★WHEELER, W. M. Review of Auguste Forel's "The Social World of the Ants Compared with That of Man."

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BOOKS

FOREL, A. *The Social World of the Ants Compared with That of Man.* (Trans. by C. K. Ogden.) 2 vols. London; New York: Putnam's, 1928. Pp. xxx+551; 445. 24 plates; 738 text-figures.

This work is a notable achievement as the last important contribution to biology by the last of a long line of illustrious Swiss naturalists, beginning with Charles Bonnet and including Trembley, François, and Pierre Huber, and more than one generation of de Candolles, de Saussures, and Agassiz. The original French edition, which was issued in parts in 1921-1923 by the Librairie Kundig of Geneva, though very attractively printed, contained quite a number of inaccuracies. The present edition has been most fortunate in its translator, Mr. C. K. Ogden, the distinguished editor of *Psyche* and the "International Library of Psychology, Philosophy and Scientific Method." His language is so fluent, lucid, and idiomatic and his rendering of technical terms so skillful that the work has all the appearance of having been composed in English. Many of the errors in the French edition have been conscientiously corrected, and an adequate index has been provided, so that this edition, quite apart from its larger letter-press and pages, is decidedly superior to the original. Among the profuse illustrations, the colored and black and white plates drawn by E. W. Heinrich are exceptionally beautiful and accurate. Many of them, in fact are more life-like than any ant-illustrations published heretofore. Especially the two plates X and XI, representing ant-battles, are drawn with such unusual insight and courage that, by comparison, the attempts of previous draughtsmen to depict similar scenes seem very crude.

The significance of the "Social World of Ants" can be fully appreciated only by the myrmecologist who has enjoyed intimate personal acquaintance with its author. Auguste Forel was born in 1848 and began to study ants and other insects before his eighth year. The observations which he made during his childhood and youth were brought together and published in 1874 as a quarto volume, the "Fourmis de la Suisse," which is one of the landmarks of myrmecology, and has lost none of its value during all the years that have since elapsed. This was only the beginning of his penetrating studies of the ants, which were carried on without interruption till 1922, when illness and failing eyesight compelled him to write his last myrmecological paper and to dispose of his very valuable collections to the Museum of Geneva. Since 1874 he has published hundreds of important monographs and notes, containing descriptions of several thousand species, subspecies and varieties from all parts of the world and treating of every aspect of ant-structure, distribution, psychology, and behavior. But all this was only a delightful avocation! He was at the same time one of the

foremost European neurologists, practicing psychiatrists, and social reformers. His publications in these capacities, as listed by some of his Viennese friends and admirers on his 60th birthday, comprise 10 important works on brain anatomy, 31 on normal psychology, sleep, hypnotism, and suggestion, 23 on psychiatrical and criminal psychology, 34 on the deleterious effects of alcohol, 11 on sex and social ethics. His long experience as a psychiatrist, at one time as the director of the large hospital for the insane at Zürich, and since in private practice, his untiring, sympathetic, and unselfish devotion to his patients of all social classes, his extraordinary intuition, coupled with a singularly ardent and straightforward personality, yielded him a rare knowledge of his fellow men. So comprehensive and penetrating was his insight into human behavior that there is scarcely one of its protean aspects which he has not touched upon with illuminating comment in his publications.

Of course, the work of such a man on ants must be decidedly worth reading. In the first place, it summarizes the whole of myrmecology as it has developed from the middle of the 18th century to about 1920. This Forel readily accomplished not only because he was familiar with all the pertinent literature but because he himself had been one of the most enthusiastic contributors to the advancement of the science. His example inspired a number of young men to take up the study, and these, now become a small army of workers, trained in up-to-date methods of investigation, are inaugurating a new *quantitative* era in myrmecology. We may say, therefore, that Forel's work summarizes and concludes the *qualitative,* or natural history period of myrmecological investigation from Réaumur (1744) and Gould (1747) to about 1920.

But Forel's two volumes on the "Social World of Ants" are more than a digest of our knowledge of the ants. His daily preoccupation during a long life with the problems of the greatest of social animals could hardly fail to find expression in such a work. This is indicated in the sub-title "compared with that of man," and justifies the digressions, which seem to have irritated some previous reviewers. These digressions are really of peculiar interest, because they reveal the conclusions reached by a very acute intellect after long study of insect behavior under normal conditions and of the effects of abnormal stimuli both internal and social on the more unstable individuals of our own species. Hence the emphasis on sex, alcoholism, and the numerous maladjustments incident to our modern industrial and political environment, and our woefully antiquated ethics, educational, and religious institutions.

No adequate review of the vast amount of myrmecological data in Forel's two volumes can be undertaken in this review. These data, moreover, which derive much of their significance from their very mass and intricacy, are probably of less interest to the readers of this journal than the author's interpretation of insect behavior and conception of the basic resemblances

and differences between formicine and human societies. As a rule, sociologists take little interest in animal societies, and it must be admitted that a knowledge of these is of slight practical importance. But the fact is of great theoretical interest that insect societies, evolving during the long eons of geological time from social rudiments like the simple family, have acquired a more highly integrated structure than that of man, though the component individuals exhibit a maximum of irrational, or "instinctive" and only a minimum of what we are pleased to call "intelligent" behavior. This may at least direct our attention to the two corresponding aspects of human behavior, and perhaps lead us to suspect that we have been grossly misestimating the relative importance of the rational and irrational in human societies.

During the past two centuries, interpretations of ant-behavior have swung like a pendulum from one extreme position to the other. To the 18th and early 19th century naturalists, ants seemed like diminutive reasoning human beings. By the close of the latter century they had come to be interpreted as purely tropistic and reflex machines (Bethe and others). Now opinion has swung back part way to regarding their behavior as being in some degree intelligent (plastic), but as in great part reflex (automatic). Forel was one of the first to adopt this position in the 70's and 80's of the last century, and all observers of ants and other insects have since accepted essentially the same interpretation. Such differences of opinion as exist are very largely terminological. On the publication of Semon's "Mneme," Forel, and later Brun, adopted its nomenclature with enthusiasm. As will be seen from the following quotation (vol. 1, p. 425), "intelligence" is used by Forel in the modern sense of "behavioristic adaptability" and not in the scholastic sense as a synonym of "ratiocination," or drawing conclusions from premises.

"We have been admiring the marvels of adapted instinct and their economy. In these facts, betraying the meticulous adaptation of causes to their effects, some people find proof of an Intelligence in the Universe, divine, supreme and personal. They forget that the word 'intelligence' is only an abstract term extracted from our meagre human intelligence, and that they are only moving in a vicious circle. Science proves simply that all animal and vegetable life forms and develops in phylogenesis, as well as in ontogenesis, by the accumulated inheritance of characters which living beings have acquired, second by second, day by day, year by year, millions of years by millions of years, owing to stimulation by the action of the external world, in other words, by the engrams they receive from these stimuli. It also proves that natural selection brings about a gradual detailed adaptation of the characters thus acquired to the various circumstances of this same external world. Thus it is that living organic 'nature' reacts upon the living beings which spring from her. We are at liberty, if it pleases us, to give such adaptations the name of 'intelligence,' a quality of our own whose range, in our immense vanity, we exaggerate. This intelli-

gence simply plays a part in the manifestations presented by living beings. But all the rest is only sophistical divagation on the unknowable 'Absolute First Cause of the Universe' which forms the object of the grandiloquent false science called metaphysics. Genuine science gives no reply to all this but the old dictum of Socrates, 'I know nothing about it.'"

"'Vanity of vanities, all is vanity,' cried Solomon, King of the Jews, so they tell us, shortly before his death. He was not thinking then of the ants, though he had held them up as an example to idle humanity, but of man, who in his vanity set himself up on the topmost peak of the Universe and announced that he was created in the image of a personal God of his own invention. In reality, all that man knows and all that he can know about the world which lies around him and from which he issues is revealed to him, not by a God whom he can never know, but through the mediation of the sensations which he owes to his sense organs. These sensations of ours are transmitted to our brains by our nerves; they are elaborated and compared with one another by the aid of our movements, after being conserved by means of the sensory images (engrams) engraved on our brains, and the recall (ecphory) of these images by memory. In this way, the brain, the organ of our mind, uses that mobile internal concentration of its activity which we call attention, to combine sensations and gradually transform them, in our thoughts and feelings, into perceptions, representations and abstractions. We use our language, perfected by writing, to give our most highly generalized abstractions the big, fine-sounding names out of which we afterwards build equally big systems, described as *metaphysical*. The vain authors of these systems claim that we ought to *believe* in them absolutely and that they represent the Absolute of the Universe, whether or not revealed by a man-made God. We need not here concern ourselves further with such matters.

"And as for the ants—except for the big metaphysical abstractions which their simple, unwritten antennal language does not enable them to conceive—very much the same things happen to them, in a general way at any rate. Their senses give them information about the external world. They combine these data by means of their movements and their brain. The brain conserves, combines and ecphorizes (recalls) by memory. None the less, there are differences. In their case, the ancestral engrams which have been fixed by heredity, and have thus become instinctive and innate are, relatively speaking, infinitely more considerable than they are in our own, and the engrams which are individually acquired and remembered during their shorter lives are infinitely less important. Yet they are certainly present, as we shall prove irrefutably by numerous precise experiments" (vol. 1, p. 177).

The rather limited range of intelligent behavior in ants is best seen in their reactions to their various parasites and guests. Since these reactions are required to meet unusual or inconstant environmental conditions, they

have all the value of natural experiments. Many of the parasites and guests are furnished with attractive odors, or alluring organs (trichomes, exudatoria), or structural and integumentary peculiarities which serve to persuade the ants to tolerate or even to feed and rear them. And since the consociation of the ants and guests commonly occurs in the dark chambers of the nest, many of the guests resort to a kind of behavioristic and tactile rather than to visual mimicry in deceiving their hosts. This leads Forel to digress on the influence of unconscious liars in human society (1, p. 267).

"There is also a singular mimicry of demeanor, consisting in the activity of the limbs, in the mutual antennal language that passes between the guest and its ant, in caressing the legs, in its manner of eating and allowing or causing itself to be carried about, etc., and this kind of mimicry is not the least successful means of deceiving the ants' social instinct in a fashion that is as hypocritical as it is unconscious.

"We must bear in mind, that among ourselves also the unconscious liar, the victim of hysteria, himself believes in the reality of the invented stories which his sick imagination drives him to tell us—as in the case of the late celebrity, Thérèse Humbert, for example. That is why unconscious liars or pathological swindlers lead us astray a hundred times more effectively than the conscious liar, who is aware that he is lying and afraid of betraying himself, and whose physiognomy, voice, and demeanor do, therefore, actually betray him. Since he believes in his fictions, the hysterical swindler, on the other hand, acts quite naturally; he enters into his part in good earnest, with all his heart, and all his artist's passion. Like a really good actor on his stage, he carries us with him, even to the verge of tears—just as the good symphile of our worthy ants leads them unconsciously by the nose, or rather by the antennae."

It is clear that all insect societies have arisen phylogenetically as single families. This stage is still repeated in the ontogeny of the annual societies of bumblebees and wasps and the perennial societies of ants and termites, but has been lost in the honeybees. Even these, however, retain the familial type of society, and no matter how many thousand individuals an insect society may eventually number, they are all offspring of one or a few mothers. Human societies, on the other hand, are not expanded families, nor have they had their origin in a single family as implied in Genesis, but seem to have arisen from mammalian consociations of the horde, pack, or herd type. The flocks of birds are evidently analogous, but independent developments. They are all protective, or defensive organizations, in which the individuals are ordered in an elaborate social hierarchy on the basis of their several, variable, psychophysical endowments. The great mobility of these societies, especially of those of man, depends therefore on an inherent instability of individual status, which in turn depends on the precarious and temporary ability of the individual to adjust his behavior to his more dominant as well as to his more submissive fellows. These tendencies

everywhere manifest themselves as what have been called the "instincts" of self-assertion and self-abasement and, in their more pronounced forms, as the ambivalent behavior which the psychoanalysts have called sadism and masochism, love and hate, the will to power and the will to death, etc. Recent studies of mammalian and avian associations show the importance of this "pecking order" as a social constraint and cohesive and its essential difference from the mutual exchange of food and chemical stimuli (trophallaxis) which holds the individuals of the insect society together. The following reflections in which Forel indulges are interesting and suggestive but seem not to emphasize sufficiently the extraordinary divergence of human and insect societies and the impossibility, to say nothing of the undesirability of our imitating the peculiar and highly specialized excellencies of formicine societies:

"The resemblance between a society of ants and a society of men is no mere matter of appearances, but more than the difference between them. Both depend on profound causes, hereditary or acquired, which we have now to analyze seriously.

"The great variability of their instincts, the generally omnivorous capacities of their digestion, the multiplicity of their species (nearly 4500, not counting races or varieties), their longevity, the relative stability of their colonies and their distribution over practically the whole world give the ants a great *social force* which other social insects possess in part only.

"The hereditary social instinct of ants permits them to live without chieftains, guides, police or laws, in an admirably coordinated state of anarchy; human beings are absolutely unable to do this and if they attempt as much they at once fall back into such a triumphant state of brigandage that they are compelled to submit once more to the rule of chieftains. Such is the ancient tragedy of humanity, a thousand times repeated throughout history (vol. 2, p. 336).

"A written tradition, even an antennal tradition corresponding to our oral tradition, is excluded in the case of all ants. And in spite of this fact, the social cosmos of a formicary is very much superior to our states, societies and federations, from the point of view of order, organization, and the social work of the united community. Why so?

"Well, dear reader, it is because man's hereditary nature, deep-rooted in his brain, makes him an egoistic, individualistic, fierce, domineering, tyrannical, jealous, passionate and revengeful being, who wishes to enjoy liberty by the abuse of his neighbour's toil. For the slightest social defects possessed by this neighbour he is argus-eyed, but he unconsciously misinterprets or extenuates his own faults. For his personal satisfaction alone he chooses a few friends or companions and one of several sexual help-meets. It is comparatively rare for even his family to be united. Yet there are some men, and more especially some women—though they are exceptional—it is true, who devote themselves to the social well-being of humanity and are

perpetually denying themselves for the sake of their neighbours; but the masses misunderstand and persecute them. Moreover, when they attain 'power' success intoxicates them and turns their heads; rare indeed are those who resist, keep their integrity and persevere to the end along the path of true social service. What must we do, then, to grow nearer to the ants and yet remain men?" (vol. 2, p. 356).

"Ants being anarchists and communists at the same time, realize the ideals of both Proudhon and Kropotkin for human society, but they do so by means of a natural instinct inherited during the egg-stage, such as we have no claim whatever to possess. Owning neither government, rulers nor laws, they all usually inhabit the same nest and common chambers. They do not indulge in family apartments, separate workrooms, personal attendants, kitchens, dining-rooms or bedrooms; the whole of their internal and domestic life, both that of the young and that of the adults, is conducted in common. Intimacies and family secrets, which must not be divulged, are also rarely found among them—for nearly all their nuptials take place in the open air. Their home life and its customs are therefore evolved by our little friends in the darkness of their common nest, and only occasionally at the surface, in the surrounding district or on roads which are also common property, for the ownership of land is socialized as completely as that of the means of production and consumption. Otherwise, what could be the significance of these means, among creatures whose individual bodies, even, have social stomachs incomparably larger than those which digest food for their precious selves? And you, friend reader—have you yourself thoroughly digested the above-mentioned consequences of communistic life among the ants? If you wish to understand their habits, you must certainly do so" (vol. 1, p. 375).

In the latter part of the first volume and in the "Epilogue," which is rather diffuse and seems to show signs of fatigue, Forel favors us with some philosophical and ethical digressions, which are interesting mainly because they prove that a very active, sincere, and socially useful man can obtain adequate inspiration from quite other than creedal sources, a fact which only the devout seem ever to have doubted.

"The ways of the Creator are unfathomable—so said our fathers. Our reply is that the ways of nature can be fathomed perfectly well, with perseverance and toil, by the human brain. The things that are, and always will be, unfathomable are the pseudo-problems of metaphysics, with their divagations into an alleged unknowable 'Absolute' of the Universe. Let us learn, therefore, to be content with the relations between this self of ours, a function of our brain, and the external world surrounding us. Let us bow in resignation before the unfathomable essence of the world, and before the hypothetical First Cause of wickedness and ugliness, as before that of the goodness and beauty, which we may discover at every step if we search carefully about our little planet. Let us admit that the notions of good and

bad, beautiful and ugly, are only relative to ourselves and our sensations. Let us imitate the ants of a single polycladic formicary; we shall then become more modest and sociable throughout the entire world by the federation of all peoples" (vol. 1, p. 372).

"Given the passions and weaknesses of man, however, we must fight with all our strength, by means of good legislation, against all the social causes which inflame our unwholesome passions—such as alcohol, narcotics, gambling, debauchery and luxury, for these are the worst hindrances to the social well-being of all in that peaceful federation of nations to which we must aspire. The *scientific religion of man's social well-being*—this must be the religion of the future, and, like that of the Bahais, it must be free from doctrine and from metaphysics, uniting all that is truly good and purely human in the ancient religions. As for a God incomprehensible to man, whom some believe they can know or feel, whom many adore and others fear or even curse, and whom many people bedeck with their human attributes—we may leave everyone free to adore this idea with whatever metaphysics he pleases. The religion of the social well-being of man has no concern with Him: neither have I seen His temple among the ants" (vol. 2, p. 351).

The last quotation shows that Forel should have been born in the United States. Had he been so fortunate, or so unfortunate, it is probable that he would now in his eighty-first year be the beloved honorary president of all our anti-saloon, anti-narcotic, anti-vice, anti-gambling, eugenic, birth-control, ethical, free-thought, social-betterment and other uplift organizations and that many of these would be saner and more efficient if he could have participated in their development during the past three decades, though his appeal to legislation sounds rather ominous.

The "Social World of Ants" closes with a 50-page appendix on the termites, written by Dr. E. Bugnion, Forel's brother-in-law and formerly professor of anatomy at the University of Lausanne. It is really a study of the development of the defensive instincts of the only social competitors of the ants among tropical and subtropical insects. Bugnion undertakes to show how the soft-bodied termites have acquired special structural and behavioristic devices for protecting themselves from the incessant inroads of the ants, which are their only implacable enemies apart from the birds that feed on their adult sexual forms during the dessemination flights and the edentate mammals that break open the termitaria and devour their inhabitants in all their developmental stages.

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