

## MUTUAL AID AMONG ANIMALS.

### I.

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 generalisation, which soon became the very basis of our philosophical, biological, and sociological speculations. All that immense variety of adaptations of function and structure of organic beings to their surroundings, of physiological and anatomical evolution, of intellectual progress, and moral development which we formerly used to explain by so many different causes, was embodied by Darwin in one general conception of continued endeavours—of struggle against adverse circumstances—for such a development of individuals, races, species and societies, as would result in the greatest possible fulness, variety, and intensity of life. It may be that Darwin himself was not fully aware at the outset 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.’<sup>1</sup>

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 *co-operation*, 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

<sup>1</sup> *Origin of Species*, chap. iii.

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 edit., 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 civilised societies (ch. v.). 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 emphasised in those same chapters of the *Descent of Man*.

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 vulgarisers, we must recognise that even the most authorised exponents of Darwin's views did their

best to maintain those false ideas. In the animal world, who certainly is considered as one of the animals, the animals of evolution, are we not taught by him, in the name of the struggle for Existence and its Bearing upon Man,

from the point of view of the moralist, the animal world is a gladiators' show. The creatures are fairly well fitted to the strongest, the swiftest, and the cunningest. The spectator has no need to turn his thumb down, as

Or, further down in the same article, dealing with the animals among animals, so among primitive men

the weakest and stupidest went to the wall, while those who were best fitted to cope with their competitors, in another way, survived. Life was a continuous struggle, and temporary relations of the family, the Hobbesian, were the normal state of existence.<sup>2</sup>

In how far this view of nature is supported by the evidence which will be hereafter given, regards the animal world and, on another point, primitive man. But it may be remarked that the view of nature has as little claim to be taken as the opposite view of Rousseau, who saw peace, and harmony destroyed by the animals. The first walk in the forest, the first observation, or even the perusal of any serious work on the life of animals, and prevent him from seeing but a field of slaughter, just as this work on nature nothing but harmony and peace. The error of excluding the beak-and-claw struggle, and Mr. Huxley is committing the error of Rousseau's optimism nor Mr. Huxley's pessimism, an impartial interpretation of nature.

As soon as we study animals—not only in the forest and the plain, but in the mountains—we at once perceive that there is an amount of warfare and extermination, and especially amidst various classes of animals, at any time, as much, or perhaps even more, than mutual defence amidst animals belonging to at least, to the same society. Social life is based on mutual struggle. Of course it is not to be estimated, however roughly, the relative importance of these series of facts. But if we res

<sup>2</sup> *Nineteenth Century*, 1890.

best to maintain those false ideas. In fact, if we take Mr. Huxley, who certainly is considered as one of the ablest exponents of the theory of evolution, are 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, does 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.<sup>2</sup>

In how far this view of nature is supported by fact, will be seen from the evidence which will be here submitted to the reader as regards the animal world and, on another occasion, as regards primitive man. But it may be remarked at once that Mr. Huxley's view of nature has 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 has committed the error of excluding the beak-and-claw fight from his thoughts; and Mr. Huxley is committing the opposite error; but neither Rousseau's optimism nor Mr. 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

<sup>2</sup> *Nineteenth Century*, Feb. 1888, p. 165.

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 organisation. 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 of evolution, 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 meeting of Russian naturalists; but, like so many good things published in the Russian tongue only, that remarkable address remains almost entirely unknown.<sup>3</sup>

'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 in-

<sup>3</sup> Leaving aside the pre-Darwinian writers, like Toussenel, Fée, 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 facultés mentales des animaux*, 2 vols., Brussels, 1872; L. Büchner's *Aus dem Geistesleben der Thiere*, 2nd ed. in 1877; and Maximilian Perty's *Ueber das Seelenleben der Thiere*, Leipzig, 1876. Espinas published his most remarkable work, *Les Sociétés animales*, 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 Kessler was a zoologist by profession, and especially 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, Büchner published another work, *Liebe und Liebes-Leben in der Thierwelt*, a second edition of which was issued in 1885. The idea, as seen, is in the air.

dividuals keep together, the more they mutually aid each other, and the more are the chances of the species for making further progress in its intellectual development. 'In the classes of animals,' he continued, 'and especially in the lower classes, practise mutual aid,' and he illustrated his idea from the life of the burying beetles and the social life of some mammalia. The examples were few, as I pointed out in a short opening address, but the chief idea was stated; and, after pointing out that in the evolution of mutual aid played a still more prominent part, he concluded as follows:—

I obviously do not deny the struggle for existence, but I believe that the progressive development of the animal kingdom, and especially the progress of the higher species, is favoured much more by mutual support than by mutual struggle. All beings have two essential needs: that of nutrition, and that of maintaining the species. The former brings them to a struggle and to mutual aid, the latter to mutual support. The needs of maintaining the species bring them to support one another. But I am inclined to think that in the organic world—in the progressive modification of organic life—mutual aid among individuals plays a much more important part than the struggle for existence.

The correctness of the above views struck me, and was supported by the zoologists present, and Syevertoff, whose work on the habits of ornithologists and geographers, supported them. He mentioned some of the species which have 'an almost ideal organisation for mutual aid, while others are in decay, while other species practising mutual aid are in decay. Take on the other side a sociable bird, the duck, which is organised on the whole, but it practises mutual aid, and it invades the earth, as may be judged from its habits and species.'

The readiness of the Russian zoologists to accept these views seems quite natural, because nearly all of them had spent their years of studying the animal world in the wide territories of Northern Asia and East Russia; and it is impossible to escape the impression produced upon me by the animal world when I explored the Vitim regions in the Far East, which was accomplished by a zoologist as my friend Polyakoff was. The fresh impression of the *Origin of Species* was renewed for the keen competition between animals of the same species. The reading of Darwin's work had prepared us to take into account the remarks of the third volume (in a small edition). We saw plenty of adaptation to the environment often in common, against the adverse circumstances, and Polyakoff wrote me

<sup>4</sup> *Memoirs (Trudy) of the St. Petersburg Society of Naturalists*, VOL. XXVIII.—No. 163.

dividuals 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 pointing out 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.<sup>4</sup>

The correctness of the above views struck most of the Russian zoologists present, and Syvertsoff, 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 organisation for robbery,' and nevertheless are in decay, while other species practising mutual help do thrive. 'Take on the other side a sociable bird, the duck,' he said; 'it is poorly organised 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 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 of the small edition). 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

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

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 our notice, though we 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 recognised 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, most wonderful facts of mutual aid, 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 may glean a few facts of well-ascertained co-operation. The numberless associations of locusts, vanessæ, cicindelæ, cicadæ, and so on, are practically quite unknown; 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. 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 larvæ 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 or-

ganisation we may find like examples. In the Indies and North America combine in large numbers to come to the sea and to deposit therein their spawn. The fact implies concert, co-operation, and mutual support. In the case of the crab (*Limulus*), I was struck (in 1882, at least) with the extent of mutual assistance which it is capable of bestowing upon a comrade in case of need. It had fallen upon its back in a corner of the tank, and its pan-like carapace prevented it from returning to its feet the more so as there was in the corner another crab, the task still more difficult. Its comrades came to its aid. An hour's time I watched how they endeavoured to free the prisoner. They came two at once, pushed the crab, and after strenuous efforts succeeded in turning it over. The iron bar would prevent them from approaching the crab, and the crab would again heavily fall upon its back. In such attempts, one of the helpers would go in, push the crab, bring two other crabs, which would begin to push and lifting of their helpless comrade. I watched in the Aquarium for more than two hours, and, when I had to cast a glance upon the tank: the work was done. Since I saw that, I cannot refuse credit to the theory of Erasmus Darwin—namely, that 'the comrade in the coming season stations as sentinel an unmolested comrade to prevent marine enemies from injuring the unprotected state.'<sup>5</sup>

Facts illustrating mutual aid amidst the bees are so well known to the general public that the works of Mr. Romanes, L. Büchner, and others may limit my remarks to a very few hints. We not only see that every description of the life of the bees, foraging, building, rearing of aphides, and so on, is in accordance with the principles of voluntary mutual aid. It is, with Forel, that the chief, the *Landmutter*, of many species of ants is the fact and the chief of the community, sharing its food, already swallowed and digested, with every member of the community which may belong to two different species or to two different colonies. Members occasionally meet together, will avoid

<sup>5</sup> George J. Romanes's *Animal Intelligence*, 1882.

<sup>6</sup> Forel's *Recherches sur les fourmis de la Suisse*, 1885; *Harvesting Ants and Trapdoor Spiders*, London, 1885; ought to be in the hands of every boy and girl. See also *des Insectes*, Paris, 1868; J. H. Fabre's *Souvenirs d'un entomologiste*, Paris, 1880; Ebrard's *Études des mœurs des fourmis*, Genève, 1810; Sir John Lubbock's *Ants*, London, 1890.

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ganisation 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, co-operation, 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 saucer-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 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.'<sup>5</sup>

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 Mr. Romanes, L. Büchner, and Sir John Lubbock, that I may limit my remarks to a very few hints.<sup>6</sup> 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 recognise, 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

<sup>5</sup> George J. Romanes's *Animal Intelligence*, 1st ed. p. 233.

<sup>6</sup> Forel's *Recherches sur les fourmis de la Suisse*, Zurich, 1874, and J. T. Moggridge's *Harvesting Ants and Trapdoor Spiders*, London, 1873 and 1874, adapted for youth, 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, 1886; Ebrard's *Études des mœurs des fourmis*, Genève, 1864; Pierre Huber's *Les fourmis indignées*, Genève, 1810; Sir John Lubbock's *Ants, Bees, and Wasps*, and so on.

belonging to the same nest or to the same colony of nests will approach each other, exchange a few movements with the antennæ, 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 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 larvæ, 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.<sup>7</sup>

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 over-ground vaulted galleries; their spacious halls and granaries; their corn-fields, harvesting and 'malting' of grain;<sup>8</sup> their rational methods of nursing their eggs and larvæ, and of rearing the aphides whom Linnæus 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,

<sup>7</sup> Forel's *Recherches*, pp. 244, 275, 278.

<sup>8</sup> 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.

in its turn, evidently led to the development of intelligence which cannot but strike the

If we knew no other facts from animal life about the ants and the termites, we should be struck by that mutual aid (which leads to mutual cooperation for courage) and individual initiative (which leads to intellectual progress) are two factors infinitely more important than mutual struggle in the evolution of the ant. The ant thrives without having any of the qualities which cannot be dispensed with by animals living in a community. It renders it conspicuous to its enemies, and its species are conspicuous in the meadows. It is protected by a hard carapace, and its stings are so dangerous when hundreds of stings are present. The animal, is not of a great value for individual life, and larvæ of the ants are a dainty for a great number of the ants of the forests. And yet the ants, which are much destroyed by the birds, not even by the birds, are dreaded by most stronger insects. When a man full of ants in a meadow, he saw that 'the ants were digging their holes to be sacked by the ants' and the crickets fled in all directions; the spiders hid their prey in order not to become prey themselves; the wasps were taken by the ants, after a great number of ants perished for the safety of the common good; insects cannot escape, and Forel often saw a wasp, so on, surprised and killed by the ants. The ants support and mutual confidence. And if the ants are higher developed termites—stands at the head of insects for its intellectual capacities; if it is protected by the most courageous vertebrates; and if it is a word—'is one of the most marvellous atoms of nature, perhaps more so than the brain of man,' that mutual aid has entirely taken the place of the communities of ants?

The same is true as regards the bees. The bee so easily might become the prey of so many enemies, has so many admirers in all classes of animals, and bears, also have none of the protective features.

<sup>9</sup> This second principle was not recognised at first. It was only by the minute observations, no doubt is possible as to the part played by the individual's initiative in whatever the ants do. As to the part played by the initiative of the individual, so well illustrate the part played by the initiative of the individual groups, one would be inclined to suppose that the influence of Tolstoi's works, if his epoch-making work was as early as 1874, when Tolstoi was quite unknown in



of nests will approach antennæ, and 'if one then has its crop full it thus requested proper position, and is licked up by the prominent a feature recurs both for feed- Forel considers the different parts, one of individual, and the the community. If enough to refuse or even worse. If fighting with some dy individual with themselves. And nging to an enemy latter as a friend. tion and decisive

om which embodies umerous that the ants, not to men, t, or the colony of between different war-time, mutual into a habit, and are, are the rule. obbesian war,' and ts, their buildings, ved roads and over- d granaries; their irrational methods he aphides whom of the ants;' and, ence—all these are y practise at every of life also neces- tial feature of the al initiative which,

long time it has been Dr. Lincecum, Mr. See an excellent sum-

in its turn, evidently led to the development of that high and varied intelligence which cannot but strike the human observer.<sup>9</sup>

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 larvæ 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 stronger 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 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

<sup>9</sup> This second principle was not recognised at once. Former observers often spoke of kings, queens, managers, and so on; but since Forel has published his minute observations, no doubt is possible as to the free scope left for every individual's initiative in whatever the ants do. As to the 'war-studies' of Forel, which so well illustrate the part played by the initiative of separate individuals and small groups, one would be inclined to suppose that the Swiss Professor wrote them under the influence of Tolstoi's works, if his epoch-making researches had not been published as early as 1874, when Tolstoi was quite unknown in Europe.

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 achieve 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. Their combinations achieve what man often fails to achieve if 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 an appropriate 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, 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 entering 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 anti-social 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 inclina-

tions. The cunningest and the shrewdest are those who understand the advantages of social support.

Certainly, neither the ants, nor the bees, nor have risen to the conception of a higher social whole of the species. In that respect they have attained a degree of development which we do not see in our political, scientific, and religious leaders. Their social life hardly extend beyond the limits of the hive or colony, and colonies of no less than two hundred nests, be seen in the species (*Formica exsecta* and *F. pressilabris*) described by Forel on Mount Tendre and Mount Salève. It is true that each member of these colonies recognises its place in the colony, and that they all take part in common work. In Pennsylvania Mr. MacCook saw a whole nation of nests of the mound-making ant, all living in one place, and Mr. Bates has described the hillocks of ants on large surfaces in the 'campos'—some of them composed of two or three different species, and most of them by narrow vaulted galleries or arcades.<sup>10</sup> The mutual protection are thus met with even among animals.

Going now over to higher animals, we find an undoubtedly conscious mutual help for all. In the case of we must recognise at once that our knowledge of the higher animals still remains very imperfect. Much information have been accumulated by first-rate observers in the various divisions of the animal kingdom of which we possess trustworthy information as regards fishes and birds. Owing to the difficulties of observation, and the fact that attention has yet been paid to the subject, we know less. Kessler already remarked how little we know of the life of many of them. Many of them are nocturnal in their habits, and themselves underground; and those rumormongers' migrations offer the greatest interest to us. Their herds. It is chiefly upon birds that we have the most of information, and yet the social life of many of them but imperfectly known. Still, we need more information of well-ascertained facts, as will be seen.

I need not dwell upon the associations of animals in rearing their offspring, for providing it with food, or steps in life, or for hunting in common; but upon the way that such associations are formed among sociable carnivores and rapacious birds.

<sup>10</sup> H. W. Bates, *The Naturalist on the*

tions. The cunningest and the shrewdest are eliminated 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 Salève; and Forel maintains that each member of these colonies recognises 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 narrow vaulted galleries or arcades.<sup>10</sup> 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 recognise 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

<sup>10</sup> H. W. Bates, *The Naturalist on the River Amazons*, ii. 59, sq.

special interest from being the field upon which tenderer feelings develop even amidst otherwise most cruel animals. It may also be 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, *Haliaeetus albicilla*) 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 whereto 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.<sup>11</sup> Of 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

<sup>11</sup> N. Syevertsoff, *Periodical Phenomena in the Life of Mammalia, Birds, and Reptiles of Voronèje*, Moscow, 1855 (in Russian).

assemble for devouring a corpse, and that younger ones first) always keep watch eating. In fact, the white-tailed eagle—one of the best hunters—is a gregarious bird altogether, when kept in captivity it very soon contracts keepers.

Sociability is a common feature with very many birds of prey. The Brazilian kite, one of the most numerous, is nevertheless a most sociable bird. Its hunting habits are described by Darwin and other naturalists, and when it has seized upon a prey which is too big, it calls its friends to carry it away. After a busy day, vultures go for their night-rest to a tree or to the bushes. Many birds, sometimes coming together from distant places, miles, and they often are joined by several other species. The percnopters, 'their true friends,' D'Orbigny's vulture, one of the strongest vultures, has been described from its love of society. They live in numerous societies; numbers of them join in their hunting. 'They live in very good friendship,' Le Vaillant says. In the same cave I sometimes found as many as three. The little Egyptian vultures live in close friendship. Together in the air, they go together to spend the day. In the morning they all go together to search for their prey. The slightest quarrel arise among them; such as Brehm, who had plenty of opportunities of observing. The red-throated falcon is also met with in numerous societies. In Brazil, and the kestrel (*Tinnunculus ceruleus*) of Europe, and has reached in the winter the southern parts of Asia, gathers in numerous societies. In the case of the kestrel it is (or rather was) so sociable that Nordmann describes them in bands, with other falcons (*Falco tinnunculus subbuteo*), coming together every fine afternoon, and enjoying their sports till late in the night. They all at once, in a quite straight line, towards the prey, and, having reached it, immediately return to the same place to repeat the same flight.<sup>13</sup>

It would be impossible simply to enumerate the hunting associations of birds; but the fish-eating pelicans are certainly worthy of notice for the intelligence displayed by these clumsy birds in fishing in numerous bands, and after having

<sup>12</sup> A. Brehm, *Life of Animals*, iii. 477; all quotations are from this work.

<sup>13</sup> *Catalogue raisonné des oiseaux de la faune par le Nordmann*, abstracts in Brehm, iii. 360.

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. 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.'<sup>12</sup> The little Egyptian vultures live in close friendship. They play together in the air, they go 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 observing 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. cesulon*, 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.<sup>13</sup>

It would be impossible simply 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

<sup>12</sup> A. Brehm, *Life of Animals*, iii. 477; all quotations after the French edition.

<sup>13</sup> *Catalogue raisonné des oiseaux de la faune pontique*, in Démidoff's *Voyage*; abstracts in Brehm, iii. 360.

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 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.<sup>14</sup> 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 that 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 thrashed ever so far from the yard, the sparrows in the yard have always had their crops full of the grain.’<sup>15</sup> 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 chase as soon as they see it in possession of a good prey. The kites will also give chase to the swiftly fishing hawk, and rob it of the fish it has captured; but no one ever saw the kites fighting together for the

<sup>14</sup> Max. Perty, *Ueber das Seelenleben der Thiere* (Leipzig, 1876), pp. 87, 103.

<sup>15</sup> G. H. Gurney, *The House-Sparrow* (London, 1885), p. 5.

possession of the prey so stolen. On the Kerguelen I saw the *Buphagus*—the sea-hen of the sealers—them disgorge their food, while, on the other terms combined to drive away the sea-hen as from their abodes, especially at nesting time.<sup>16</sup> The swift lapwings (*Vanellus cristatus*) boldly prey. ‘To see them attacking a buzzard, a kite is one of the most amusing spectacles. On the assurance of victory, and one sees the anger of such circumstances they perfectly support their courage grows with their numbers.’<sup>17</sup> The latter the name of a ‘good mother’ which the Greek fails to protect other aquatic birds from the attack. But even the little white wagtails (*Motacilla*) well known in our gardens and whose whole length is eight inches, compel the sparrow-hawk to abandon them. ‘I admired their courage and agility,’ the old I wrote, ‘and I am persuaded that the falcon could not out-ture any of them. . . . When a band of a bird of prey to retreat, they make the triumphant cries, and after that they separate together for the special purpose of giving chase just as we see it when the whole bird-population is raised by the news that a nocturnal bird of prey is during the day, and all together—birds of prey and singers—set to chase the stranger and make his concealment.

What an immense difference between the chase of a hawk, and such small birds as the meadow lark, or a hawk, and such small birds as the meadow lark, by their common action and courage against the powerfully winged and armed robbers! They do not only chase the birds of prey which might be dangerous to them, but they chase also the fishing hawk ‘rather than it any harm;’ while in India, according to I saw, the jackdaws chase the gowinda-kite ‘for simple reason.’ As to the Brazilian eagle *urubitinga*, Prince Maximilian was chased by numberless flocks of toucans and cassins (our rook), which mocked it. ‘The eagle usually flies very quietly, but from time to time it will be chased. In all such cases the little birds, though they are inferior to the bird of prey, prove superior to it by their courage.’

However, the most striking effects of courage and mutual aid of the individual, for its enjoyment of life, and its intellectual capacities, are seen in two

<sup>16</sup> Dr. Elliot Coues, *Birds of the Kerguelen Islands*, Collections, vol. xiii., No. 2, p. 11.

<sup>17</sup> Brehm, iv. 567.

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possession of the prey so stolen. On the Kerguelen Island, Dr. Couës 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.<sup>16</sup> 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.'<sup>17</sup> 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. 'I often admired their courage and agility,' the old Brehm, now grandfather, 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 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.' As to the Brazilian eagle *urubitinga*, Prince Wied saw it surrounded by numberless flocks of toucans and cassiques (a bird nearly akin to our rook), which mocked it. 'The eagle 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.

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

<sup>16</sup> Dr. Elliot Couës, *Birds of the Kerguelen Island*, in Smithsonian Miscellaneous Collections, vol. xiii., No. 2, p. 11.

<sup>17</sup> Brehm, iv. 567.

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 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.'<sup>18</sup> 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 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 recognising 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.

<sup>18</sup> Brehm, iv. 671, *seq*

They enjoy society of other birds. Crows come together from many company with the parrots in the bush. When they start hunting, they display the mobility and capacity of coping with circumstances. A band of white cacadoos in Australia, in a corn-field, they first send out a scout to the highest trees in the vicinity, who then upon the intermediate trees broadcast and transmit the signals. If the report is favourable, the cacadoos will separate from the bulk of the flock and then fly towards the trees to scrutinise the neighbourhood for signs of danger. When they give the signal for general advance, they at once and plunders the field. The cacadoos have the greatest difficulties in their own way, but if man, with all his art and science, of them, the cacadoos become more than a match; henceforward baffle all stratagem.

There can be no doubt that the intelligence which enables the parrots to rival human intelligence and almost to outdo them. Their high intelligence is described by some species, namely the parrot, to their mutual attachment it is a great advantage. If killed by a hunter, the others are distressed with shrieks of complaints and groans, and 'friendship,' as Audubon said; and if belonging to two different species, the accidental death of one is followed by the death from grief of the other. It is less evident that in their social life, more than they possibly might find in any other bird, a claw. Very few birds of prey are so sociable as the smaller species of parrots, and the parrots, as he also says of the parrot, that they hardly have any enemies. It is most probable that the longevity of the parrot is rather than die from the claw of a predator. His still more superior intelligence, in his association, succeeds in prolonging his life. Longevity would thus appear to be not say the same as regards the parrot, but to be favoured in its development.

<sup>19</sup> R. Lendenfeld,



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They enjoy 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, 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 scrutinise 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.<sup>19</sup>

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 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

<sup>19</sup> R. Lendenfeld, in *Der zoologische Garten*, 1889.

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, in a subsequent paper, to draw therefrom our conclusions.

P. KROPOTKIN.

## HOW ART KAVANAGH RICHARD THE KING

A FOURTEENTH CENTURY

### I.

THE Pale was all on fire again! There had been raids at Newcastle, and at the Naas; raids, too, at Dunshauglin, and over the greater part of the country the O'Keefes, the O'Nolans, were all out like hornets. Calvagh O'Toole, who had assailed the English in Leinster, and had taken many heads,' says his native chronicler, 'to be taken by him, besides prisoners, horses, and other spoils, he followed the war-path, and might shortly be expected to give a fine performance. Worse still, Art Kavanagh was at the head of his young men at his heels, and though nobody knew exactly where he was, that only made him more difficult to find, since wherever you would wish him not to be, he was certain he would presently be found.

Barely three years had come and gone since Art Kavanagh had left Ireland, having remained there ten months in Dublin, feasting himself and feasting others. To him had come in all the greater chiefs of the Pale, who had accepted knighthood at his hands, notwithstanding considerable demur on their part, they declared that knighthood in their country was invariably bestowed on the older or younger—so soon, in fact, as a lad had been knighted, and that it was a toy therefore unfit for the use of warriors. Seeing, however, that Art Kavanagh would not matter, they in the end submitted with a good grace. Art Kavanagh, or Art McMurrough as his own name was, keeping his vigils—the grim penitent—in the night, and next day, 'clad in a silk garment edged with gold, and at the king's own table, the O'Neil from the Pale, and the O'Connor Faley from mid-Leinster.