Spiders

The small black creature moving about jerkily on the sunny windowsill near where ~~the~~ rubber plant stands is unmistakably a spider. She has deserted momentarily her secure green recess among the stiff leaves to warm herself in the early March sun and perhaps to forage for minute flies ~~that~~ which sometimes collect phototropically at the edges of the panes. All winter long the spider has made her home in a small sunroom off the kitchen where my wife maintains a tropical environment during the cold months to keep us in touch with the more amicable seasons which we both insist we would not want to see perpetually prolonged, as the people who move to Florida or further south claim they would, but which nevertheless she preserves ~~in~~ with a variety of plants from warmer climates as out-of-context reminders to bouy up our spirits through the dismal periods of winter. The spider is a fortuitous inhabitant of this artificial environment along with some other creatures towards which we are less well disposed. She shares it with crickets that hatch out in the cold months and are often welcome ~~singers~~ chirpers during snow storms. The unwelcome visitors are the various parasites such as aphids, scale, and white flies whose numbers, in the absence of their normal enemies, explode in unrestrained multiplication. I have always wishfully assumed that the spiders prey on these undesirables rather than on young crickets, but I have never confirmed this hope.

~~Our greenhouse~~ This spider of ours has an exploritory bent, turning up on the kitchen table, near the sink, and in even more dangerous locations, but being alert and quick has so far escaped mishap. She seems to prefer, however, the rubber plant by the south window, when on one of her excursions, and is there quite safe. She is a member of the group of jumping spiders, lively little creatures, that move about

by quick running spurts or short jumps. They are covered with fur from head to foot, and although black is the predominant color in many species, they are the most brilliantly decorated of all the spiders, brightness and variety of color compensating for smallness of size. The black legs of some varieties are tufted at the joints with colored hairs, the abdomen is striped and spotted in various patterns, and the thorax is often a solid bright color.

Our spider is probably a male of the common Zebra Spider species, Salticus scenicus, for he is rather too brightly decorated to be a female. Although on first sight he gives the impression of being entirely black, closer examination reveals a white pattern on his small oval abdomen, plumes of white hair at the joints of his legs, and long black fringes hanging from the segments between the joints of his front legs. His mandable-like appendages, the chelicerae, his most colorful features, are iridescent blue.

The head and thorax of spiders are fused into one structure called the cephalothorax, so when we speak of the head of a spider we refer to the front end of the cephalothorax where the four pairs of eyes, typical of spiders, and the mouth parts are located. Most spiders' heads are rounded with the weak eyes situated on the sides and top. The sedentary spiders that trap their food in webs, or lie in ambush for their prey, do not need good eyesight and generally have, therefore, small myopic eyes. The hunting spiders, on the other hand, that stalk or run down their prey have evolved much larger eyes for the acute vision they need. Of this group the jumping spiders enjoy by far the best developed sight. Every stalking predator needs good eyesight, and indeed all predaceous animals, except those insectivorous birds which obtain their food on the wing, the insectivorous bats, and pit vipers - rattle snakes etc. - which locate prey by a heat sensor, all depend on their eyes for a livelihood. Two of the eyes of jumping

spiders are proportionately much larger than those of other spiders, and are positioned on the front of the head which is squared off to give them a directly forward view, probably with binocular vision. This adaptation of body shape to large eyes for better vision is found in no other spiders.

Communication between people depends to a great extent on facial expression. We detect the most fleeting moods that alter the face of a person with whom we are conversing, and recognize that the feelings we arouse in him are expressed in these changes. The mobility of a face has much to do with what we are able to read of a person's thoughts and emotions. To a less degree we communicate with our dogs. My wife has a Scotty who tells me many things by the way she looks up at me, by the tilt of her head, the intensity of her gaze, and the point of her ears. But because dogs have less expressive faces than people we have more difficulty understanding them and sometimes misinterpret their signals. When it comes to a creature as distantly related to us as a spider we detect no expression, and undoubtedly they show none even to another spider. They are arthropods after all with rigid exterior skeletons, and in the armour of their heads are embedded their immobile eyes, the most expressive organs in other animals. The fixity of those large black lenses gives to the face of a jumping spider the mechanical impersonality of a robot. Imagine finding yourself unexpectedly in a situation but that confronted of a fly by the huge, fixed, expressionless eyes of a monster spider the size of a buffalo who could pounce one hundred yards. With no escape possible you would be paralized with fear. But there is a fundamental difference between you and the fly. Almost certainly no insect experiences terror - an emotion found only in the higher vertebrates. Fear has developed in the higher animals by evolutionary selection as a survival mechanism; in insects where species

survival depends on massive reproduction, fear is unnecessary ~~even if~~ though also ~~it were~~ an im possible attribute of ~~for~~ the insect's primative nervous system. The fly will respond as automatically as the spider and may get away by quicker reflexes, but it happens seldom.

Let us consider the appearance of a jumping spider from the point of view of its prey without attempting to humanize it other than to assume that the prey, a small insect in this case, has eyesight like ours. Looked at from its own level the face of ~~a~~ the spider would attract immediate attention,and on that face below a high hairy forehead two highlighted eyes like black shoe buttons set close together would be the most conspicuous features. Large for a spider this size, they suggest by their bulging lidless convexity optical mechanisms more than living organs. They are flanked ~~on either side~~ where the superciliary ridges might have begun in a higher animal by two smaller eyes which look like an experiment with parking lights. The other ~~two~~ pairs of eyes [most spiders have eight eyes] are invisible on the sides and top of the head. The upper face ends at a groove in the head armour just below the large eyes, at which division are hinged a pair of organs resembling bushy drooping walrus-like mustachios called the chelicerae, which end in the sharp introverted fangs. In many of the jumping spiders the hair on the chelicerae is a bright contrasting color to the rest of the body. ~~From~~ On both sides of the head short jointed appendages project forward and dangle beside the face like two withered arms. They are the palpi, or pedipalpi so named for their leg-like function ~~like the legs~~ as tactile ~~organs~~ appendages, but in the male they serve a much more important purpose. Arching from under the body of the spider spring the four pairs of true legs . They all are attached to the cephalothorax and seen from the front only the first two pairs are clearly distinguishable. From this aspect with elbows raised the spider appears to be practicing ~~in a position~~

~~for doing~~ pushups, but this exercise is ~~practiced~~ carried on only during courtship. For the purpose of making a living the legs of the jumping spider are the springs which launch him on his pounce, triggered by the images ~~produced~~ projected of his prey in his robot-like eyes.

The hunting technique of the jumping spider is very similar to that of a cat. When ~~it~~ he spies a suitable insect ~~it~~ he advances on it with the utmost stealth, taking advantage of any cover present and moving forward by almost imperceptable stages a ~~step~~ step at a time until he reaches jumping distance. All the while, if the surface is narrow or steep, he has been unreeling from his spinnerets a silken drag line which has been stuck down to the support at frequent intervals. Having attained the critical distance, he pauses as though to take stock of the situation , and when certain of his quarry he suddenly with a speed impossible to follow jumps, pinning down the prey with his front legs. Should he miss, which rarely happens, the drag line will ~~arrest~~ arrest his fall and he will simply climb back up his thread.

Unlike other spiders, which can be trapped in bath tubs too smooth to grip, jumping spiders have adhesive hair pads on their feet ~~pot~~ which stick to polished surfaces. This feature is an adaptation for stalking prey wherever detected, whether on slippery or vertical surfaces, and, in man's artificial ebvironment, on window panes.

Mating of jumping spiders is preceeded by a courtship dance. the male on whom has been bestowed the most gaudy of ornamentation, postures before the female to display his decorations, attract her attention, and establish his identity for his ultimate acceptance by her. He extends his plumed front legs, rises on straightened legs, bobs and sways exhibiting all his bright attributes, colored tufts and fringes and iridescent chelicerae in a ritual characteristic of his species. In this performance the functional sugnificance of his striking embellishments is manifest.

When not on the prowl jumping spiders retreat to a silk-lined lair where the female deposits her eggs and spins around them a protective sack.

Wolf spiders have the next best eyesight of the arachnid tribe. Their eyes may be measurably larger than the jumping spider's, but then they are many times larger too so that proportionately their eyes are smaller. The jumping spiders rarely exceed a half inch in diameter, legs and all, whereas ~~the~~ wolf spiders range from several inches among the tarantulas down to an inch or less in some of the wandering species. They all belong to the family Lycosidae and none of them spin webs although several ~~of the~~ species including tarantulas excavate burrows which they line with silk and occupy as a home base, particularly during the later period of their lives. Others are constant wanderers leading the lives of nomadic hunters without geographical attachments. They are ever on the prowl for prey and when they sight a victim they charge it with a speed of attack which Crompton likens to that of the cheetah in the mammal world. The burrowers, the trapdoor spiders and tarantulas, stand watch at the entrances of their retreats to sally forth and pounce upon passing insects or other spiders. The wandering wolf spiders found in New Mexico near where I live are medium sized long legged lycosids striped and blotched with gray and black hair. The legs are banded in the same colors and the chelicerae are covered with reddish brown fur from which shiny black, curved fangs project. They are gentle spiders whatever ~~their~~ formidable appearance they may present and can be handled without running the risk of a bite, but should a bite be sustained as the result of accidental rough ~~handling~~ treatment no ill effects would result. The face of the wolf spider is not flattened like that of the jumping spider but narrows to the top of the head dolichocephalously where the largest pair of eyes are situated for forward vision, most useful for detection of prey. Below them in a row, two on either

side, are four much smaller eyes. Intermediate in size between these and the two large eyes the fourth pair is placed on the top of the head, one on either side where they have a view to the rear. Thus the spider is able to ~~see in several~~ keep track of what goes on about him in all directions ~~at once~~.

The Lycosidae are primative spiders ancestral to the true spiders ~~which~~ that evolved much later and to which group belong the silk spinners ~~which~~ that lead sedentary lives and construct webs for trapping their prey. The wolf ~~grpup~~ spider family has a limited ability to produce silk which is used for lining ~~their~~ burrows and making ~~their~~ egg cases, but not for catching or holding ~~their~~ prey. Whereas the orb weavers survive no longer than one ~~season~~ summer between generations, the lycosids, as invertebrates go, are very long lived. Female wolf spiders may live for two or three years whereas some of the tarantula females as long as thirty years. The males, as in humans with whom the differential, however, is not so great, are less hardy; they often die after mating but not always from natural causes. I have kept tarantula males that ~~grew~~ grew less and less active as the fall season advanced, stopped eating, and gradually became emaciated and inert as life faded from them. Females could easily have been kept alive through the winter.

But there is another cause of early male mortality related to the predatory and solitary habits of spiders. The female being near sighted as well as of a ~~voracious~~ rapacious temperament does not readily distinguish between a male of her species, with whom she may be eager to mate and who may be ~~eager~~ equally eager to mate with her, and a prey animal, the result being that she may sieze and devour him before the nuptials have even begun, or, unless he is very agile, after their consumation. This cannibalism, together with the morphological characteristics of male spiders which often though not in all species distinguishes them so strikingly from the female both in size and appearance causes the male to approach the ~~female~~ female with the utmost caution.

In pursuing his function to perpetuate the species he is literally risking his life, and more times than not actually sacrificing it. He must approach her tentatively and persuasively to elicit her acquiescence and to assuage her propensity to sieze and eat him before he is able to assume the proper position for bringing about her insemination, and then when this purpose is accomplished he must quickly escape. She doesn't make it easy for him with the result that he frequently ends up as a post-nuptial meal. Under these circumstances it is hardly surprising that female spiders live longer than males or that they are more in evidence.

Something should be said at this point about the bizarre manner by which spider eggs are fertilized. As soon as the male spider reaches maturity he prepares himself for mating. Lacking a primary intomittent organ he performs an extrordinary series of acts called sperm induction by which he transfers semen from his genital organ to the specialized syringe-like apparatus in the tips of his pedipalpi which serve as secondary inseminating devices. To do this he spins a small platform of silk on which he deposits a drop of sperm and then applies his palpi to the drop until it is absorbed. Thus prepared he sets out in search of a mature female. If he is a hunting spider eyesight may assist him in his search, but most spiders rely on the sensation of touch which adds greatly to the hazard of the quest. When contact with the female has been established he must approach her cautiously if he is to accomplish his purpose and not immediately be devoured. To arouse her interest he follows a characteristic courtship ritual genetically established in his species. Where the discrepancy in size between the sexes is great as in the black widow spider a courtship pattern accommodated to this dimorphism has developed along more general lines that differ from the behavior where the sexes are of comparable size and vision is good as with jumping spiders whose

courtship dances have already been described. Thus the most specialized displays are found among the long-sighted spiders and short-sighted web weavers in both of which sensory perception is extended well beyond the limits of direct physical contact, in the first case by sight and in the second by ~~indirect means through~~ vibration of the web.

Having gained the attention of the female and established identification, the male can then asume the position for the performance of the culminating copulatory act. This position usually includes a mutual embrace involving in various species the chelicerae and hooks on the legs of one or both of the partners. In those spiders in which the male is as large as the female his seisure acts to subdue resistance or aggresiveness on her part until she is ready to accept the mating process. When the proper attitude of the two sexes is finally attained the female becomes quiescent and the transfer of sperm begins. On the ventral side of the female abdomen immediately in front of the genital fold is an organ called the epigynum which gives access to two symetrical pouches for receiving and storing the sperm. Into these receptacles the male inserts in turn the ends of his palpi ~~releasing~~ squirting by pressure the sperm previously stored i n them in preparation for ~~mating~~ this act. The structures of the epigynum and the palpi of each species are complimentary and uniquely adapted to this function thus effectively forestalling the possibility of cross fertilization and maintaining the integrity of the species. In some spider species this process of insemination takes only a few minutes, in others the sexes stay together for an hour or more. The sperm remains viable in the pouches of the epigynum, from which there is no interior opening, for long periods of time and is diepensed at the time of egg laying when fertilization of the eggs taked place.

In northern New Mexico the commonest building material used by the Spanish poeple who settled the country, following the custom of their Moorish ancestors, is adobe in the from of sun-baked clay blocks. Houses, rarely exceeding one story, had flat roofs constructed of peeled pine logs called vegas across which were laid split wood slabs. Over these slabs several inches of clay dirt was spread to act as insulation and was graded towards wooden spouts or cannales through an adobe parapet built above the roof on the outside walls. Rain water would usually run off through the cannales before it could soak through the dirt insulation. This construction, which was soon immitated by the Pueblo Indians, was named Pueblo style architecture and became very popular with the English speaking settlers from the east after the Mexican War. They improved the water tightness of the roof by adding tar paper. To protect the outside walls from erosion by rain and snow portals were added, sometimes to all four sides of a house. The roof of the portal is usually an extension of the roof of the house. A portal is commonly not enclosed and often serves as a cool outside living room in summer.

Sheltered Portals also provide a living space for a variety of other animals from birds down to insects and spiders. Under the portals that extend around a large fraction of the perimeter of the house I live in, linnets, Say's phoebes, and Woodhouse's jays have built their nests. A large species of solitary bee makes burrows in the adobe walls near the eves in which she lays her eggs and stocks with provisions for the developing larvae before sealing the opening with mud. Before they emerge the next spring many of these grubs become winter food for Red-shafted flickers who chisel out large chunks of adobe digging for them, causing considerable damage to the wall. But spiders are the creatures we are concerned with here.

For several years a large population of humped orb weavers, Araneagemmoides, constructed beautifully symetrical webs across the corners formed by

the lintal and posts under each portal. There were so many spiders that some years every corner was occupied, forcing the late comers to resort to the less favorable sites where they sometimes interfered with access to the house. Over night a web would appear in a doorway, and because we could not bear to destroy it we would carefully duck under as we went in and out. As the summer advanced the females grew bigger and their abdomens swelled with eggs. I watched them struggle out of their too tight skins when they molted, an event during which they were exposed to great danger for they could not escape their enemies during while this change of skin was in process. Before molting started the spider would retreat to the wall or ceiling where she would hang while the shedding went on, which could last for several hours. First the carapace would crack around the cephalothorax to release the spider's head, then she would straighten her legs drawing them together into a bundle beneath her. One by one laboriously she withdrew her legs from this package; each one seemed to require a prodigious effort accompanied by much squirming and writhing. At last free, she rested while her new carapace expanded and hardened before returning to her web.

My children were as fascinated as I was by the way these spiders subdued and wrapped up the insects that blundered into their webs. Lacking the patience to watch until this happened naturally we tossed moths and grasshoppers into the webs where they would become entangled. At the first vibration ~~caused by the struggling insect~~, the spider charged from her station at the ~~center~~ hub of the web, ~~siezing it with her legs and immediately clamping her fangs into it~~ and holding the struggling insect with her legs immediately clamped her fangs into it. As soon as the venom paralized the insect and its struggles ceased the spider cut it free from the entangling strands ~~of her web~~ and proceeded to ~~wrap~~ swathe it ~~up~~ in a cocoon of silk. Nothing is more fascinating than this process which is carried out with unbelievable

speed and thoroughness. Straddling the inert prey the spider rotates it under her abdomen with her hind legs while she sprays silk from her spinnerets. The silk emerges from the spinning organs in a single white sheet called the swathing band ~~from its~~ ribbon-like ~~appearance,~~ although it is actually two bands produced by a pair of spinnerets and is made up of many fibers. When large amounts of silk are needed in a hurry, as during swathing of a still active prey, it is squirted out from the spigots of the silk glands with a considerable degree of directional control. The insect is quickly encased in an opaque shroud which as the silk contracts draws its appendages into a tight package.

Most spiders including the humped orb weavers are equipped with three pairs of spinnerets - a few varieties with four pairs. Each spinneret is connected with various glands which secrete liquid silk of different compositions and physical properties. The spider produces at will the kind of silk, or mixtures of silk, she requires for a particular purpose. She excretes a tough dry silk for draglines and the web framework, a weaker but more elastic silk for ~~the~~ snare ~~strands of the web,~~ a sticky liquid that hardens very slowly ~~and~~ ~~which she uses to coats the snare fibers,~~ and a silk for making attachment discs ~~for~~ anchoring the structural strands of the web. All silk ~~as manufactured by~~ the silk glands ~~is a liquid~~, and except in special cases where it remains ~~semi-liquid~~ ~~it~~ hardens as fast as it emerges from the spigots of the spinnerets. How this change takes place is not yet known; some arachnologist believe the process is chemical induced by exposure to air, others that ~~it is a~~ the change is physical ~~alteration is~~ brought about mechanically by stretching. This latter interpretation is supported by the way spiders ~~manipulate~~ draw out the silk threads with their legs as they are produced ~~and by~~ the manipulation of the segmented, finger-like spinnerets, that in some species comb the silk through hairs, in further support of evidence for this view.

Having completed the swathing of her prey the spider may begin her meal immediately at the site of capture, or she may carry it to the hub of her web and feed on it there. When she does this she attaches a thread to the bundle and carries it dangling from a hind leg. Spiders are able to raise insects this way many times their own weight. The feeding habits of spiders are most unusual. They ingest no solid food; digestion takes place outside their bodies by means of enzymes secreted by the maxillary glands which they spread over the insects tissues. Liquifaction is very rapid and as it progresses the spider sucks the juice into her stomach. To render the soft tissues of the prey available to the powerful digestive secretions she crunches through the exterior skeleton with her maxillae and chelicerae, turning the insect over as its tissues are exhausted for attack at a new point. Gradually as the chewing and sucking goes on the prey is reduced to a dry ball of keratin and discarded. All spiders are predatory subsisting only on living animal tissue, which must be consumed as soon as the victim is rendered impotant. From the point of view of the insect prey, provided it has a point of view, this fate must present the ultimate in horror. First, it finds itself paralized but still living by an injection of venom, in a state of bound and absolute helplessness dis, and then its is subjected to slow, piecemeal solution of its tissues until its life is extinguished. No savage torture could be worse. But take heart: the insects probably do not appreciate what is happening to them. For consider the authenticated case of the male preying mantis which was siezed while feeding on a tree cricket by a much larger female mantis. As she devoured him beginning with his abdominal end he continued his feast on the cricket with utter disregard for his own fate.

Towards the end of the summer the humped orb weaver , who has been fattening on insects and whose abdomen has become swollen with eggs begins to prepare for the culminating event of her life, the perpetuation of her species. Her task is to weave a container for the eggs she must leave to survive the winter months, and from which in the spring dozens

of spiderlings will emerge to carry on the race. She retreats to a corner under the eaves, or other protected place near which her web is attached, and there constructs a scaffolding to support the egg sac. In this she spins a sheet of silk on which she will deposit her eggs glued together with a sticky fluid containing the sperm stored in her body since she mated. Many orb weavers spin this platform from below as a roof and deposit their eggs on the under side. The silk used is produced by special glands and differs from all other silk used for web construction and swathing prey. It is less elastic than drag line silk, contracts into a crackley sheet, and is often tinted pink or yellow. Having laid her eggs the spider proceeds to cover them with another sheet of silk which she sews to the first one around the edges. At this point some spiders cut the sac free temporarily and wrap it in another layer of parchment-like silk as they rotate it with their legs. Other species produce a double walled egg case with fluffy silk like cotton wool between the layers; but whatever the basic design orb weavers surround the outside hard cover with a halo of silk fibers which hold the sac to its support.

Wishing to observe, under more favorable circumstances, than were available under my portal, the construction of an egg sac, I thought of capturing removing a gravid Aranea gemmoides, and placing her in an ample cage in my studio. But not having any way of knowing how near term the spiders were, I hoped by doubling the to increase my opportunity to observe the process and decrease my vigil by taking two, by capturing two spiders. What I did not appreciate, as a consequent determining factor with disasterous results, was the depth of the terretorial instinct in sedentary spiders. At the time of these terretorial requirements were "experiment" defense of terretory was just beginning to be published through observations of vertebrates other than birds, and not at all among arthropods. Probably I should have realized that spiders orb weavers

Wishing to observe the construction of an egg sac under circumstances more favorable than were available naturally, I captured a gravid Aranea gemmoides and placed her in an ample cage in my studio. But not knowing how near term any of the spiders were, I hoped ~~to~~ by taking two spiders to increase my opportuity to watch the construction process, and at the same time to reduce the vigil. What I did not appreciate, with consequent disasterous results, was the overpowering strength of the terretorial instinct in these sedentary arachnids. At the time of these observations terretorial behavior studies were just beginning to be published extensively on vertebrates other than birds, and little along this line had yet been done with the lower animals. However, I should have realized that orb weavers

insist on a minimum living space, for I had noted that their webs were always well separated. Even had I considered the possibility of a contest for dominance could not have anticipated the violence of the conflict that took place. During the night, unobserved, a life and death battle was fought unequalled in any staged gladiatorial spectacle. When I went to offer my spiders juicy insects in the morning I was confronted by a scene of most dreadful carnage. The walls of the glass cage were spattered with spider eggs and the dismembered remains of one of the females were strewn over the floor. The victorious contestant, torn and dying, clung high with her remaining legs in a corner surveying the arena in which she had so recently vented her fury on the corps of her opponent.

Reputedly One of the most poisonous spiders found in the United States is the Black Widow, a reputation well deserved and greatly enhanced by striking her appearance and easy identification. As spiders go she is medium sized, jet black, and is equipped with long delicate legs which are her most important organs for exploring her immediate environment and for apprehending prey. She relatively has a tiny cephalothorax and a huge spherical abdomen like a polished black marble With which she maintains tactile contact with her immediate environment and which are her most important organs for apprehending prey. Her small tiny head and thorax are dwarfed almost invisible beneath a relatively huge spherical abdomen like a polished black marble. All these characteristics render the identification of the Black Widow conclusive, but one additional feature, if it can be seen, would dispel any lingering doubt of the spider's identity. On the underside ventral surface of the abdomen, where it is not readily visible unless the spider can be observed from below, is an orange-red double triangle figure resembling an hour glass. The danger of a bite being bitten by a Black Widow has been greatly exaggerated, but is not an insignificant trivial discomfort for a healthy adult and could be serious for

a child. The venom is a neurotoxin which causes pain and general systemic symptoms but rarely death since the amount injected is minute. Black widows are timid, non-aggressive, retiring spiders that prefer to remain hidden under buildings, in dark recesses, and in crevices where contact with them is not likely to occur; but if they are disturbed they seek safety in retreat and bite only in self-defense when escape is impossible.

The name black widow derives from the common but erroneous belief that she invariably devours her mate. He is much smaller and paler than she, and although, as with many other spiders, he runs some risk of being eaten by her, this is not his usual fate. The black widow, Latrodectus mactans, is a member of the comb-footed spider family Theridiidae. A special feature of this family is the presence of a comb-like organs formed of toothed bristles on the hind legs which are used to throw silk over the prey. Latrodectrus spins (in dark places) near the ground ~~in dark places~~ an irregular but cleverly engineered snare ~~designed~~ adapted to trap terrestrial insects. In connection with this maze of tough sticky guy lines she builds a tunnel of silk into which she retreats if disturbed and where she waits for a blundering insect to get caught. When this happens she rushes out to investigate but does not immediately sieze the victim as orb weavers do. Instead she cautiously approaches her captive to size up the situation and when satisfied concerning its value turns her back to it and using the combs on her hind legs casts silk from her spinnerets to secure it firmly at one point. This accomplished she bites the secured part of the prey to inject venom. She then attaches other lines and by a process of pulling and tightening one strand at a time gradually raises the insect into her web where she proceeds to feed on it at her leisure.

No4 Black widows have been known to immobilize and raise (into their webs) animals many times their size and weight, among them small snakes and mice, ~~into their webs~~ by this method of ~~tightening one~~ applying tension to judiciously to different ~~attachments~~ lines in succession. I have kept black widows in cages for many weeks, feeding them on crickets, and have observed this process over and over again. The immobilized

cricket is always hauled up into the web and feasted on for a day or two until all liquifiable tissues have been consummed when the shrivelled remains are cut loose and dropped to the floor of the cage. Never have I experienced any aggressiveness from a black widow among all the individuals that I have kept captive. I have often reached into their cages to move them around with my finger for photographic purposes, and not once has one shown any inclination to attack or bite. The usual behavior is to tap my finger gently, exploratively, with a front leg and then to back away having apparently established the nutritional uselessness of the object. I confess that I have not attempted to imitate with my finger the behavior of a trapped insect struggling to free itself, which might have led to a different response. Interesting as it might have been to test the spider's reaction to my finger, to find out if she would try to tie it down with a band of silk before immobilizing it with a bite, I rejected the experiment out of respect for the known toxicity of her venum.

In captivity black widows do very well, grow to an inch across when well nourished, and spin egg sacs of white silk, beautiful balls like balls of the purest cotton, half to three quarters of an inch in diameter, which they leave suspended in their webs. One black widow I raised fabricated two egg sacs in quick succession without becoming as greatly depleted as it would be supposed such a prodigious effort should have produced; she remained in albeit somewhat smaller, turgid, glistening, ebony health, following these labors and might have produced more receptacles for her progeny had not an event intervened which led to her escape. During the night the eggs in one of the cases hatched, and on entering my studio in the morning I discovered a sheet of fine silk fibers extending from the cage to the ceiling. Clinging to this gossamer veil of the finest from top to bottom were hundreds, myriads, of it seemed, of minute, pale brown spiderlings. They were all in motion, creeping slowly along the

near invisible fibers of their own incredible creation. How they had ballooned the silk to the ceiling in the still air of my studio remains a mystery, but true to instinct, to the long established pattern of behavior for dispersal of certain species of spiders, they left the guardianship of their mother, so faithful while they remained unhatched embryos, but perhaps not so great a security once they acquired an active independence. She might have eaten them.

I knew not how to cope with this multitude of newly born spiders, how to transfer them outdoors. The task was not complicated by risk of being bitten since immature spiders are not venomous, but ~~it was impossible~~ through any means of intervention ~~because of the~~ it was made impossible by their sheer numbers and smallness ~~of the spiders~~. So I left my studio door open, and inadvertantly the glass top of the cage, when I had to leave ~~to attend to~~ on other business. On returning in an hour or two I found to my great relief that all the young black widows had vanished, and with them also, I regret to say, their mother.