MENTAL EVOLUTION IN ANIMALS. By George J. Romanes, M.A., LL.D., F.R.S. With a Posthumous Essay on Instinct, by Charles Darwin, M.A., LL.D. London: Kegan Paul, Trench, & Co.

In fulfilment of his design, announced in his work on "Animal Intelligence," Mr Romanes has now written a work on the evolution of mind in animals. While the former volume was chiefly devoted to instances and illustrations, the present volume is principally given up to the exposition of his theories based upon the facts which he had collected. It is not too much to say that the present treatise is the most substantial, the most scientific and complete, we have upon a most important and complicated subject; and the whole question of instinct—its origin, its modifications, its physiological and psychological aspects—is treated here with lucid investigation, fulness of observation, and able disquisition. It would, however, be too much to say that there is conclusiveness in all the subtle theories regarding that unknown dim realm where consciousness takes its source, or in the efforts to guess the exact modes in which the physical gives place to the psychical phenomena, and intelligence originates in its rudimentary form in a low organism, to pass ultimately into the wonderful forms of human reason. We simply learn nothing, of course, by being told that "consciousness is but an adjunct which arises when the physical processes involve ganglionic friction;" we are merely playing with science when we say proudly that "the psychical processes constitute the subjective expression of objective turmoil among molecular forces." For such vague phrases do as little to represent the fact as, in the Mediæval theatre, scanty of scenery, did the man who stood on the stage with a paper in his hand announcing "This is a wall." But if in the theories of the origin of mind and the mode of evolution of intelligence from unconscious organism, Mr Romanes is as unable as others to give the true solution, the value of this work is but slightly impaired, and the scientific merits of the main exposition is not affected. The author acknowledges that "we are totally in the dark as to the causal connection, if any, between

such a state of turmoil in a ganglion and the occurrence of consciousness. Whether it is the angel that descends to trouble the waters, or the waters which call down the angel, is verily the question which divides the spiritualists and the materialists; but with this question we have nothing to do." If the author cannot tell how and why consciousness arose, he can describe its phases in all grades of animated life, and show how it is expressed in the forms of the lowest organism, and in all grades of higher development in animals. There is an admirable closeness of observation and fulness of information on this point which renders the work full of interest, even in those parts which are most theoretically, most debatable, and least final. The essay by Darwin, full of his keen observation and suggestive thoughts, adds much to the interest of this work. The portion of this volume which is most full of value—enhanced by the opinions and illustrations of Mr Darwin—treats of instinct, and its relations to the doctrine of evolution of mind, and the mode in which it is differentiated from reason nervous action on the one hand and reason on the other. It was a few years ago the universal practice to speak of the various instincts of animals as fixed and unchangeable in their nature, and to point to Providence as the source which could be vouchsafed to those who inquired what was their origin. To the principle of evolution the naturalist now turns for a competent answer, and in such causes as "natural selection" and the law of heredity he seeks his scientific explanation of the problem :—

"The first mode of origin consists in natural selection, or survival of the fittest, continuously preserving actions which, though never intelligent, yet happen to have been of benefit to the animals which first chanced to perform them. . . . The second mode of origin is as follows:—By the effects of habit in successive generations, actions which were originally intelligent become, as it were, stereotyped into permanent instinct. Just as in the lifetime of the individual adaptive actions which were originally intelligent may by frequent repetition become automatic, so in the lifetime of the species actions originally intelligent may by frequent repetition and heredity so write their effects on the nervous system that the latter is prepared, even before individual experience, to perform adjustive actions mechanically which in previous generations were performed intelligently. This mode of origin of instincts has been appropriately called the 'lapsing of intelligence.'"

The illustration of these two methods of evolving habits of the original individual, by the law of inheritance of qualities, into instincts of a race or family descended from it, is done with an abundance of facts, and mysterious phenomena in animal life are traced to their simple common sources. If it be true the instincts are slowly developed, it may be expected that there now may exist cases where they are still imperfect or not yet fully evolved; and such instances abound, as in the case of the flesh-fly, which will deposit its maggots in eggs in the flower of the "carrion-plant," the smell of which, resembling putrid meat, deceives the fly; or as in the case of the rabbit toddling along gaily and letting the weasel easily capture it. On the other hand, we can see instances in the making—in man in the hereditary habits of mockery, or handwriting; in animals, in the tendency of dogs to "tog," the acquired instinct of fear of man in birds in oceanic islands, which at first were fearless; the habits of domesticated animals, inherited artificial paces in horses; the tumbling of pigeons, like the Indian breed, which for at least 250 years have been known to tumble on the ground after being slightly shaken; and countless things half taken up and shown upon. In such cases purposeless habits become hereditary, and indistinguishable from true instincts. The plasticity of instinct is a point to which Mr Romanes devotes considerable attention, especially as it is a prevalent notion that instincts are invariably an essential part of the constitution of each species, Yet this animals can modify these instinctive actions by intelligent adaptation to new circumstances is a fact known to every naturalist, as in the case of the bird which, having placed its nest upon a forcing-house, found that she did not need to visit it during the day, when the heat of the house was enough to incubate the eggs, but always returned to sit upon the eggs at night, when the temperature fell. The mathematical instincts of bees have not prevented their displaying an intelligence which may show that many of their automatic habits were once natural and are now due to "lapsed intelligence," as when humble bees, prevented from getting to the nectarial cup, will bore through from a piece of cloth and carded them with their feet into a fretted mass, which they used as moss. Birds show especially the way in which a species can change and adapt its habits of nest-building to suit new surroundings, and how thus intelligent modifications in the individual become instinctive in the descendants, as in the case of the house sparrow, which in trees still builds a domed nest, but in towns avails itself of sheltered holes in buildings, where it can save trouble by erecting a loosely-constructed nest. The Irish tomy of partridges springs without uttering a call; whilst on the opposite coast, the Scottish covey shrieks with all its might. It is said that in the higher-animals a tendency to sing in the middle of the night or in the day runs in families, and is strictly heritable. Mr Darwin, in his paper, notes that ground parrots, ground wood-peckers, and true frogs have abandoned their former arboreal habits, though their structures retain the special adaptations for these old tree habits. Amongst the abundance of curious details in this work, it is difficult to brief space to select the most illustrative and effective facts, or to give an adequate idea of the variety of information collected by Mr Darwin and Mr Romanes on the subject. The discussion of the origin of these instincts which are detrimental to the species, or migration, the effect of domestication, or the difficult problem how, on the hereditary principle, instincts of neuter insects can be transmitted, are full of interest; and though many of the points are still left without sufficient explanation, much light is cast on questions which were till recently considered unanswerable. The study of the forms of intelligence and reason in animals, from the lowest and least animated of organisms ; the illustrations which instinct bears to intelligence ; the illustrations of the existence and exercise of intelligence, emotions, and affections in animals which seem most to be dominated by unalterable automatic action, is very able, very minute, and often exceedingly satisfactory. By the theory of evolution, a large barren field of wonder becomes a cultivated field of knowledge, fruitful in scientific results, and in the higher investigation of the origin, purpose, and growth and modifications of hereditary habits and qualities which are found in man as well as in the worm, we gain a vivid gleam of light on the origin of racial customs and the development of reason, from the blind sensations in the centre of a worm.