Chapter 1

MUTUAL AID AMONG ANIMALS

Struggle for existence. - Mutual aid — a law of Nature and chief factor of progressive evolution. — Invertebrates. — Ants and bees. - Birds: Hunting and fishing associations. - Sociability. - Mutual protection among small birds. - Cranes; parrots.

THE conception of struggle for existence as a factor of evolution, introduced into science by Darwin and Wallace, has permitted us to embrace an immensely-wide range of phenomena in one single generalization, which soon became the very basis of our philosophical, biological, and sociological speculations. An immense variety of facts: - adaptations of function and structure of organic beings to their surroundings; physiological and anatomical evolution; intellectual progress, and moral development itself, which we formerly used to explain by so many different causes, were embodied by Darwin in one general conception. We understood them as continued endeavours — as a struggle against adverse circumstances - for such a development of individuals, races, species and societies, as would result in the greatest possible fullness, variety, and intensity of life. It may be that at the outset Darwin himself was not fully aware of the generality of the factor which he first invoked for explaining one series only of facts relative to the accumulation of individual variations in incipient species. But he foresaw that the term which he was introducing into science would lose its philosophical and its only true meaning if it were to be used in its narrow sense only - that of a struggle between separate individuals for the sheer means of existence. And at the very beginning of his memorable work he insisted upon the term being taken in its 'large and metaphorical sense including dependence of one being on another, and including (which is more important) not only the life of the individual, but success in leaving progeny'.[1]

I. *Origin of Species,* chapter 3.

While he himself was chiefly using the term in its narrow sense for his own special purpose, he warned his followers against committing the error (which he seems once to have committed himself) of overrating its narrow meaning. In *The Descent of Man* he gave some powerful pages to illustrate its proper, wide sense. He pointed out how, in numberless animal societies, the struggle between separate individuals for the means of existence disappears, how *struggle* is replaced by *cooperation,* and how that substitution results in the development of intellectual and moral faculties which secure to the species the best conditions for survival. He intimated that in such cases the fittest are not the physically strongest, nor the cunningest, but those who learn to combine so as mutually to support each other, strong and weak alike, for the welfare of the community. 'Those communities,' he wrote, 'which included the greatest number of the most sympathetic members would flourish best, and rear the greatest number of offspring' (2nd ed., p. 163). The term, which originated from the narrow Malthusian conception of competition between each and all, thus lost its narrowness in the mind of one who knew Nature.

Unhappily, these remarks, which might have become the basis of most fruitful researches, were overshadowed by the masses of facts gathered for the purpose of illustrating the consequences of a real competition for life. Besides, Darwin never attempted to submit to a closer investigation the relative importance of the two aspects under which the struggle for existence appears in the animal world, and he never wrote the work he proposed to write upon the natural checks to over-multiplication, although that work would have been the crucial test for appreciating the real purport of individual struggle. Nay, on the very pages just mentioned, amidst data disproving the narrow Malthusian conception of struggle, the old Malthusian leaven reappeared — namely, in Darwin's remarks as to the alleged inconveniences of maintaining the 'weak in mind and body' in our civilized societies (ch. 5). As if thousands of weak-bodied and infirm poets, scientists, inventors, and reformers, together with other thousands of so-called 'fools' and 'weak-minded enthusiasts', were not the most precious weapons used by humanity in its struggle for existence by intellectual and moral arms, which Darwin himself emphasized in those same chapters of *Descent ofMan.*

It happened with Darwin's theory as it always happens with theories having any bearing upon human relations. Instead of widening it according to his own hints, his followers narrowed it still more. And while Herbert Spencer, starting on independent but closely-allied lines, attempted to widen the inquiry into that great question, 'Who are the fittest?' especially in the appendix to the third edition of the *Data of Ethics*, the numberless followers of Darwin reduced the notion of struggle for existence to its narrowest limits. They came to conceive the animal world as a world of perpetual struggle among half-starved individuals, thirsting for one another's blood. They made modern literature resound with the war-cry of *woe to the vanquished*, as if it were the last word of modern biology. They raised the 'pitiless' struggle for personal advantages to the height of a biological principle which man must submit to as well, under the menace of otherwise succumbing in a world based upon mutual extermination. Leaving aside the economists who know of natural science but a few words borrowed from second-hand vulgarizers, we must recognize that even the most authorized exponents of Darwin's views did their best to maintain those false ideas. In fact, if we take Huxley, who certainly is considered as one of the ablest exponents of the theory of evolution, were we not taught by him, in a paper on the 'Struggle for Existence and its Bearing upon Man', that,

> from the point of view of the moralist, the animal world is on about the same level as a gladiators* show. The creatures are fairly well treated, and set to fight; whereby the strongest, the swiftest, and the cunningest live to fight another day. The spectator has no need to turn his thumb down, as no quarter is given.

Or, further down in the same article, did he not tell us that, as among animals, so among primitive men,

> the weakest and stupidest went to the wall, while the toughest and shrewdest, those who were best fitted to cope with their circumstances, but not the best in another way, survived. Life was a continuous free fight, and beyond the limited and temporary relations of the family, the Hobbesian war of each against all was the normal state of existence.[2]

In how far this view of nature is supported by fact, will be seen

2. *Nineteenth Century,* February **1888,** p. **165.**

from the evidence which will be here submitted to the reader as regards the animal world, and as regards primitive man. But it may be remarked at once that Huxley's view of nature had as little claim to be taken as a scientific deduction as the opposite view of Rousseau, who saw in nature but love, peace, and harmony destroyed by the accession of man. In fact, the first walk in the forest, the first observation upon any animal society, or even the perusal of any serious work dealing with animal life (D'Orbigny's, Audubon's, Le Vaillant's, no matter which), cannot but set the naturalist thinking about the part taken by social life in the life of animals, and prevent him from seeing in Nature nothing but a field of slaughter, just as this would prevent him from seeing in Nature nothing but harmony and peace. Rousseau had committed the error of excluding the beak-and-claw fight from his thoughts; and Huxley committed the opposite error; but neither Rousseau's optimism nor Huxley's pessimism can be accepted as an impartial interpretation of nature.

As soon as we study animals — not in laboratories and museums only, but in the forest and the prairie, in the steppe and the mountains - we at once perceive that though there is an immense amount of warfare and extermination going on amidst various species, and especially amidst various classes of animals, there is, at the same time, as much, or perhaps even more, of mutual support, mutual aid, and mutual defence amidst animals belonging to the same species or, at least, to the same society. Sociability is as much a law of nature as mutual struggle. Of course it would be extremely difficult to estimate, however roughly, the relative numerical importance of both these series of facts. But if we resort to an indirect test, and ask Nature:' Who are the fittest: those who are continually at war with each other, or those who support one another?' we at once see that those animals which acquire habits of mutual aid are undoubtedly the fittest. They have more chances to survive, and they attain, in their respective classes, the highest development of intelligence and bodily organization. If the numberless facts which can be brought forward to support this view are taken into account, we may safely say that mutual aid is as much a law of animal life as mutual struggle, but that, as a factor of evolution, it most probably has a far greater importance, inasmuch as it favours the development of such habits and characters as insure the maintenance and

further development of the species, together with the greatest amount of welfare and enjoyment of life for the individual, with the least waste of energy.

Of the scientific followers of Darwin, the first, as far as I know, who understood the full purport of mutual aid *as a law of Nature and the chief factor ofevolution,* was a well-known Russian zoologist, the late Dean of the St Petersburg University, Professor Kessler. He developed his ideas in an address which he delivered in January 1880, a few months before his death, at a Congress of Russian naturalists; but, like so many good things published in the Russian tongue only, that remarkable address remains almost entirely unknown.[3]

'As a zoologist of old standing', he felt bound to protest against the abuse of a term - the struggle for existence - borrowed from zoology, or, at least, against overrating its importance. Zoology, he said, and those sciences which deal with man, continually insist upon what they call the pitiless law of struggle for existence. But they forget the existence of another law which may be described as the law of mutual aid, which law, at least for the animals, is far more essential than the former. He pointed out how the need of leaving progeny necessarily brings animals together, and, 'the more the

3. Leaving aside the pre-Darwinian writers, like Toussenel, Fee, and many others, several works containing many striking instances of mutual aid - chiefly, however, illustrating animal intelligence — were issued previously to that date. I may mention those of Houzeau, *Les facultes mentales des animaux,* **2** vols., Brussels, **1872;** L. Biichner's *Aus dem Geistesleben der Thiere,* **2nd** ed., **1877;** and Maximilian Perry's *Ueber das Seelenleben der Thiere,* Leipzig, **1876.** Espinas published his most remarkable work, *Les Societes animates,* in **1877,** and in that work he pointed out the importance of animal societies, and their bearing upon the preservation of species, and entered upon a most valuable discussion of the origin of societies. In fact, Espinas's book contains all that has been written since upon mutual aid, and many good things besides. If I nevertheless make a special mention of Kessler's address, it is because he raised mutual aid to the height of a law much more important in evolution than the law of mutual struggle. The same ideas were developed next year (in April **1881)** by J. Lanessan in a lecture published in **1882** under this title: *La lutte pour l'existence et l'association pour la lutte.* G. Romanes's capital work, *Animal Intelligence,* was issued in **1882,** and followed next year by the *Mental Evolution in Animals.* About the same time **(1883),** Buchner published another work, *Liebe und Liebes-Leben in der Thierwelt,* a second edition of which was issued in **1885.** The idea, as seen, was in the air.

individuals keep together, the more they mutually support each other, and the more are the chances of the species for surviving, as well as for making further progress in its intellectual development'. 'All classes of animals,' he continued, 'and especially the higher ones, practise mutual aid', and he illustrated his idea by examples borrowed from the life of the burying beetles and the social life of birds and some mammalia. The examples were few, as might have been expected in a short opening address, but the chief points were clearly stated; and, after mentioning that in the evolution of mankind mutual aid played a still more prominent part, Professor Kessler concluded as follows:

> I obviously do not deny the struggle for existence, but I maintain that the progressive development of the animal kingdom, and especially of mankind, is favoured much more by mutual support than by mutual struggle. . . . All organic beings have two essential needs: that of nutrition, and that of propagating the species. The former brings them to a struggle and to mutual extermination, while the needs of maintaining the species bring them to approach one another and to support one another. But I am inclined to think that in the evolution of the organic world - in the progressive modification of organic beings - mutual support among individuals plays a much more important part than their mutual struggle.[4]

The correctness of the above views struck most of the Russian zoologists present, and Syevertsoff,* whose work is well known to ornithologists and geographers, supported them and illustrated them by a few more examples. He mentioned some of the species of falcons which have 'an almost ideal organization for robbery', and nevertheless are in decay, while other species of falcons, which practise mutual help, do thrive. 'Take, on the other side, a sociable bird, the duck,' he said; 'it is poorly organized on the whole, but it practises mutual support, and it almost invades the earth, as may be judged from its numberless varieties and species.'

The readiness of the Russian zoologists to accept Kessler's views seems quite natural, because nearly all of them have had opportunities of studying the animal world in the wide uninhabited regions

4. *Memoirs (Trudy) of the St Petersburg Society of Naturalists,* vol. xi, **1880.**

* Nikolai Alekseevich Severtsov (Syevertsoff) **(1827-85),** Russian zoologist and geographer, noted for his exploration of Turkestan and the Pamirs. - *Ed.*

of Northern Asia and East Russia; and it is impossible to study like regions without being brought to the same ideas. I recollect myself the impression produced upon me by the animal world of Siberia when I explored the Vitim regions in the company of so accomplished a zoologist as my friend Polyakoff was.* We both were under the fresh impression of the *Origin of Species,* but we vainly looked for the keen competition between animals of the same species which the reading of Darwin's work had prepared us to expect, even after taking into account the remarks of the third chapter (p. 54). We saw plenty of adaptations for struggling, very often in common, against the adverse circumstances of climate, or against various enemies, and Polyakoff wrote many a good page upon the mutual dependency of carnivores, ruminants, and rodents in their geographical distribution; we witnessed numbers of facts of mutual support, especially during the migrations of birds and ruminants; but even in the Amur and Usuri regions, where animal life swarms in abundance, facts of real competition and struggle between higher animals of the same species came very seldom under my notice, though I eagerly searched for them. The same impression appears in the works of most Russian zoologists, and it probably explains why Kessler's ideas were so welcomed by the Russian Darwinists, whilst like ideas are not in vogue amidst the followers of Darwin in Western Europe.

The first thing which strikes us as soon as we begin studying the struggle for existence under both its aspects - direct and metaphorical — is the abundance of facts of mutual aid, not only for rearing progeny, as recognized by most evolutionists, but also for the safety of the individual, and for providing it with the necessary food. With many large divisions of the animal kingdom mutual aid is the rule. Mutual aid is met with even amidst the lowest animals, and we must be prepared to learn some day, from the students of microscopical pond-life, facts of unconscious mutual support, even from the life of micro-organisms. Of course, our knowledge of the life of the invertebrates, save the termites, the ants, and the bees, is extremely limited; and yet, even as regards the lower animals, we

* Ivan Semyonovich Polyakov **(1847-87),** Russian zoologist. See also Kropotkin's *Memoirs of a Revolutionist,* Boston, **1899,** pp. **215, 338-40. —** *Ed.*

may glean a few facts of well-ascertained cooperation. The numberless associations of locusts, vanessae, cicindelae, cicadae, and so on, are practically quite unexplored; but the very fact of their existence indicates that they must be composed on about the same principles as the temporary associations of ants or bees for purposes of migration.[5] As to the beetles, we have quite well-observed facts of mutual help amidst the burying beetles *(Necrophorus).* They must have some decaying organic matter to lay their eggs in, and thus to provide their larvae with food; but that matter must not decay very rapidly. So they are wont to bury in the ground the corpses of all kinds of small animals which they occasionally find in their rambles. As a rule, they live an isolated life, but when one of them has discovered the corpse of a mouse or of a bird, which it hardly could manage to bury itself, it calls four, six, or ten other beetles to perform the operation with united efforts; if necessary, they transport the corpse to a suitable soft ground; and they bury it in a very considerate way, without quarrelling as to which of them will enjoy the privilege of laying its eggs in the buried corpse. And when Gleditsch attached a dead bird to a cross made out of two sticks, or suspended a toad to a stick planted in the soil, the little beetles would in the same friendly way combine their intelligences to overcome the artifice of man. The same combination of efforts has been noticed among the dung-beetles.

Even among animals standing at a somewhat lower stage of organization we may find like examples. Some land-crabs of the West Indies and North America combine in large swarms in order to travel to the sea and to deposit therein their spawn; and each such migration implies concert, cooperation, and mutual support. As to the big Molucca crab *(Limulus),* I was struck (in 1882, at the Brighton Aquarium) with the extent of mutual assistance which these clumsy animals are capable of bestowing upon a comrade in case of need. One of them had fallen upon its back in a corner of the, tank, and its heavy saucepan-like carapace prevented it from returning to its natural position, the more so as there was in the corner an iron bar which rendered the task still more difficult. Its comrades came to the rescue, and for one hour's time I watched how they endeavoured to help their fellow-prisoner. They came two at once, pushed

5. See Appendix 1.

their friend from beneath, and after strenuous efforts succeeded in lifting it upright; but then the iron bar would prevent them from achieving the work of rescue, and the crab would again heavily fall upon its back. After many attempts, one of the helpers would go in the depth of the tank and bring two other crabs, which would begin with fresh forces the same pushing and lifting of their helpless comrade. We stayed in the aquarium for more than two hours, and, when leaving, we again came to cast a glance upon the tank: the work of rescue still continued! Since I saw that, I cannot refuse credit to the observation quoted by Dr Erasmus Darwin — namely, that 'the common crab during the moulting season stations as sentinel an unmoulted or hard-shelled individual to prevent marine enemies from injuring moulted individuals in their unprotected state'.[6]

Facts illustrating mutual aid amidst the termites, the ants, and the bees are so well known to the general reader, especially through the works of Romanes, L. Btichner, and Sir John Lubbock, that I may limit my remarks to a very few hints.[7] If we take an ants' nest, we not only see that every description of work — rearing of progeny, foraging, building, rearing of aphides, and so on - is performed according to the principles of voluntary mutual aid; we must also recognize, with Forel, that the chief, the fundamental feature of the life of many species of ants is the fact and the obligation for every ant of sharing its food, already swallowed and partly digested, with every member of the community which may apply for it. Two ants belonging to two different species or to two hostile nests, when they occasionally meet together, will avoid each other. But two ants belonging to the same nest or to the same colony of nests will approach each other, exchange a few movements with the antennae, and 'if one of them is hungry or thirsty, and especially if the other has its crop full ... it immediately asks for food'. The individual

6. George J. Romanes's *Animal Intelligence,* 1st ed., p. **233.**

7. Pierre Huber's *Les fourmis indigènes,* Geneva, **1861;** Forel's *Recherches sur les fourmis de la Suisse,* Zurich, **1874,** and J. T. Moggridge's *Harvesting Ants and Trapdoor Spiders,* London, **1873** ° ° d **'874,** ought to be in the hands of every boy and girl. See also: Blanchard's *Métamorphoses des Insectes,* Paris, **1868;** J. H. Fabre's *Souvenirs entomologiques,* Paris, **1866;** Ebrard's *Études des mœurs des fourmis,* Geneva, **1864;** Sir John Lubbock's *Ants, Bees, and Wasps,* and so on.

thus requested never refuses; it sets apart its mandibles, takes a proper position, and regurgitates a drop of transparent fluid which is licked up by the hungry ant. Regurgitating food for other ants is so prominent a feature in the life of ants (at liberty), and it so constantly recurs both for feeding hungry comrades and for feeding larvae, that Forel considers the digestive tube of the ants as consisting of two different parts, one of which, the posterior, is for the special use of the individual, and the other, the anterior part, is chiefly for the use of the community. If an ant which has its crop full has been selfish enough to refuse feeding a comrade, it will be treated as an enemy, or even worse. If the refusal has been made while its kinsfolk were fighting with some other species, they will fall back upon the greedy individual with greater vehemence than even upon the enemies themselves. And if an ant has not refused to feed another ant belonging to an enemy species, it will be treated by the kinsfolk of the latter as a friend. All this is confirmed by most accurate observation and decisive experiments.[8]

In that immense division of the animal kingdom which embodies more than one thousand species, and is so numerous that the Brazilians pretend that Brazil belongs to the ants, not to men, competition amidst the members of the same nest, or the colony of nests, does not exist. However terrible the wars between different species, and whatever the atrocities committed at war-time, mutual aid within the community, self-devotion grown into a habit, and very often self-sacrifice for the common welfare, are the rule. The ants and termites have renounced the 'Hobbesian war', and they are the better for it. Their wonderful nests, their buildings, superior in relative size to those of man; their paved roads and overground vaulted galleries; their spacious halls and granaries; their cornfields, harvesting and 'malting' of grain;[9] their rational methods of

8. Forel's *Recherches,* pp. **244, 275, 278.** Huber's description of the process is admirable. It also contains a hint as to the possible origin of the instinct (popular edition, pp. **158, 160).** See Appendix **2.**

9. The agriculture of the ants is so wonderful that for a long time it has been doubted. The fact is now so well proved by Mr Moggridge, Dr Lincecum, Mr MacCook, Col. Sykes and Dr Jerdon, that no doubt is possible. See an excellent summary of evidence in Mr Romanes's work. See also *Die Pilzgaerten einiger Sud-Amerikanischen Ameisen,* by Alf. Moeller, in Schimper's *Botan. Mitth. aus den Tropen,* vi, **1893.**

nursing their eggs and larvae, and of building special nests for rearing the aphides whom Linnaeus so picturesquely described as 'the cows of the ants'; and, finally, their courage, pluck, and superior intelligence — all these are the natural outcome of the mutual aid which they practise at every stage of their busy and laborious lives. That mode of life also necessarily resulted in the development of another essential feature of the life of ants: the immense development of individual initiative which, in its turn, evidently led to the development of that high and varied intelligence which cannot but strike the human observer.[10]

If we knew no other facts from animal life than what we know about the ants and the termites, we already might safely conclude that mutual aid (which leads to mutual confidence, the first condition for courage) and individual initiative (the first condition for intellectual progress) are two factors infinitely more important than mutual struggle in the evolution of the animal kingdom. In fact, the ant thrives without having any of the 'protective' features which cannot be dispensed with by animals living an isolated life. Its colour renders it conspicuous to its enemies, and the lofty nests of many species are conspicuous in the meadows and forests. It is not protected by a hard carapace, and its stinging apparatus, however dangerous when hundreds of stings are plunged into the flesh of an animal, is not of a great value for individual defence; while the eggs and larvae of the ants are a dainty for a great number of the inhabitants of the forests. And yet the ants, in their thousands, are not much destroyed by the birds, not even by the ant-eaters, and they are dreaded by most stronge.r insects. When Forel emptied a bagful of ants in a meadow, he saw that' the crickets ran away, abandoning their holes to be sacked by the ants; the grasshoppers and the crickets fled in all directions; the spiders and the beetles abandoned their prey in order not to become prey themselves'; even the nests of the wasps were taken by the ants, after a battle during which many ants perished for the safety of the commonwealth. Even the swiftest

10. This second principle was not recognized at once. Former observers often spoke of kings, queens, managers, and so on; but since Huber and Forel have published their minute observations, no doubt is possible as to the free scope left for every individual's initiative in whatever the ants do, including their wars.

insects cannot escape, and Forel often saw butterflies, gnats, flies, and so on, surprised and killed by the ants. Their force is in mutual support and mutual confidence. And if the ant - apart from the still higher developed termites — stands at the very top of the whole class of insects for its intellectual capacities; if its courage is only equalled by the most courageous vertebrates; and if its brain - to use Darwin's words — 'is one of the most marvellous atoms of matter in the world, perhaps more so than the brain of man', is it not due to the fact that mutual aid has entirely taken the place of mutual struggle in the communities of ants?

The same is true as regards the bees. These small insects, which so easily might become the prey of so many birds, and whose honey has so many admirers in all classes of animals from the beetle to the bear, also have none of the protective features derived from mimicry or otherwise,* without which an isolatedly-living insect hardly could escape wholesale destruction; and yet, owing to the mutual aid they practise, they obtain the wide extension which we know and the intelligence we admire. By working in common they multiply their individual forces; by resorting to a temporary division of labour combined with the capacity of each bee to perform every kind of work when required, they attain such a degree of well-being and safety as no isolated animal can ever expect to achieve, however strong or well-armed it may be. In their combinations they are often more successful than man, when he neglects to take advantage of a well-planned mutual assistance. Thus, when a new swarm of bees is going to leave the hive in search of a new abode, a number of bees will make a preliminary exploration of the neighbourhood, and if they discover a convenient dwelling-place - say, an old basket, or anything of the kind - they will take possession of it, clean it, and guard it, sometimes for a whole week, till the swarm comes to settle therein. But how many human settlers will perish in new countries simply for not having understood the necessity of combining their efforts! By combining their individual intelligences they succeed in coping with adverse circumstances,

* In a footnote to the last Russian edition Kropotkin explains that, while many animals are able to blend with their surroundings, such is not the case with bees or ants, whose black colour prevents them from concealing themselves from their enemies. - *Ed.*

even quite unforeseen and unusual, like those bees of the Paris Exhibition which fastened with their resinous propolis the shutter to a glass-plate fitted in the wall of their hive. Besides, they display none of the sanguinary proclivities and love of useless fighting with which many writers so readily endow animals. The sentries which guard the entrance to the hive pitilessly put to death the robbing bees which attempt to enter the hive; but those stranger bees which come to the hive by mistake are left unmolested, especially if they come laden with pollen, or are young individuals which can easily go astray. There is no more warfare than is strictly required.

The sociability of the bees is the more instructive as predatory instincts and laziness continue to exist among the bees as well, and reappear each time that their growth is favoured by some circumstances. It is well known that there always are a number of bees which prefer a life of robbery to the laborious life of a worker; and that both periods of scarcity and periods of an unusually rich supply of food lead to an increase of the robbing class. When our crops are in and there remains but little to gather in our meadows and fields, robbing bees become of more frequent occurrence; while, on the other side, about the sugar plantations of the West Indies and the sugar refineries of Europe, robbery, laziness, and very often drunkenness become quite usual with the bees. We thus see that antisocial instincts continue to exist amidst the bees as well; but natural selection continually must eliminate them, because in the long run the practice of solidarity proves much more advantageous to the species than the development of individuals endowed with predatory inclinations. The cunningest and the shrewdest are elimi lated in favour of those who understand the advantages of sociable life and mutual support.

Certainly, neither the ants, nor the bees, nor even the termites, have risen to the conception of a higher solidarity embodying the whole of the species. In that respect they evidently have not attained a degree of development which we do not find even among our political, scientific and religious leaders. Their social instincts hardly extend beyond the limits of the hive or the nest. However, colonies of no less than two hundred nests, belonging to two different species *{Formica exsecta* and *F. pressilabris)* have been described by Forel on Mount Tendre and Mount Saleve; and Forel

maintains that each member of these colonies recognizes every other member of the colony, and that they all take part in common defence; while in Pennsylvania Mr MacCook saw a whole nation of from 1,600 to 1,700 nests of the mound-making ant, all living in perfect intelligence; and Mr Bates has described the hillocks of the termites covering large surfaces in the 'campos' - some of the nests being the refuge of two or three different species, and most of them being connected by vaulted galleries or arcades.[11] Some steps towards the amalgamation of larger divisions of the species for purposes of mutual protection are thus met with even among the invertebrate animals.

Going now over to higher animals, we find far more instances of undoubtedly conscious mutual help for all possible purposes, though we must recognize at once that our knowledge even of the life of higher animals still remains very imperfect. A large number of facts have been accumulated by first-rate observers, but there are whole divisions of the animal kingdom of which we know almost nothing. Trustworthy information as regards fishes is extremely scarce, partly owing to the difficulties of observation, and partly because no proper attention has yet been paid to the subject. As to the mammalia, Kessler already remarked how little we know about their manners of life. Many of them are nocturnal in their habits; others conceal themselves underground; and those ruminants whose social life and migrations offer the greatest interest do not let man approach their herds. It is chiefly upon birds that we have the widest range of information, and yet the social life of very many species remains but imperfectly known. Still, we need not complain about the lack of well-ascertained facts, as will be seen from the following.

I need not dwell upon the associations of male and female for rearing their offspring, for providing it with food during their first steps in life, or for hunting in common; though it may be mentioned by the way that such associations are the rule even with the least sociable carnivores and rapacious birds; and that they derive a special interest from being the field upon which tenderer feelings develop even amidst otherwise most cruel animals. It may also be

11. H. W. Bates, *The Naturalist on the River Amazon,* ii, 59 ff.

added that the rarity of associations larger than that of the family among the carnivores and the birds of prey, though mostly being the result of their very modes of feeding, can also be explained to some extent as a consequence of the change produced in the animal world by the rapid increase of mankind. At any rate it is worthy of note that there are species living a quite isolated life in densely-inhabited regions, while the same species, or their nearest congeners, are gregarious in uninhabited countries. Wolves, foxes, and several birds of prey may be quoted as instances in point.

However, associations which do not extend beyond the family bonds are of relatively small importance in our case, the more so as we know numbers of associations for more general purposes, such as hunting, mutual protection, and even simple enjoyment of life. Audubon already mentioned that eagles occasionally associate for hunting, and his description of the two bald eagles, male and female, hunting on the Mississippi, is well known for its graphic powers. But one of the most conclusive observations of the kind belongs to Syevertsoff. Whilst studying the fauna of the Russian Steppes, he once saw an eagle belonging to an altogether gregarious species (the white-tailed eagle, *Haliaetos albicilld)* rising high in the air; for half an hour it was describing its wide circles in silence when at once its piercing voice was heard. Its cry was soon answered by another eagle which approached it, and was followed by a third, a fourth, and so on, till nine or ten eagles came together and soon disappeared. In the afternoon, Syevertsoff went to the place where-to he saw the eagles flying; concealed by one of the undulations of the Steppe, he approached them, and discovered that they had gathered around the corpse of a horse. The old ones, which, as a rule, begin the meal first — such are their rules of propriety — already were sitting upon the haystacks of the neighbourhood and kept watch, while the younger ones were continuing the meal, surrounded by bands of crows. From this and like observations, Syevertsoff concluded that the white-tailed eagles combine for hunting; when they all have risen to a great height they are enabled, if they are ten, to survey an area of at least twenty-five miles square; and as soon as any one has discovered something, he warns the others.[12] Of

12. N. Syevertsoff, *Periodical Phenomena in the Life of Mammalia, Birds, and Reptiles of Voroneje,* Moscow, **1855** (in Russian).

course, it might be argued that a simple instinctive cry of the first eagle, or even its movements, would have had the same effect of bringing several eagles to the prey; but in this case there is strong evidence in favour of mutual warning, because the ten eagles came together before descending towards the prey, and Syevertsoff had later on several opportunities of ascertaining that the white-tailed eagles always assemble for devouring a corpse, and that some of them (the younger ones first) always keep watch while the others are eating. In fact, the white-tailed eagle — one of the bravest and best hunters — is a gregarious bird altogether, and Brehm says that when kept in captivity it very soon contracts an attachment to its keepers.

Sociability is a common feature with very many other birds of prey. The Brazilian kite, one of the most 'impudent' robbers, is nevertheless a most sociable bird. Its hunting associations have been described by Darwin and other naturalists, and it is a fact that when it has seized upon a prey which is too big, it calls together five or six friends to carry it away. After a busy day, when these kites retire for their night-rest to a tree or to the bushes, they always gather in bands, sometimes coming together from distances of ten or more miles, and they often are joined by several other vultures, especially the percnopters, 'their true friends', D'Orbigny says. In another continent, in the Transcaspian deserts, they have, according to Zarudnyi, the same habit of nesting together. The sociable vulture, one of the strongest vultures, has received its very name from its love of society. They live in numerous bands, and decidedly enjoy society; numbers of them join in their high flights for sport. 'They live in very good friendship,' Le Vaillant says, 'and in the same cave I sometimes found as many as three nests close together.'[13] The Urubu vultures of Brazil are as, or perhaps even more, sociable than rooks.[14] The little Egyptian vultures live in close friendship. They play in bands in the air, they come together to spend the night, and in the morning they all go together to search for their food, and never does the slightest quarrel arise among them; such is the testimony of Brehm, who had plenty of opportunities of observ-

13. A. Brehm, *Life of Animals,* iii, **477;** all quotations after the French edition.

14. Bates, p. 151.

ing their life. The red-throated falcon is also met with in numerous bands in the forests of Brazil, and the kestrel *(Tinnunculus cenchris),* when it has left Europe, and has reached in the winter the prairies and forests of Asia, gathers in numerous societies. In the Steppes of South Russia it is (or rather was) so sociable that Nordmann saw them in numerous bands, with other falcons *{Falco tinnunculus, F. oesulon,* and *F. subbuteo),* coming together every fine afternoon about four o'clock, and enjoying their sports till late in the night. They set off flying, all at once, in a quite straight line, towards some determined point, and, having reached it, immediately returned over the same line, to repeat the same flight.[15]

To take flights in flocks for the mere pleasure of the flight, is quite common among all sorts of birds. 'In the Humber district especially,' C. Dixon writes, 'vast flights of dunlins often appear upon the mud-flats towards the end of August, and remain for the winter.... The movements of these birds are most interesting, as a vast flock wheels and spreads out or closes up with as much precision as drilled troops. Scattered among them are many odd stints and sanderlings and ringed-plovers.'[16]

It would be quite impossible to enumerate here the various hunting associations of birds; but the fishing associations of the pelicans are certainly worthy of notice for the remarkable order and intelligence displayed by these clumsy birds. They always go fishing in numerous bands, and after having chosen an appropriate bay, they form a wide half-circle in face of the shore, and narrow it by paddling towards the shore, catching all fish that happen .to be enclosed in the circle. On narrow rivers and canals they even divide into two parties, each of which draws up on a half-circle, and both paddle to meet each other, just as if two parties of men dragging two long nets should advance to capture all fish taken between the nets when both parties come to meet. As the night comes they fly to their resting-places - always the same for each flock — and no one

15. *Catalogue raisonne des oiseaux de lafaunepontique,* in Démidoflf's *Voyage;* abstracts in Brehm, iii, **360.** During their migrations birds of prey often associate. One flock, which H. Seebohm saw crossing the Pyrenees, represented a curious assemblage of 'eight kites, one crane, and a peregrine falcon' *(The Birds of Siberia,* **1901,** p. **417).**

16. *Birds in the Northern Shires,* p. **207.**

has ever seen them fighting for the possession of either the bay or the resting-place. In South America they gather in flocks of from forty to fifty thousand individuals, part of which enjoy sleep while the others keep watch, and others again go fishing.[17] And finally, I should be doing an injustice to the much-calumniated house-sparrows if I did not mention how faithfully each of them shares any food it discovers with all members of the society to which it belongs. The fact was known to the Greeks, and it has been transmitted to posterity how a Greek orator once exclaimed (I quote from memory): 'While I am speaking to you a sparrow has come to tell to other sparrows that a slave has dropped on the floor a sack of corn, and they all go there to feed upon the grain.' The more one is pleased to find this observation of old confirmed in a recent little book by Mr Gurney, who does not doubt that the house-sparrows always inform each other as to where there is some food to steal; he says, 'When a stack has been threshed ever so far from the yard, the sparrows in the yard have always had their crops full of the grain.'[18] True, the sparrows are extremely particular in keeping their domains free from the invasions of strangers; thus the sparrows of the Jardin du Luxembourg bitterly fight all other sparrows which may attempt to enjoy their turn of the garden and its visitors; but within their own communities they fully practise mutual support, though occasionally there will be of course some quarrelling even amongst the best friends.

Hunting and feeding in common is so much the habit in the feathered world that more quotations hardly would be needful: it must be considered as an established fact. As to the force derived from such associations, it is self-evident. The strongest birds of prey are powerless in face of the associations of our smallest bird pets. Even eagles — even the powerful and terrible booted eagle, and the martial eagle, which is strong enough to carry away a hare or a young antelope in its claws — are compelled to abandon their prey to bands of those beggars the kites, which give the eagle a regular

17. Max. Perty, *Ueber das Seelenleben der Thiere,* Leipzig, **1876,** pp. **87, 103.*** * In the Russian edition of **1922** Kropotkin notes that Brehm, on the basis of personal observation, gives an excellent description of these 'intelligent and extremely peace-loving birds'. - *Ed.*

18. G. H. Gurney, *The House-Sparrow,* London, **1885,** p. **5.**

chase as soon as they see it in possession of a good prey. The kites will also give chase to the swift fishing-hawk, and rob it of the fish it has captured; but no one ever saw the kites fighting together for the possession of the prey so stolen. On the Kerguelen Island, Dr Coues saw the *Buphagus* — the sea-hen of the sealers - pursue gulls to make them disgorge their food, while, on the other side, the gulls and the terns combined to drive away the sea-hen as soon as it came near to their abodes, especially at nesting-time.[19] The little, but extremely swift lapwings (*Vanellus cristatus)* boldly attack the birds of prey. ' To see them attacking a buzzard, a kite, a crow, or an eagle, is one of the most amusing spectacles. One feels that they are sure of victory, and one sees the anger of the bird of prey. In such circumstances they perfectly support one another, and their courage grows with their numbers. '[20] The lapwing has well merited the name of a 'good mother' which the Greeks gave to it, for it never fails to protect other aquatic birds from the attacks of their enemies. But even the little white wagtails *(Motacilla alba),* whom we well know in our gardens and whose whole length hardly attains eight inches, compel the sparrow-hawk to abandon its hunt. T often admired their courage and agility,' the old Brehm wrote, 'and I am persuaded that the falcon alone is capable of capturing any of them. ... When a band of wagtails has compelled a bird of prey to retreat, they make the air resound with their triumphant cries, and after that they separate.' They thus come together for the special purpose of giving chase to their enemy, just as we see it when the whole bird-population of a forest has been raised by the news that a nocturnal bird has made its appearance during the day, and all together — birds of prey and small inoffensive singers — set to chase the stranger and make it return to its concealment.

What an immense difference between the force of a kite, a buzzard or a hawk, and such small birds as the meadow-wagtail; and yet these little birds, by their common action and courage, prove superior to the powerfully winged and armed robbers! In Europe, the wagtails not only chase the birds of prey which might be dangerous to them, but they chase also the fishing-hawk 'rather

19. Dr Elliot Coues, *Birds of the Kerguelen Island,* in Smithsonian Miscellaneous Collections, vol. xiii, No. **2,** p. **11.**

20. Brehm, iv, 567.

for fun than for doing it any harm'; while in India, according to Dr Jerdon's testimony, the jackdaws chase the gowinda-kite 'for simple matter of amusement'. Prince Wied saw the Brazilian eagle *urubitinga* surrounded by numberless flocks of toucans and cassiques (a bird nearly akin to our rook), which mocked it. 'The eagle,' he adds, 'usually supports these insults very quietly, but from time to time it will catch one of these mockers.' In all such cases the little birds, though very much inferior in force to the bird of prey, prove superior to it by their common action.[21]

However, the most striking effects of common life for the security of the individual, for its enjoyment of life, and for the development of its intellectual capacities, are seen in two great families of birds, the cranes and the parrots. The cranes are extremely sociable and live in most excellent relations, not only with their congeners, but also with most aquatic birds. Their prudence is really astonishing, so also their intelligence; they grasp the new conditions in a moment, and act accordingly. Their sentries always keep watch around a flock which is feeding or resting, and the hunters know well how difficult it is to approach them. If man has succeeded in surprising them, they will never return to the same place without having sent out one single scout first, and a party of scouts afterwards; and when the reconnoitring party returns and reports that there is no danger, a second group of scouts is sent out to verify the first report, before the whole band moves. With kindred species the cranes contract real friendship; and in captivity there is no bird, save the also sociable and highly intelligent parrot, which enters into such real friendship with man. 'It sees in man, not a master, but a friend, and endeavours to manifest it,' Brehm concludes from a wide personal experience. The crane is in continual

21. As to the house-sparrows, a New Zealand observer, Mr T. W. Kirk, described as follows the attack of these 'impudent' birds upon an 'unfortunate' hawk: 'He heard one day a most unusual noise, as though all the small birds of the country had joined in one grand quarrel. Looking up, he saw a large hawk *(C. gouldi* — a carrion feeder) being buffeted by a flock of sparrows. They kept dashing at him in scores, and from all points at once. The unfortunate hawk was quite powerless. At last, approaching some scrub, the hawk dashed into it and remained there, while the sparrows congregated in groups round the bush, keeping up a constant chattering and noise' (Paper read before the New Zealand Institute; *Nature,* to October **1891).**

activity from early in the morning till late in the night; but it gives a few hours only in the morning to the task of searching its food, chiefly vegetable. All the remainder of the day is given to society life. 'It picks up small pieces of wood or small stones, throws them in the air and tries to catch them; it bends its neck, opens its wings, dances, jumps, runs about, and tries to manifest by all means its good disposition of mind, and always it remains graceful and beautiful.'[22] As it lives in society it has almost no enemies, and though Brehm occasionally saw one of them captured by a crocodile, he wrote that except for the crocodile he knew no enemies of the crane. It eschews all of them by its proverbial prudence; and it attains, as a rule, a very old age. No wonder that for the maintenance of the species the crane need not rear a numerous offspring; it usually hatches but two eggs. As to its superior intelligence, it is sufficient to say that all observers are unanimous in recognizing that its intellectual capacities remind one very much of those of man.

The other extremely sociable bird, the parrot, stands, as known, at the very top of the whole feathered world for the development of its intelligence. Brehm has so admirably summed up the manners of life of the parrot, that I cannot do better than translate the following sentence:

> Except in the pairing season, they live in very numerous societies or bands. They choose a place in the forest to stay there, and thence they start every morning for their hunting expeditions. The members of each band remain faithfully attached to each other, and they share in common good or bad luck. All together they repair in the morning to a field, or to a garden, or to a tree, to feed upon fruits. They post sentries to keep watch over the safety of the whole band, and are attentive to their warnings. In case of danger, all take to flight, mutually supporting each other, and all simultaneously return to their resting-place. In a word, they always live closely united.

They enjoy the society of other birds as well. In India, the jays and crows come together from many miles round, to spend the night in company with the parrots in the bamboo thickets. When the parrots start hunting, they display the most wonderful intelligence, prudence, and capacity of coping with circumstances. Take,

22. Brehm, iv, **671** f.

for instance, a band of white cacadoos in Australia. Before starting to plunder a corn-field, they first send out a reconnoitring party which occupies the highest trees in the vicinity of the field, while other scouts perch upon the intermediate trees between the field and the forest and transmit the signals. If the report runs 'All right,' a score of cacadoos will separate from the bulk of the band, take a flight in the air, and then fly towards the trees nearest to the field. They also will scrutinize the neighbourhood for a long while, and only then will they give the signal for general advance, after which the whole band starts at once and plunders the field in no time. The Australian settlers have the greatest difficulties in beguiling the prudence of the parrots; but if man, with all his art and weapons, has succeeded in killing some of them, the cacadoos become so prudent and watchful that they henceforward baffle all stratagems.[23]

There can be no doubt that it is the practice of life in society which enables the parrots to attain that very high level of almost human intelligence and almost human feelings which we know in them. Their high intelligence has induced the best naturalists to describe some species, namely the grey parrot, as the 'bird-man'. As to their mutual attachment it is known that when a parrot has been killed by a hunter, the others fly over the corpse of their comrade with shrieks of complaints and ' themselves fall the victims of their friendship', as Audubon said; and when two captive parrots, though belonging to two different species, have contracted mutual friendship, the accidental death of one of the two friends has sometimes been followed by the death from grief and sorrow of the other friend. It is no less evident that in their societies they find infinitely more protection than they possibly might find in any ideal development of beak and claw. Very few birds of prey or mammals dare attack any but the smaller species of parrots, and Brehm is absolutely right in saying of the parrots, as he also says of the cranes and the sociable monkeys, that they hardly have any enemies besides men; and he adds: 'It is most probable that the larger parrots succumb chiefly to old age rather than die from the claws of any enemies.' Only man, owing to his still more superior intelligence and weapons, also derived from association, succeeds in partially destroying them. Their very longevity would thus appear as a result

23. R. Lendenfeld, in *Der zoologische Garten*, 1889.

of their social life. Could we not say the same as regards their wonderful memory, which also must be favoured in its development by society-life and by longevity accompanied by a full enjoyment of bodily and mental faculties till a very old age?

As seen from the above, the war of each against all is not *the* law of nature. Mutual aid is as much a law of nature as mutual struggle, and that law will become still more apparent when we have analysed some other associations of birds and those of the mammalia. A few hints as to the importance of the law of mutual aid for the evolution of the animal kingdom have already been given in the preceding pages; but their purport will still better appear when, after having given a few more illustrations, we shall be enabled presently to draw therefrom our conclusions.