeared abandoned by the end of the winter. On March 9 there were no signs of the ants on top of the ridge though on the lower level was a single fresh crater of large size (24x32 cm.) with an entrance 10 mm. in diameter. At 9 am, there were no workers at either place. Three or more meters away were additional craters which undoubtedly were part of the same colony. Under the flat rock where winged forms appeared in December, the rock now having sunken so only the top was exposed, was a number of workers of all sizes. The usual chambers were here under the rock and the temperature in them was 59° F. The ants were slowly active and no winged forms were present. The surface temperature nearby was 66° F.

PHEIDOLE (Figures 3—4)

The common Pheidole of Baghdad has a completely striate head in the soldier, both soldier and worker caste being small and brown in color. They appear larger than P. megacephala which is found throughout the warm parts of the world and has been carried by commerce to the most isolated islands, where it tends to drive out some of the endemic ants. The Baghdad ants appear to have similar habits.

A colony occupied much of the lower floor of our house during the winter to the exclusion of other ants here. Generally during the year they evidently would live in chambers in the surrounding soil but during the cool month of January they were active chiefly around or in the house, which would be warmer and drier from the sun or from fireplace. During January they were active all night inside the house over the warm tiles in front of the fireplace, where they gathered particles of nuts and other food. As they moved over the heated tiles, their rate of movement speeded up markedly, and they would then be as active as in the summer.

Several rains in January caused the ground to become very damp and this reduced their activity in the garden, which terminated following complete flooding after a heavy rain February 5 so that the only places available to the ants were the terraces.
on part of the south and west sides of the house itself. The west-facing terrace had a front against the brick wall of the house of 7.5 meters and in the exposed angle formed by the terrace and wall (Figure 3) the ants moved in file, often like the army ants or driver ants of the American and African tropics. As seen below, they not only traversed this 7.5 meters but also portions of the walks at either end at right angles and facing south, (Figure 4). Individual ants thus traversed 12 or more meters. Numerous craters were made in the brick walls and workers going back and forth between them proved that this was one widespread and polydomous colony. They penetrated the wall of the house and foraged inside over an area of more than 50 square meters and possibly more nearly 100. The constant interchange of workers between craters indicated they nested over an area some 16 meters long and about \( \frac{1}{2} \) meter wide so that 8 square meters would be a conservative estimate of the polydomous nest surface area. Based on counts of other ant colonies elsewhere, 10,000 workers and soldiers would be a conservative estimate of the colony population which might more nearly be 25,000. There are doubtless several queens in a colony of such size.

Observations were made intermittently throughout the winter on the colony as follows:

February 9-Cool (54° F. max.) but warm in sheltered places in sun, such as on S and W sides of house. The flooded yard reduced the area available to the colony. The craters had been washed away by rain and the ants were using the interstices between bricks to come outside. Quite possibly they had moved the colony to drier chambers in the house. Considerable activity on the south side, the ants scurrying over the wet ground and on the bricks, gathering insects or seeking other food. There was one soldier to an estimated one or two score workers. On the west side the ants were dragging a large crushed beetle. Again the proportion of soldiers to workers was about one to two score. The ants dragged the carcass the entire length of the west terrace and around to the middle of the south side, a distance of some 12 meters. An occasional soldier joined the procession.

February 12-This colony has maintained constant patrol of the fireplace tiles for a month, since a wood fire has been maintained. They gather particles of pistachios, almonds, walnuts and other food and are active day and night.

February 13-The ants were forming a long double file from inside the house to the west terrace and along the wall to the
corner, thence along the south wall to a crater entrance on the outside of the fireplace, a distance of 11.3 meters. They were dragging fragments of orthopods (sow bugs, the common house cricket and other insects) as well as pieces of bread. Five workers on one piece dragged it steadily to the crater, travelling 37 cm. in one minute, to 70 cm. the second minute, to 91 cm. in a third minute. The last lap was slower because the path was dirtier. Another piece of food was dragged by one worker, with a second often participating, a distance of 29 cm. in one minute. About twelve workers dragging a piece of grasshopper travelled 26 cm. in one minute, 35 cm. in a second minute, 24 cm. in a third minute and 25 cm. in a fourth minute. One worker travelling along a path alone made 69 cm. in a minute with numerous pauses to touch antennae with workers going in the opposite direction, and also paused briefly to explore a hole. A second worker travelling most of the distance without meeting more than a few oncoming workers made 80 cm. in a minute. In all cases the temperature of the tile over which the ants walked was 66°F. and the time 5:30-5:38 p.m. The ants were so busily engaged in bringing food in file that they greatly resembled the South American and African army or driver ants. Occasional soldiers were travelling also both away from the crater and towards it. The proportion of soldiers to workers varied greatly from about one to a score to one soldier to about three score workers. Their activity was accelerated by the warm terrace which received the entire afternoon sun.

They had evidently been active within the house during the night since at 6:45 am. in front of the fireplace, the room being darkened by curtains, they were busily foraging for bits of food. There was one soldier to 22 workers at one instant. They were here active past 10 p.m. the night before.

February 18—7:25 am. Ants slowly active along the outside of the west and south walls, travelling in file on the tiles where the temperature was 55°F.

A worker travelled 29 cm. in one minute and to 68 cm. in the second minute.

Another worker travelled 36 cm. in one minute, then to 59 cm. in the second minute but back to 55 cm. by the end of the second minute.

A third ant travelled 24 cm. in the first minute where it explored a crevice for some seconds.

A fourth ant travelled 22 cm. in one minute.
February 19—7 am. The ants again were slowly active along the same walls despite squally weather with showers during the night and at present. Temperature mild (56 ° F. minimum).

February 22-6:45 am. Denser files along the same walls than for some days with more than the usual soldiers present. In one instance there were 10 workers between 2 soldiers in the file, followed by 52 workers before the next soldier was encountered, then by 50 workers to the fourth soldier.

February 25-7:15 am. Photograph (Figure 3) shows 5 crater nests at the angle between the outside south and west walls where there was a screen door. The position of the nests is marked by 3x5 inch cards. The total front of these craters was 1:8 meters. South of the door 3.5 m. along the west front of the terrace was another crater. This west front has a length of 7.5 m; part of the distance travelled by the ants in going from some of the nests to the south side of the house.

February 27 at 6:30 — 7 am. the ants were slowly active at the house craters, but not at the damp soil craters where the temperature was 52° F. The temperature just within a soil crater against the south wall was 56° F. at 7 am. and in another farther removed from this wall it was 52° F. the former site having been warmed somewhat by the sun of the previous day. The air temperature was now 48° F., having been 46° earlier. At 6:30 p.m., the air temperature being 57° F., the ants were slowly crawling along the west wall and at craters here an ant crawled 20 cm. in one minute, with pauses at several points and a second ant crawled 32 cm. in the same time, also with pauses. A third ant crawled 9 cm. in half a minute and 4 cm. in the second half, pausing to explore. On the south side of the house were two raised flower beds 2.9 x 0.5 meters in area with the chimney area between (Figure 4). In the soil at the outer brick wall of one garden were 11 craters and in the other garden, now filled with luxuriant vegetation, were many others. The ants at this time in February were now transferring their activity from the house to the surrounding soil. The garden, which had been flooded since February 6, was now free from water but still muddy except at the margin of the house and walks.

By March 15 this south side was a beehive of activity as shown in the photograph (Figure 4) and the ants were neglecting the house. Over 50 craters were here present, the site of them being marked by 3 x 5 inch cards. At 4 p.m. this south side was in bright sunlight and relatively few ants were out. At the largest
crater of fine soil, over 3 inches high, no ants were out since the surface temperature was over 120° F. (limit of thermometer).

On March 8 the house was sprayed with an oil emulsion of DDT and none of the ants was noticed inside for several weeks. Their activity was transferred to the now drying soil. On April 1 at 9 p.m. however, they were back at the fireplace for the first time since the spraying, actively scavenging over dead ashes for particles of nuts. There were between one and two hundred workers at a time, with a few soldiers.

During the summer warmth of April they returned actively and continuously to the house, becoming a pest in the kitchen where they gathered bread, sugar and a great variety of other foods. They also extended their activities throughout the house, including the soil-covered roof. At the same time the colony was active in the surrounding soil where it preyed mostly on other insects.

**Monomorium (Xeromyrmex) salomonis phaenicia Emery**

This ant, which is smooth, small and black, is one of the common house ants of the city and one of the commonest ants of the fields and lots. It is dull colored compared with the much larger harvester, *Messor barbarus*, and of about the size as the somewhat darker *Tapinoma nigrum*. The latter is easily distinguished by its pungent odor when crushed between the finger while the *Monomorium* lacks any appreciable odor. All three occur in the same places in waste areas.

The *Monomorium* appears to be a general scavenger and comes into the houses from crater nests in soil nearby. It was found to be active on hot, dry and dusty ground in October as well as on cool and damp ground is January. It has typical ant habits, forming a small, circular crater of fine soil grains carried up from below in excavating small chambers.

As a house ant it may wander up to the second floor and in November regularly scavenged over a second floor balcony where crumbs of food were occasionally found.

December 5 the workers were tending the common green aphids on *Nerium oleander*, the aphids giving off much sticky excretion on the leaves, which also attracted flies.

January 14, a day when the minimum was 34° F. and the maximum 60° F., the ants were slowly active at 3:15 p.m., having in one place multiple craters of fine soil grains.
Like non-desert ants, this species is not bothered by light rain and February 19 at 2 p.m. they were excavating during light sprinkles of a showery day.

Monomorium (flor'cola ?)

A tiny, dark brown and shiny species of Monomorium appears under a hand lens to be similar to the tropicopolitan flor'cola. The latter is well known in the tropics for invading houses and is a minor pest. The present species, which may be the same, apparently lived in the same house as the Pheidole described above throughout the winter, but did not become evident until April. By April 17 those tiny ants were replacing the Pheidole at mid-day on the hot west terrace which received the full effect of the sun. At 2 p.m. the ants were scurrying quickly over the hot tiles at a temperature of 121° F. and up the brick wall, where they formed minute holes in the mortar. This temperature was far too high for the Pheidole, who did not now appear. The next day at the same place at 3:15 p.m. the ants were again active occasionally on the tiles which had a temperature of 121° F. while 60 cm. away in the shade, but over the same tiled terrace, the Pheidole were scurrying actively about. The temperature here was 104° F. That the Monomorium is a warm weather species is also indicated by finding them absent here in the 9 a.m. shade April 20 at a tile temperature of 74° F. while the Pheidole were active at the same site at the same time. By 11:30 a.m. the Monomorium had begun to appear on the brick wall, still in the shade where the temperature had now risen to 81°, and occasionally scurried over the tile of the terrace, now beginning to receive the sun, at a temperature of 106°, as did Pheidole in both places. By 2:30 p.m., however, the tile temperature had risen to 114° F. which was too hot for the Pheidole but not the Monomorium, the latter scurrying quickly over the adjacent tiles from the brick wall. The Pheidole had a nest entrance in the very corner of the terrace which was barely shaded and at a temperature of 102° F. From this entrance the ants quickly ran out to shaded areas so that their critical temperature appeared to be between 105° and 114° F.

Monomorium, yellow

A tiny yellow species that may be a thief ant like Solenopsis molesta Say in North America, which it much resembles in size and color. The latter ant is so small as to form its nest chambers in the walls within the nests of larger ants and prey upon the
brood or food of them. The Monomorium is probably similarly predatory or carnivorous, feeding on small insects. It appears to live largely or entirely underground (hypogeic) as its paleness indicates.

The ants were found in a cultivated field, living in lumps of clay, October 20 and were not seen later in the season.

Monomorium evansi Donisthorpe (Figure 5)

Described from Amara, Iraq and not recorded elsewhere, this species has been found to be one of the harvesting ants of Baghdad. The ants are shinier and more stoutly built than the far commoner Monomorium phoenicia and darker, being a definite black, rather than dark brown or ferruginous. The ants have three sharp teeth on each mandible. They are such smaller than the common harvester Messor, and not polymorphic.

They were first found at riding stables on the edge of the city November 18, 1950. The horses were fed barley and the ants were gathering fragments of this and smaller seeds which had spilled on the ground in the shade. A favorite seed was flat and gray. The whole barley grains were too large for the ants to drag but they had no difficulty with smaller weed seeds and fragments of plant stems. The minimum temperature the night before had been 49° F. with a maximum the day before of 77° F. The present temperature at the time (late afternoon) was lower in the 70°'s and under these conditions the Messor, also found at the stables, were not active in the shade here. The ants were travelling in a file, gathering the seeds from the spilled area and taking them to the base of the stable wall some 3.5 meters distant. They had the usual crater entrance to nest chambers in the soil.

Apparently these ants cease their general activity above ground during cooler weather since they were not seen January 28 at a temperature in the shade at the stable site of 55° F. at 2 p.m. A few were, however, active on the opposite and sunny west side of the stables at the same time when the soil surface temperature here was 84° F. to 88° F., fluctuating with a cool breeze.

Crematogaster

One of the most abundant ants the world over is Crematogaster, which is strikingly characterized by having a shiny, triangular or heart-shaped gaster (abdomen). This is sometimes held over the thorax to give it the common name of “parasol ant”. Many of
of the species live in trees, some of which build large nests of
-carton like those of wasps and containing many thousands of
worker.

The Baghdad species is small and inconspicuous. It does not
appear to be at all common and is not the species *sordidula*, found
in Turkey. A nest was taken October 20 in an old garden in
-nearly dry clumps of mud and consisted of irregular chambers.
The ants were not noticed during the winter but reappeared in
April.

**Cardiocondyla nuda mauritanica**

Though world-wide in distribution in the warmer places, the
ants of this genus are not often seen in most countries. They are
small, crawl slowly on short legs and inconspicuously colored.

Workers were first seen October 23 crawling in the warm
-sun over concrete at the margin of a swimming pool, and at the
same place January 21, and on other occasions. They appear
to be general scavengers and may be found in the company of
*Pheidole* and *Tapinoma*. Though primarily a tropical group, they
did maintain limited activity in Baghdad in sunny places
throughout the winter.

After the passing of the winter and the rise in the temperature
-of the surfaces over which they crawled, their normal speed
greatly increased. By April 15 they had become as fast as most
-of the other small ants with which they associated, such as
*Tapinoma nigerrimum*, and, instead of crawling close to the
ground as they did during the winter, they rose upon their legs.
Since the legs were moderately short this habit was not striking
as in the long legged *Cataglyphis*.

**Tetramorium**

Ants of the genus *Tetramorium* are among the most numerous
ants in Eurasia and Africa. What appears under a hand lens to
-be workers of a small and ferruginous species of this genus or
*Leptothorax* were taken October 23 on the concrete walk around
-a swimming pool. These ants were inconspicuous during the
winter but by April 15 were again in evidence on concrete walks
-and on the nearby soil, where they formed crater entrances to the
-nest. In size and general appearance they resembled the common
*Pheidole* but were more compact in habitus (general appearance).
Trichoscapa membranifera Emery

(Strumigenys "Cephaloxys" simillima Emery)

Dacetine ants, of which this genus is a common and worldwide type, are usually associated with moist habitats and especially tropical rain forests. The ants are generally one or two millimeters in length and dull colored. They become motionless at the least disturbance so that this habit, combined with their small size and color, make them particularly hard to find. Their discovery in Baghdad was most unexpected and this area must be one of the driest in which they are found.

The ants were taken at the base of a brick wall in clay under a trash pile of wet weeds on December 4. It is quite probable that their period of activity in Baghdad is either confined to the winter months, when moisture is adequate, or the immediate vicinity of canals or other wet places in the summer. At the particular site where they were taken in December, they probably dig down deeply in the soil in the summer and are not to be found at the surface. They are carnivorous, feeding on other minute animals like Collembola, and could feed regularly underground by following tunnels or holes inhabited by such animals.

Soil from exactly the same site was carefully examined for these ants later in December, January and February and from similar sites elsewhere without success, which indicates their general scarcity.

Tapinoma nigerrimum Nylander

A small and inconspicuous black ant is Tapinoma nigerrimum, which is nevertheless widely-distributed and common in Baghdad. Attention may be drawn to them by their habit of forming slowly moving files over the bare earth. The ants have the anterior clypeal margin deeply excised and the mandibles have at least seven acute teeth. While small for Baghdad ants the species is fairly large for the genus and represents in this part of the world T. sessile. Say of North America in general habits though it is much larger. A ready means for identifying them is to crush one between the fingers and smell it. A pungent odor suggesting rancid coconuts is a feature of Tapinoma and no other ant in Baghdad has anything similar.
Like their North American relative, this species is tolerant of the cold and retains much activity throughout the winter. It was not observed in houses, how ever, but is active in open and sunny sites. The nest is in the form of small, irregular chambers in the soil, surmounted by a crater of fine grains, much finer grains than those excavated by *Messor* or *Camponotus*.

December 8 at 4:25 p.m. the ants were active in numbers at an air temperature of 59° F. in the shade. A trail of workers connected two series of craters some seven meters apart, where at each site the ants were excavating down cracks in the drying soil.

December 25 at 3:45 p.m., the air temperature being 55° F., no ants were outside their shaded nests.

January 14, a day when the maximum was 60° and the minimum 39° F., the ants were slowly active. January 21 at 10:30-11 a.m. the ants were active in the sun over concrete walks and were travelling in continuous files to and from their nest. Most of the ants going to the nest were carrying insects or parts of them. One carried a pale, dead leafhopper, others aphids and in one case a tiny black male fly. They walked with antennae widespread and body held close to the ground. The latter position kept them from being blown away by a slight breeze. These ants in file showed a considerable degree of polymorphism unusual in this genus, the range in worker size being comparatively great.

January 24, the morning minimum temperature having been 32° F., the ants were slowly active in the sun against the west wall of stables, the air temperature then being about 48°. They were not active at a nearby series of craters which were in the shade but fresh soil grains showed that they had been active when the sun shone on the nest.

January 28, the morning minimum temperature having been 34° F., the ants were again slowly active at the same time and place over dry, sunny soil which had temperatures of 84-88°, fluctuating with a cool breeze. The air shade temperature was 60°. The ants burrowed in the mud-coated brick walls and had several entrances. At several entrances were clusters of dead *Dorylus fulvus* ants, predatory species which had been preying on this and other species (q.v.). That the *Tapinoma* were by no means helpless under the attacks was shown by the dead *Dorylus* now being brought up from deeper chambers. The *Tapinoma* were travelling above the ground singly or in files.
February 19 at 2 p.m. the ants were excavating during light sprinkles of a showery day.

Females without wings were seen during April, beginning April 1, as they crawled singly over the ground and winged females and males were taken by mid April. April 19 was gusty with high humidity and males and females were taken in copula on bare ground. During the remainder of the month males were occasionally to be seen clinging closely to plant stems close to the ground or crawling rapidly over the ground.

**Acantholepis frauenfeldi Mayr**

Among the common tree ants of Africa and Asia are those of the genus *Acantholepis*. The species are small and inconspicuous unless they make files up and down the tree trunks. They are ordinary looking except for irregularities on the rear of the thorax and an often spinose node. The present species, *frauenfeldi*, is probably seldom noted in Baghdad but must be widely distributed.

Workers were seen October 25 in attendance in aphids on tender young leaves of the common hedge plant, oleander (*Nerium oleander L*.), locally called "difla". While commonly associated with plants, the species here forms crater nests in the soil and the ants swarm over the ground and up the vegetation much like the tropicopolitan *Paratrechina longicornis*. Like the latter, they move rapidly when temperatures are warm. In mid-winter, January 14, large numbers were swarming over the ground, partly in the sun, partly in recent shade, when the temperature was approximately 56° F., the early morning minimum having been 39°. The ants were climbing small plants of camel thorn or algoul (*Alhagi maurorum Med.*).

**Plagiolepis pygmaea** Latreille

One of the two tiniest ants in Baghdad is *Plagiolepis pygmaea*, the other being the yellow *Monomorium*. The latter is hypogean, living underground, while the *Plagiolepis* is terrestrial, running over the soil and climbing vegetation. Because of its small size and pale, nondescript color it is exceedingly inconspicuous and will probably be found to be more common in Baghdad when specifically looked for. It also has an evasive habit, when disturbed, of running to the opposite side of a twig or leaf so as to be difficult to both see and catch.
Several workers were taken November 20 attending common green aphids on young leaves of "difla", *Nerium oleander*. The ants were taken up to heights of a meter or more on the shrubs and probably nested in the soil. On the same shrub December 4 an alert and evasive worker was seen at 3:30 p.m. in the bright sun.

They appeared to be scarce during the winter though capable of limited activity. On April 25, however, for the first time they were seen in numbers. At the margin of a reedy old canal many were seen crawling over the ground, some forming a thin file, in the company of *Tapinoma nigerimum*. They appeared to be nesting in the soil.

*Nylanderia jaegerskoeldi* Mayr

Ants of the genus *Nylanderia* are generally inconspicuous, and of small size. The present species is no exception and appears to be *jaegerskoeldi* though having the occiput impressed. Ants of this genus have a few long, sparse hairs sticking up at all angles from the body.

A type of migration of a related species witnessed by the author in Panama and in Trinidad, British West Indies, was also witnessed November 4 in Baghdad. The ants were carrying their larvae and pupae from the base of a date palm to the earth brick wall of a stable six meters distant, and were accompanied by a myrmecophilous cricket as in the other two localities. The temperature was warm (85° F.) and the afternoon sun (3:45—4:15 p.m.) bright. The original nest site was in soil now being cultivated shallowly but this did not appear to be the reason for moving. In the other two cases the colonies appeared to be excessively parasitized. The new site was on the opposite side from a nest of *Monomorium evansi* and the stables presented optimum nesting conditions for both. The ants could readily escape water-logged soil by moving up between the bricks.

The ants were most inconspicuous during the winter. That they maintain some activity is shown by finding on January 28 dead workers at the stable site which had been killed in battle with *Dorylus fulvus*.

**Cataglyphis**

A characteristic genus of ants of the Old World steppes and deserts is *Cataglyphis*. They are beautifully adapted to arid regions in body form and in habits. In distribution they are the warm temperate and tropical equivalents of the holarctic.
Formica which they much resemble. The ants are slender, with long, spindly legs on which they run with great rapidity. When first encountered at midday on the desert at Port Sudan on the Red Sea the workers were taken to be flying insects, hovering over the hot sand. They were, however, the wingless workers running like shadows, with body held high on their legs. Another adaptation to running over hot surfaces is the habit the Baghdad species show of holding the abdomen vertically when running, thus keeping as much as possible of the viscera away from the soil. When the ants are chilled they do not show this habit.

Two species have been found in Baghdad, one small and yellow, the other big and dark brown.

**Cataglyphis bicolor orientalis Forel**

This big and dark brown *Cataglyphis* is one of the common Baghdad ants but is less tolerant of the cool weather than other species so it is not conspicuous during the winter. It inhabits the same open sites as *Messor*, forming irregular crater entrances to the nest. The entrances are the largest of those of Baghdad ants, except *Camponotus*, being sometimes one or two centimeters in diameter. The ants are highly polymorphic with large maxima and smaller sizes down to the minima, which appear generally to remain within the nest. Like the African *Oecophylla*, the American tropical *Atta* and other ants, the minima workers have the function of caring for the brood while the maxima forage for food. The nest itself consists of irregular chambers in the soil, the ants probably living in deep chambers during the dry and hot periods.

October 10 they were the most conspicuous ant in the south loop of the Tigris River when the ground was exceedingly dry and dusty. They were aggressive and moved rapidly. At one nest entrance they were carrying out the empty cocoons of the maxima and at another site they were carrying their larvae. Some maxima were carrying the seeds of *Prosop's. stephaniana* and castor beans.

By December 2, following rain November 30-December 1, winged females were appearing, a day earlier than females of *Messor barbarus* nearby. The females were seen wandering out from the nest entrances or in the chambers 3:51—45 p.m. The rain had only wetted the slight mound in which the nest was for a depth of a few centimeters (about 6—10) so that it probably was the damp conditions of the surface of the soil which brought them out. This is true also in North America and elsewhere
the reason being that these females, after their marriage flight, can settle on the damp soil and dig a tunnel into soil of this type better than in shifting, dry soil. Then, when they lay eggs and these start developing, the brood runs less risk of drying out or dessicating.

This nest was also the home of many small, active guests or myrmecophiles of the Order Thysanura which had short legs and shield-shaped bodies so that they scurried over the ground without exposing any vulnerable parts for an ant to grasp. They looked like tiny, flattened, dark gray oval discs as they ran rapidly between the soil grains when the chambers containing them were exposed. They also ran freely in the tunnels and it is probable that they are mostly scavengers since they were most numerous in the chambers containing the remains of dead ants, or carcasses of ants’ prey, their habit being largely insectivorous. These chambers were large, being about 3 x 1 cm. Such chambers are also common in the northern Formica. A second myrmecophile, looking like a centipede with a pair of forceps-like terminal appendages, was also present and may have been more predatory, feeding on the ants or their brood.

There is a considerable range in size in this species and in this nest the smallest size was only seen when the chambers were exposed. The ants had been bringing out many empty cocoons, probably of the females. The ants carried one another about, grasping the other ant at different angles but the one being carried always curled up its legs, thus offering less impediment to being carried.

None was out on December 8, 4-4:30 p.m. at a temperature of 59° F. though one of the myrmecomphilos Thysanura, such as was earlier found, was taken while scurrying over the damp ground one meter distant. December 25 at 4 p.m. there was none out at a nest site in the shade, the air temperature being 64° F.

By January 14, the height of the winter, with a minimum of 39° F. and a maximum of 60°, the ants were not active above the ground during the warmer part of the day around 3 p.m. They were, however, found nearby under a small flat rock, half-embedded in the open soil, but were sluggish and easy to capture. When aroused they still erected their abdomens vertically. Workers of all sizes were in tunnels just below the soil surface. On January 28, the minimum in the morning being 34° F. and the maximum again 60° they also were not active above ground and there was no sign of recent activity at either site. Underneath
the rock again the ants were sluggishly milling about when the rock was lifted and the temperature here at 2:30 p.m. was 60°. Under a rock of similar dimensions covering *Messor barbarus* nest chambers, but more shaded, the temperature was 54° at 1:45 p.m. so that the *Cataglyphis* were occupying a distinctly more open, hence warmer, site. Sheltered and dryer soil surfaces temperatures on the west side of a mud wall nearby were still higher (84°-88 F.), fluctuating with a cool breeze.

January 21 at 9:45 am. there was no activity at a nest site in an area of brick work fully exposed to the sun, and at other morning hours during January, while by early March at the same hours there was much activity.

By February 16, at Babylon with warming conditions, the ants were becoming active during the day, and by February 22 the ants were to be found running over warm surfaces. On February 23, however, on the open, stony desert about 19 miles west of Baghdad, the ants were not out in the morning though they had recently been active as shown by the crater soil grains. The air temperature at 10:30 am. was 70° F. but one inch above the desert surface of clay and gravel it was 80°. The temperatures in the ant nest were distinctly lower (61° at a depth of 4 cm. and 59° at 10 cm.) and at these temperatures the ants were too sluggish, to emerge.

The winter had passed by March 9 but at 9 am on this day there were many workers under the rock described above on January 14. At this time many workers of all sizes were going in and out the nest entrance at the side of the rock, the dryish soil having a temperature of 74° F: They did not erect their abdomens until they were disturbed. The ants were moderately active but much less so than on a hot day. As they came out of the cooler nest chambers they held their abdomens horizontally although the entrance was sufficiently large so that its small diameter was not the reason. The air temperature was 69° F. The ants had brought up from their chambers below much refuse and scurrying among the refuse and soil forming the crater were numerous myrmecophiles like the small gray one described above on December 2 but smaller in size and more numerous. These were outside the nest entrance at this time instead of being confined to the chambers. Under the rock there were more and also a different type, a cricket type, small in size but with the hind femora greatly enlarged and flattened.

By March 16 they were actively engaged in excavating their
nests and at 9:40 am. at one site in a polygonal open area of
brickwork they were numerous. A large number of the maxima
castes was out. This was the site where in January at the same
time none was to be found.

During early April these ants extended their activity over the
roadways to areas where they were not seen in the winter. By
April 17 they were invading the west terrace of the house described
above under *Pheidole* and running over the hot tiles at tempera-
tures of 115-120° F. They had never been seen here in the winter
or early spring. Similarly on April 13 they were seen actively
running about at the lower series of *Messor barbarus* craters, which
had often been examined during the winter without any time
seeing *Cataglyphis* here.

April 25 the largest nests ever seen were discovered in the
northern part of the city on a flat, open area near huts. Externally
the nests were indicated by two thin craters of scattered soil,
each having a diameter of slightly over two meters and less than
two meters apart. The two, however, were part of the same
colony since workers went back and forth between the craters.
Mostly maxima workers were out at about 1 p.m. of an overcast
day.

This species has a habit like that observed in the African
*Ocymyrmex*, an ant of similar spidery form. They excavate or
scatter the soil by using their front legs as a dog would, and throw
the soil backwards underneath the body, which is held high on
their other legs.

**Cataglyphis albicans lutea Emery**

A small yellow species lives in Baghdad but is much less
commonly seen than the above larger and darker species. It has a
similar habit of running with abdomen erect when disturbed and
also forms irregular nests in the soil with a crater entrance above.
The ants are probably somewhat more nocturnal.

They are not so “domesticated” and appear to live only in
the less disturbed areas and then only out in the open soil. Here
they live in exactly the same habitat as the larger species and in
one place nests of the two species were separated by a distance of
25 meters. The characteristic plant in this area was “agoul”
(*Alhagi maurorum* Med.), or camel thorn, and the yellow ants lived
at the base of one of these plants.

December 3 the ants were slightly active in rebuilding their
nest entrance after rain December 1 and reacted to a disturbance by erecting the abdomen as they ran. No alates were in evidence as they were the day before at a nest of the large species nearby. By the height of the winter, January 14, they were not in evidence, the early morning temperature having been 39° F. and the maximum 60° F. and this was equally true of January 28 with a 34° minimum and maximum 60°. By February 16 at Babylon under warmer conditions, the ants were out but much less numerous and less active than the larger species. At Abu Ghraib near Baghdad the ants were taken on February 22, the winter conditions definitely passing.

Camponotus (Tanaemyrmex) thoracica xerxes Forel
(Figures 6—7)

This, the largest ant in Baghdad, resembles Messor somewhat in reversing its activity during the season, being active at night during warm weather and during the day during the winter. It is, however, more generally nocturnal so that it is much less commonly seen despite its size. The large, blackheaded soldiers may occasionally wander out in the day during the fall, as do scattered workers of much smaller size. It is a house ant to some extent in Baghdad though probably not usually a pest.

These ants are closely related to Camponotus maculatus of the American tropics which has versatile nesting habits, nesting in the drawers of deserted cabinets, in abandoned crockery, in cacao husks or any place offering shelter, though usually nesting in rotted wood like most Camponotus everywhere. Camponotus xerxes in Baghdad appears usually to nest in soil, forming craters of something like 15—30 cm. in diameter. The entrance to the nest is a hole in the middle of the crater which is larger than that of any other Baghdad ant except the large Cataglyphis.

A winged female was taken on November 20, earliest of this caste to be seen here.

December 3, in the afternoon, the ants were excavating at one nest at the base of a date palm and at another site at the base of a Populus euphratica tree. Rain December 1 had wetted down the area and caused cessation of general activity above ground. A worker carried to one of the nests what appeared to be a fragment of bird feces and another carried unrecognizable material. The ants nested deeply in the soil. December 4 at
3 p.m. ants of another colony were busily engaged, with other species, in excavating under a polygonal area of bricks about 6.5 meters in diameter. Though the bricks were fully exposed the site was excellent for the ants in affording protection from excessive heating, drouth and flooding at all times of the year. A number of soldiers was out at this time. December 5 at 3-4 p.m. the *Populus* colony was again busily at work excavating in the soil.

December 8 at 4-4:30 p.m. at a temperature of 59° F., few were out and these sluggish. They were however, slowly excavating and two were bringing in an Orthopterous carcass. December 25 at 3:45 p.m. after a brief shower during the night, a few ants were moving sluggishly on a crater, the air temperature being 64° F.

By the height of the winter, January 14, at 3-4 p.m. a few minima workers were out at the *Populus* and date palm craters during a day when the maximum temperature was 60° F. and the minimum 39° F. There was little activity, however. January 28, with a maximum again of 60° F. but a minimum of 34° F. there were no ants out at 1:45-3 p.m. at a crater in the sun though several media workers were seen wandering at a *Messor* site and another site.

In February, with rising temperatures, the ants appeared to be becoming more nocturnal in habit. At Babylon on February 16, for example, there were numerous craters 25-40 cm. in diameter under the date palms and in the ancient ruins with very few ants out at midday. The fresh soil showed that they had been busily excavating the night before. These ants were now the most abundant ants in the ruins with *Monomorium* next and *Cataglyphis* and *Messor barbarus* less active.

With the passage of winter the ants resumed much activity and by March 9 a considerable area with scattered date palms was dotted with new craters (Figures 6—7). These suggested the multiple craters of one of the huge South American colonies of *Atta*, the fungus-grower. Seven of the new craters taken at random had the following diameters in centimeters: 28, 30, 35, 38, 28, 30, 26, an average of 32. The entrances to these were 6, 9, 18, 7, 6, 6, 15 mm. in diameters, an average of nearly 10. The entrance size did not correspond with the crater diameter. There was not a single ant out at this time despite the large number of craters and, since the crater soil was dry, they had
not excavated the night before. This area was in the shade and the air temperature over the nests was 64° F. as it was on the surface of the soil itself. In the same area, but probably unrelated, workers were found in chambers under a half-buried rock and with them was taken a bright yellow thysanuran of small size.

During April they continued excavating extensively but appeared mostly to be nocturnal. April 13, at the March 9 site, there were many craters with fresh coverings of soil grains though no ants were out at 4:15 p.m. despite the area being in shade. A few were out, however, at the nest at the base of the Populus tree, also in the shade, which had been occasionally active during the winter.

**SUMMARY**

Baghdad has a limited ant fauna but highly representative of the Iraq plain. Like far more ancient cities of Iraq, there has been an association between ants and man here for many centuries. The association has been particularly favorable for the ants since man has elevated the general soil level at his house sites, continually adds water and wastes to the soil, promotes vegetation and adds to the possible nesting sites. At the same time, some of the ants are decidedly beneficial in preying on harmful insects and their relatives while others are of neutral importance. Occasionally they may be harmful in tending harmful insects like plant lice or in taking human food. On the whole, however, the association is mutually useful and the study of ants as social creatures commends itself to man.

The activities of ants in Baghdad are regulated markedly by the temperature with its correlated relative humidity. High temperatures, generally accompanied by low relative humidity, restricts some ants to a nocturnal life while fostering diurnal activity of others. Two species may occupy the same site, one active during the heat of the day, the other during the night or early morning and evening. During the winter, with its lower temperatures and high relative humidity, the species derived from the North maintain activity while those of tropical origin are largely inactive.
Explanation of Figures

Figure 1—Workers of *Messor barbarus semirufa* André on a card 3 x 5 inches (7.6 x 12.7 cm.) placed on their nest.

Figure 2—Multiple crater entrances to nest of *Messor barbarus semirufa* with 3 x 5 inch card (7.6 x 12.7 cm.) on which is one worker carrying another.

Figure 3—Crater entrances to nest of *Pheidole* in west part of house are indicated by 3 x 5 inch (7.6 x 12.7 cm.) cards. The ants occupied the house during the winter but moved mostly to the soil of the surrounding garden in Figure 4 during the spring. In the late winter soldiers and workers formed files carrying food from this area along the right hand wall to the left hand part of Figure 4, a distance of some 12 meters.

Figure 4—Crater entrances of the same *Pheidole* colony of Figure 3, but in the spring the colony moved to the south side of the house. Over 50 craters were formed at one time by the ants of which some 37 are shown in the photograph under the 3 x 5 inch cards.

Figure 5—Two entrances to the nest of *Monomorium evansi* Donisthorpe indicated by the clusters of workers. The ants were traveling in file from an area of spilled horse feed at the right, where they were gathering chaff. Whole grains of barley and wheat were too large for these small ants. The nest itself was at the east base of a stable, in the dirt floor and in the walls of which they had tunnels.

Figure 6—Newly formed crater entrance to the nest of the largest ant of Baghdad, *Camponotus thoracica xerxes* Forel. Scale indicated by 13 cm. fountain pen.

Figure 7—Multiple crater nest of *Camponotus thoracica xerxes* at base of young date palm. The ants are chiefly nocturnal.
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