Darwin Fifty Years After.

By Dr. David Starr Jordan.

Scientific men, as a rule, do not pay much attention to birthdays; but certain anniversaries have been impressed upon our minds of late, and in the last two years there have been many celebrations: The two hundredth anniversay of Linnaeus, and the one hundred and fiftieth of his great work, "Systema Naturæ"; the one hundredth anniversary of the birth of Agassiz, the greatest teacher of science; the one hundredth anniversay of the birthday of Charles Darwin, and the fifth anniversary of the publication of "The Origin of Species," the greatest landmark of the history of the nineteenth century. Twenty-five years ago we note another landmark of import to us. It was then that Amos Butler brought his Brookville academy to Indianapolis, where its first meeting was held on December 29, 1885. As I was just then elected president of Indiana University, the youngest of all the college presidents—and the greenest—being, therefore, by some preferred to the drier article, I was made president. With this came the suggestion that two others who, like myself, had fought each year on the bloody sands of the educational arena of Indiana—John Coulter and Harvey Wiley—would be my successors.

At that time the idea of evolution was in the air, the theory of descent, that the forms now living were created, not by mysterious power, but by the operation of natural selection and the survival of the fittest. It was my fortune to have been brought up as a student of Agassiz, having heard all his lectures on this subject, and inherited his prepossessions. It was my own studies of animals which led me little by little to become an evolutionist, and I have said that I went over to that view of the case about as graciously and as willingly as a cat which a boy draws across the carpet by its tail.

I remember it was out at Broad Ripple, just north of this city, where Copeland and myself first definitely decided that we were converts to Darwinism. The little sand darter in the river is a sort of perch, but differs from any others in having very few scales, and these very thin ones. We testified to our faith by an article in which we said that these little animals are derived from the scaly perches; that we did not know whether it has

lost its scales because it buries itself in the sand and does not need them, or whether it buries itself in the sand because it has no scales and needs protection, or whether burying itself in the sand there has come to be a gradual selection of those whose scales are fewest and thinnest. Anyhow, we were sure of its origin, and that it was descended from some of the other forms of dwarf perch to that called the Johnny Darter.

Many men before Darwin had taught the theory of descent, but Darwin gave the first rational exposition of how it came about by natural processes. He showed that adaptation is the natural result of the survival of the adapted in the struggle for existence. Variation is everywhere among animals and plants. No two animals or plants are ever alike. There is everywhere a great wealth of life—more are born than can mature, and those survive and live who are able to fit themselves into the scheme of life. Darwin did not believe in evolution in vacuo, that is, evolution wholly independent of external circumstances and conditions, but this heresy that the laws of evolution, which are simply the way things come about, can produce evolution and divergence without any except metaphysical causes, still has a large body of followers. It is, in my judgment, one of the heresies of the present time.

In the evolution of any species in the rough-and-tumble of life, we have these four elements: Variation, heredity, selection and segregation. Variation is the starter. It is interwoven with the operation of heredity. The favorable variation survives, and the animal or plant possessing it gives rise to the next generation. This is selection.

The operation of isolation is this: A group becomes separated by some barrier which the individual can not cross. Little by little the species become separated into two or more species, one just as well adapted as the other. It is not often that differences between species are differences in adaptation. It is therefore not often that they are due to natural selection. The final difference, the final polishing or rounding off of the species giving it its distinctive minor character, is due to isolation. Variation and heredity are inside the individual. The incidents of selection and isolation are of the outside world. They are part of the modifying conditions of life. Without contact with the outside influences, in my belief, there is no evolution.

Darwin may be compared to an explorer in a new country. From some high point he makes a map of the country, locating its salient fea-

tures, its rivers, lakes, peaks and cliffs. The detail must be worked out by those who come after. In the case of Darwin the map remains substantially as it was, although many have worked at the various details with which the modern chart is filling up. The discovery of the microscope has enabled us to frame a rational theory of heredity and to understand with some degree of certainty the physical basis of the functions of inheritance. The morphology of animals has been very fruitfully studied by many men. Many others have developed the history of past life on the earth, and we would have to have a theory of evolution to account for this, if Darwin had not furnished one already.

The three men most famous since Darwin are these: Wagner, Weissmann and Mendel. Mendel died before Darwin wrote and his work on the "Heredity of Peas" was forgotten until after Darwin's time, but has become a very important factor in our experimental studies of living forms in relation to inheritance. Wagner was the first one to lay adequate stress on the idea of isolation as a species-forming influence. His weakness was that he rejected selection as an element, assigning to isolation the impossible task of accounting for all the external phenomena in the origin of species. To Weismann we owe more than to any one else our present knowledge of heredity.

Theories of less importance are Eimer's orthogenesis, which has a good deal behind it, and which we shall probably accept if some genius will arise to tell us what it means. It rests on the fact that we have many long series of animals which seem to have progressively varied as time went on.

The study of the mutations of the evening primrose by De Vries has given many hints as to possibilities in plant breeding. I do not believe that the theory that species are mainly or largely formed by sudden mutations will survive the present generation of De Vries' followers, but the impulse given to experimental study of plants will long continue.

More than thirty years ago I used these words in Indianapolis:

"Darwin lies in Westminster Abbey, by the side of Isaac Newton, one of the noble men of the past whose life had made his own life possible. Of all who have written or spoken, by none has an unkind word been said. His was a gentle, patient and reverent spirit, and by his death has not only science, but our conception of Christ, been advanced and ennobled."