amination in his locality, and such a local special examination should never be held in a more remote place than the county-seat of the county where the person to be examined resides. There can be no reason why the paper containing the examination questions may not be safely mailed to the postmaster, the seals not to be broken save in the presence of all of a board of three, to consist of the postmaster, a prominent professional man of the town, and a notary public. Before these the applicant could appear, and in their presence answer the questions sent to them. To the facts of the regularity of the examination they could swear, returning the affidavits and the applicant's answers to the commission. As these special examinations are infrequent, and the positions for which they are held are of considerable importance, and should be filled by the best men at the disposal of the government, no plea of extra expense, of unnecessary trouble, nor of danger of collusion should be heeded. The latter danger would be practically *nil;* it is inconceivable that three prominent men, not more than two of whom should be of the same political party, would jeopardize their positions and reputations in their communities by any form of collusion. If these positions are not worthy of this small extra outlay of time, patience, and cash by the commission, they are confessedly not worth filling at all. The present plan contributes to a degree of departmental degeneracy and the continued existence of certain hangers-on, the relics of the departing age of political preferment, which should no longer be tolerated. At present it is quite as likely to be the ne'er-do-well friend of some clerk in the bureau where the vacancy is about to occur, who, getting an early hint of the coming vacancy, rushes to one of the schools where cramming for these examinations is given special attention, as it is to be a trained expert from New England, the South, or the West.

These suggestions have been based on the supposition that the present laws selecting the offices that shall be open to the control of the commission will remain substantially as at present. The outsider, who feels only an interest in the improvement of official science as it is to be met in the capital, will be quite likely to agree with me that at present the examination regulations are attached to the wrong end of the machine. It is the heads of bureaus, and not the more obscure officials, whose offices should depend on these examinations. What matters it whether the stenographer of a bureau be an expert in his profession if the chief whom he is under dictates to him letters which plainly attest the fact that he is holding his position by virtue of political favoritism and has not yet become acquainted with the intricacies or the science of his office? So long as the head of a scientific division of a department may be chosen without reference to his eminent fitness for the discharge of his duties, it is but a pitiable farce that leads to such care being taken to provide him with competent men to transact work which he cannot direct and of which he is not a judge. If the chiefs were chosen after a searching examination into their position among their fellows in the science, the knowledge of which they were called upon to display, it might be found then that the government had thereby obtained the services of a class of men who could be trusted to choose their own underlings. I believe that this can be now said of most of these heads of divisions and bureaus, yet one is compelled to admit at times the justice of the slurs at the work done under these that the American must be prepared to hear from the lips of foreigners. There is undoubtedly yet a taint of cheapness and unworthy show about much of this work, for which the half-pay salaries allowed by Congress and the imperfect system of examination now in vogue, as here indicated, are mainly responsible.

EUGENE MURRAY AARON.

INDICATIONS OF EVOLUTION IN LEAVES.

As evolution is the eternal plan of unfolding, in the past, from nebulous matter to plant and animal life, it is absurd to suppose the same principle of progression will not continue to produce changes in the whole realm of being in all time to come.

The investigator puts his finger on the long past geologic ages and says, "These forms are all that existed at this time:" then he points out the advance of later times, and says, "This is evolution." But how this almost infinite change has been brought about, even the imagination constructs no definite plan. It is only by studying the evolution of the present that we can appreciate the changes of the past. To say that things are unchangeable is to ignore the truths of evolution. There is an ever on flowing, rising tide which bears all things on its bosom, unfolding higher conditions, and, as a result, more perfect forms and qualities.

The leaves of plants offer to the evolutionist perhaps one of the best opportunities for studying the principle of progression actually at work; producing changes in the forms of leaves, their mode of individualization, and numerical increase.

My attention was first attracted to the interesting study of variation in leaves by the Ampelopsis quinquefolia. As its name implies, it has five leaflets. Close observation, however, discerned leaves bearing seven leaflets. Sometimes the two lower leaflets were more or less notched or deeply lobed; continued search revealed various degrees of variation, from three to seven leaflets. These specimens were considered "abnormal," "freaks of nature," or "monstrosities,"—interesting because unusual. I soon observed that the Ampelopsis was not alone in its manifest variation from typical forms. On the contrary, plants quite commonly exhibit the same tendency. Rubus villosus is especially conspicuous in this respect. It has commonly from three to five leaflets, but very often the trifoliate leaves are notched and lobed as in the Ampelopsis.

Could it be that these different forms, these variations from the common type, were evidences of evolution in leaves? Can a series of leaves be found illustrating successive stages of variation, was the query which arose in my mind. The leaves of Ampelopsis quinquefolia were again examined, in all the neighboring region. They had given rise to the query, and should therefore have the first opportunity of rendering a verdict. As the search continued, these odd forms, these "monstrosities," seemed to arrange themselves in regular order, like crystals marching into line. Instead of being "freaks of nature," they now stood like many ballots in favor of evolution.

Starting with the ordinary leaf of Ampelopsis quinquefolia, numbering five leaves, the progressive stages, until it numbers seven, were found repeatedly, perhaps a hundred specimens, from a single vine of luxuriant growth.

The first transition step apparently seemed to be but a slight enlargement or fulness on the lower or outer portion of the leaflets near the base; this fulness increases until quite a conspicuous bulge is formed. A slight notch may be next observed, which deepens as the series progresses until the lobe is cut entirely from the leaflet, becoming itself a new, perfectly formed leaflet. A prominent vein is found extend-

ing from the base of the mid-rib, through the overgrown or enlarged portion, to the extreme margin. This vein, later on in the series, forms the mid-rib of the added leaflet. The variation in the blackberry leaves emphasizes this interpretation. The trifoliate leaves seem to be struggling towards the higher type represented by the five leaflets. This is seen so plainly and so commonly that it is the exception when a blackberry bush is found whose leaves do not illustrate various transition stages of division.

Potentilla Canadensis, common cinque-foil or five-finger, furnishes an extremely interesting illustration of various transition forms. It is an embryonic history of evolution in itself, which any one may read who observes it closely.

Examples might be multiplied *ad libitum*, for plants everywhere, both in cultivation and wild, repeat the same story over and over again.

The mode of division in pinnate leaves differs from that just described in palmate leaves. In all pinnate leaves which have been observed, with one exception, the newly formed leaflets were given off from the terminal leaflet. The latter will often be found unsymmetrical or lopsided, occasioned by the extra fulness produced by this evolutionary tendency towards division. The vein which is destined to become the mid rib of the future leaflet becomes prominent, and the outline of the unborn leaflet, as it were, may be plainly seen ere the division has proceeded beyond a slight notch.

After a new leaflet has been given off, there seems to have been a portion of the parent leaflet cut away; and if the new leaflet be held close against this curved or cut portion, it will be found that it corresponds with the outline of the new leaflet. The opposite side of the parent leaflet will now be found to be the larger, and the burden of adding the next leaflet lies with it: after a leaflet has been given off from each side the terminal leaflet may again become symmetrical until a repetition of the process first described again takes place. Tecoma radicans, Sambucus Canadensis, Ailanthus, are familiar examples of this plan of division.

The development of bi-pinnate and tri-pinnate from the simple pinnate leaves was also observed frequently; especially was this noted in the leaves of Sambucus Canadensis. In this case the new leaflets are given off from the oldest leaflet, or that nearest the base, first on one side, then on the other, preserving the symmetry with such precision that one is awed by the beauty and harmony resulting from the workings of vegetative forces.

As stated above, there proved to be one exception to the general plan of division among pinnate leaves. This exception was found in the leaves of the rose. Search for transition stages was made again and again in vain, when one day, while examining the leaves, more from force of habit than with the hope of finding anything bearing on the subject of variation, the mystery was cleared away.

At the base of the rose leaf two adnate stipules are found, and these stipules themselves may be called the little mother-leaves, for the leaflets of the rose appear to have been developed from the stipules. Specimens were found where the "promise and potency" of the future leaf yet existed in the stipules, awaiting, as it were, the magic touch of evolution. The upper part of the stipule becomes enlarged and leaflike, taking on more and more the shape and size of the normal leaflet, until a perfect one is formed. A graduated and progressive series was frequently found, showing various stages of transition, from the stipules alone to the mature leaf, consisting of seven or more leaflets. The new leaflets may be readily discerned before they are given off or separated from the stipules.

The petiole lengthens as the leaflets are added, thus making room for the newcomers. If a rose-leaf is examined, the leaflets near the base will sometimes be found to be more or less alternate, but becoming opposite in the direction of the apex. This may be explained by the manner in which the leaflets are developed, viz., alternately.

The tendency in leaves to divide is manifested by many simple leaves. Very often on plants bearing lobed leaves, deeply lobed or cleft ones are found; and again, on those plants where entire leaves obtain, more or less notched or lobed ones often occur.

An increased leaf-surface implies a larger amount of elaborated plant food, and consequently an increased product, either in rapidity of growth, beauty of bloom, quantity or quality of fruit. Spencer says, "Every change of form implies change of structure; and with change of form and structure comes change of function or quality." The same laws of development are seen in the study of leaves as in the social world. Heredity gives the direction in the bud or germ, and the conditions or education unfolds it. If the season is favorable, the leaf takes a pre-impressed direction of growth, and surpasses its neighbors in assuming new forms, and the average is passed; while unfavorable conditions may produce a degradation, or appeal only to the lower states of development. It will be understood, therefore, that I do not mean to convey the idea that leaves undergo this evolutionary division during a single season. On the contrary, the principles of "natural selection" and "the survival of the fittest" have left their impress upon the animal and vegetable kingdom alike. Slowly but surely heredity transmits the gain through good conditions to succeeding generations. Through the long ages of the past this process has been going on; each generation has passed on the improvements it received from its ancestry, and has added its own gain for the advance of its posterity. Each generation comes forth with renewed powers to unfold in some special direction, and I have endeavored to show, in a few cases, the plan followed in the evolution of leaves.

MRS. W. A. KELLERMAN.

NOTES AND NEWS.

THE ninth congress of the American Ornithologists' Union will convene in New York City on Tuesday, Nov. 17, 1891, at 11 A.M. The meetings will be held at the American Museum of Natural History, Central Park (77th Street and 8th Avenue). The presentation of ornithological papers will form a prominent feature of the meetings, and members are earnestly requested to contribute, and to notify the secretary in advance as to the titles of their communications, so that a programme for each day may be prepared.

— Mr. Michael E. Sadler, the secretary of the Oxford University Extension, has accepted the invitation of the American Society for the Extension of University Teaching to lecture under its auspices in December and January of the coming winter.

— Mr. Halford J. Mackinder, reader in geography to the University of Oxford, and staff lecturer to the Oxford University Extension, comes to Philadelphia next March to lecture under the auspices of the American Society for the Extension of University Teaching, 1602 Chestnut Street, Philadelphia.

— The American Society for the Extension of University Teaching proposes to hold, during the holidays, a conference of the leading college men of the country, to consider the subject of university extension from a college point of view. This confer-