to say that while it is scarce a text-book for beginners, it is probably our best *text-book* of organic chemistry for advanced students.

E. Renouf

Essentials of Chemistry, experimental, descriptive, theoretical. By Rufus Phillips Williams, Teacher of Chemistry in the English High School, Boston. Boston, Ginn and Co. 1910.

This is an excellent manual for schools, very fully illustrated with portraits and with pictures of apparatus. It contains many instructive, qualitative and quantitative experiments, and technical methods are fully explained.

Outlines of Organic Chemistry. A book designed especially for the general student. By F. J. Moore, Ph.D., Associate Professor of Organic Chemistry in the Massachusetts Institute of Technology. New York, John Wiley and Sons. Pp. 315.

This book is of the same size and general contents as most college text-books of organic chemistry, but especial attention is paid to those substances which are of importance in daily life, in vital processes, or are of especial commercial value, such as oils, sugars, cellulose-derivatives, urea, amino-acids, proteins. The size of the book restricts the number of compounds presented, but the presentation of those chosen is scientific and complete. The treatment of the sugars is excellent, in its clear showing of the essential part of Fischer's work. It is an exceptionally good book for study.

Analytical Chemistry. By F. P. Treadwell, Ph.D., Professor of Analytical Chemistry in the Polytechnic Institute of Zurich. Authorized translation from the German by William T. Hall, S.B., Instructor in Chemistry, Massachusetts Institute of Technology. Volume II., Quantitative Analysis. Second edition, thoroughly revised and enlarged. Total issue, six thousand. New York, John Wiley and Sons. 1910. Pp. 787, 110 figures. $4.00.

Professor Treadwell's books on "Analysis" were first published in German in 1899 and have a large circulation abroad. In 1903 Mr. Hall published his translation of the volume on qualitative analysis; this was followed in 1904 by the volume on quantitative, of which the present volume is the second edition. Six thousand copies printed indicate the favorable reception of the book in this country and in England.

Mr. Hall has compared the text with the fourth German edition and has made additions, rendering the book more helpful to American chemists.

On comparing Treadwell's books with the older manuals one is impressed by the simplicity of arrangement and by the wise and careful choice of methods. Instead of presenting a host of alternate methods to the student who is incompetent to estimate their relative value, he gives a full description, often illustrated, of those most approved.

The additions made by the translator comprise well-tried American methods, most of them technical. Among them are A. A. Blair's methods for determining vanadium, molybdenum, chromium, nickel and phosphorus in steel; the dry combustion method for carbon, the Drown method for determining silicon, both in use at the Bureau of Standards, and the improvements of Hillebrand in mineral analysis.

E. Renouf
The Johns Hopkins University

SPECIAL ARTICLES

NOTES ON THE PASSENGER PIGEON

A well-written special from New York to the Chicago *Evening Post* (printed December 2, 1910) stating that "A solitary passenger pigeon, ending its life at the Zoological Garden at Cincinnati, is to-day all that remains of the species that early in the last century swarmed over the continent in flocks numbering billions," suggests the desirability of adding to the occasional notes on this native bird a record of personal observations.

I

During early life in eastern Iowa it was my fortune to see much of the passenger pigeon.

The family home in western-central Dubuque County stood just west of the woodland belt extending to the Mississippi, and some four miles east of the woodland belt skirting the Maquoqueta; the two wooded areas converging somewhat northward, so that the vernal flights may have been somewhat concentrated. The pigeons appeared regularly every spring (in the sixties and early seventies) about the time of wheat sowing; most farmers aiming to postpone the sowing until after the pigeon migration. Ordinarily the flights extended over two or three days or even more, though the chief movement usually occurred during a single day. The flocks commonly appeared over the southern horizon as dark, moving bands, one after another at intervals of a few minutes, quickly resolving themselves into myriads of birds flying northward at a height of a hundred or a hundred and fifty feet, at the rate of, say, sixty miles an hour; an average flock was, say, a hundred yards in width from front to rear and half that height, frequently extending eastward over the woodlands and westward far as the eye could reach, nearly or quite to the Maquoqueta groves four miles away; the closeness of the flight being such that a flock obscured or even concealed the sun during its passage and cast a definite shadow which might be seen to move over the ground like that of a cloud—such that the random discharge of a shotgun or even a rifle upward usually brought down a number of birds. When fired into the sound of the myriad wings changed from a sort of shrill roar into thunderous tumult, both sounds being distinctive and easily remembered. The flocks were always irregular in width and height, occasionally thinning out or even separating into a phalanx of fairly distinct flocks maintaining about the same height and rate of movement in the same latitudinal line; but the large flocks were always the more extended at right angles to the line of flight, though those of only a few thousand birds preceding or following the main flights were longer front to rear, sometimes tailing out in irregular lines of stragglers evidently unable to keep up with those of greater strength. The large flocks seldom alighted; and though the main flights commonly occurred between midforenoon and midafternoon, they sometimes continued into the night, when the passage was marked by the rustling, whistling roar of wings audible for some minutes before and after the actual passage of each flock. The smaller flocks frequently settled either to rest for a time or to feed in the woodlands; they first alighted on trees, often in such numbers that the branches were bent and frequently broken by their weight, and generally after resting a fraction of a minute flew down individually to the ground in search of acorns and other mast. When startled, they arose from trees and ground with a roar of wings audible for miles, while if not frightened by hunters or otherwise they arose more gradually and in the course of a quarter or half an hour were gone. Over the prairie between the woodlands the flocks were never seen to alight save now and then on a wheat field; even here all were never on the ground at once, but the flight, as it were, rolled over the field, the birds in the lead alighting to scratch out and pick up the newly-sown wheat, and then arise as the body of the flock passed over them to again fly to the front and repeat the process, so that each was a part of the time in the air and a part on the ground—and the entire field was robbed of its seed within a few minutes. Chiefly because of their avidity for wheat, partly because of their injury to trees by breaking branches, the pigeons were deemed a pest; yet no local defense was employed save that of energetic shooting into the flocks, killing a few hundreds annually which were used for food, and frightening the rest. There were no pigeon roosts or rookeries anywhere in the countryside, though on two or three occasions the early flights encountered storms and harbored for a few days at a time in the woodlands, where in at least one case many died. Such are merely the commonplace facts of the vernal migrations of the passenger pigeon in a representative locality—facts such as those observed

and sometimes recorded elsewhere, especially further eastward through Illinois, Indiana, Ohio and Michigan.

A rough estimate of the number of birds passing a given point in a spring may be useful. The cross-section of an average flock was, say, a hundred yards from front to rear, and fifty yards in height, and when the birds were so close as to cast a continuous shadow there must have been fully one pigeon per cubic yard of space, or 5,000 to each linear yard of east-west extension—*i. e.*, 8,800,000 to the mile, or (with reasonable allowance for the occasional thinning of the flock) say 30,000,000 for a flock extending from one woodland to the other. Since such flocks passed repeatedly during the greater part of the day of chief flight at intervals of a few minutes, the aggregate number of birds must have approached 120,000,000 an hour for, say, five hours, or six hundred million pigeons virtually visible from a single point in the culminating part of a single typical migration.

While the passenger pigeon migrated annually and in vast numbers over eastern Iowa, far exceeding the aggregate of all other migratory birds and water fowl combined, there was an irregularity of movement suggesting absence of a definite and long-established migratory habit such as that, *e. g.*, of the water fowl passing the same point. In the first place the migration was not well adjusted to the season: Frequently the pigeon was the first migrant to appear, arriving sometimes after one or two warm days of southerly wind while yet the snow remained, so that they were liable to be caught by cold and storms; while geese, cranes and various ducks came generally later (though sometimes earlier) when the season was so settled that they rarely, if ever, suffered from cold, old snow and ice, or belated storms. In the second place the pigeon flocks seemed wholly unorganized. Unlike the geese and cranes and most of the ducks, which flew in oblique lines or V's following a leader and on alighting kept sentinels on guard, the pigeon flocks were without visible leadership, the multitude merely hurrying forward with the stronger flyers toward the front, but constantly interchanging position, and when they alighted on trees and then flew down to forage on the ground each bird apparently moved according to its individual caprice, and no sentinels were left save by chance; the entire flight of the day, if not of the season, seemed to be that of a promiscuous horde of individuals, fortuitously broken up, as it were, into a series of successive waves in which each bird sought merely to remain near the others, veering to the right or left rather than forging to the front if of superior strength, in such manner as to extend the flock laterally rather than in the line of flight—apparently the smaller flocks appearing toward the end of migration were of birds left behind either by belated start or because of inferior strength, and being unequal in freshness or power of flight they strung out longitudinally rather than spreading laterally like the more numerous and more vigorous flyers. Again, unlike the water fowl which returned southward in the autumn in larger numbers than in the spring flight, the pigeons had no autumnal migration; about September and October they were a little more numerous than during the summer, and might occasionally be seen in twos, threes, fours or rarely in larger groups flying southward rather irregularly; but there was no general return of the vast hordes moving northward in the spring—it was as if the excess of birds annually went out to their destruction as the Norwegian lemming are said occasionally to rush to their death in the sea. Like the water fowl, the pigeons undoubtedly nested and bred in the north, though their chief breeding grounds must have been in the south, whence the vast flocks moved northward with the advent of spring, apparently in a desperate food-quest which might or might not be successful.

Most records of the passenger pigeon note the flight of the flocks and perhaps the collective nesting, but not the scattered breeding within the zone covered by the migration. In eastern Iowa individual pigeons left the vernal flocks in considerable numbers and remained to pair, nest and produce young—the number

so remaining being such that, excepting possibly the gray squirrel, they were the most abundant small game of the woodlands during the season from April to October. In nesting there was no collective habit among the birds; each pair seemed entirely independent of others, and the nests were irregularly distributed throughout the woodlands, no two very close together nor much alike in position. Perhaps the favorite sites were among the thick and thorny branches of haw trees, growing about the woodland margins and within ravines too wet for ordinary forest growth; sometimes they were within the forest at the base of one or two large branches projecting from a tree-trunk; again they were on broken stubs some yards high; sometimes they were in crannies or even on the surface of projecting rocks; and rarely they were on the ground in hilly places of low shrubbery. They were never noted more than fifteen or twenty feet above the ground. Wherever located, the nests were much alike, being rudely built platforms of large twigs usually six or eight inches long, so arranged as to form a slight concavity within which two white eggs (rarely one) were laid; the platform was eight or ten inches across, and the tail of the sitting bird projected beyond it on the better protected side. In the course of the incubation stray feathers and excrement partly covered the twigs, so that by the time the young were hatched the nest was moderately smooth and symmetrical within, though always rudely irregular and apparently on the verge of wreckage without. At first clumsy and helpless and nearly featherless, the young, fed by both parents, grew rapidly and their crops distended until about as large as the rest of the nestlings; and they were able to fly perhaps within three weeks after hatching, when for a few days longer they remained inordinately fat and awkward and were fed by the old birds as they perched on branches; this occurring about June, when the woods were in their quietest and most umbrageous condition. Thereafter for some two months the old birds and the young formed a family group, feeding and roosting near together, and seldom far apart, but not associating with other families; and it was apparently these groups or their survivors that winged their way southward as families and never as flocks with the approach of autumn. Between the arrival in late March or April and the departure in early October, the pigeons were easy quarry for small-game hunters and also for birds and animals of prey, so that the family groups flying southward averaged less than three; and probably from this neighborhood fewer pigeons flew southward in autumn than remained from the spring migration. Rarely a group of five or even six appeared, and there were few solitary flights, so it seems probable that depleted family groups sometimes united.

The food of the pigeons nesting in Iowa as shown by the contents of their crops was largely acorns and miscellaneous mast; and when the vernal flights rested their food was similar, except where they despoiled wheat fields of the seed grain. The crops of the birds shot in the early flights contained seeds and buds popularly reputed to be from Louisiana, but not systematically identified; though generally the crops were nearly empty. My first game was a pigeon, shot about 1862; thereafter for a dozen years I shot, say, a score annually, about equally divided between spring migrants and local birds taken in late summer and autumn.

From the early sixties the pigeon migrations declined. In the early seventies occasional flocks of diminishing numbers continued to fly in spring, a considerable part of them remaining to breed; then about 1876 these ceased, and the passenger pigeon became extinct in eastern Iowa.

II

In 1894 and 1895 and again in 1900 I conducted expeditions through southern Arizona and western Sonora, and saw something of what the camp men called "Sonora pigeons." The birds were seen singly and by twos and threes, either distant or in flight which was noted as resembling that of the passenger pigeon. In 1905 I spent some four months at the desert water of Tinajas Altas in the flanks

of Sierra Gila, seventy-five miles southeast of Yuma and near the Mexican boundary, and there had opportunities for observing what appeared to be the same bird—which was soon identified with the passenger pigeon as known in Iowa a quarter-century before. It was similar in size, the males 16 or 17 inches in length from beak to tail-tip and 24 or 25 inches in wing spread, the females somewhat smaller; it was essentially similar in color and appearance of plumage (possibly a shade more pallid), slaty bluish gray with rufous breast and a sort of iridescent sheen on the sides of the neck, with soft and down-like white feathering about the ventral region and thighs, and white showing in the tail feathers as the bird started up or alighted, the females less rufous and sheeny than the males. The size, form and color of the beak were similar, the upper mandible projecting slightly at tip and sides, with small rugosities about the nostrils, and a narrow, reddish, fleshy line marking off the base of the upper mandible from the fine and smooth feathering of the head, while the head was similar in form and size and in the peculiar backward, courtesy-like movement apparently attending a change in focus in the bird's vision. The legs and feet were the same in size, form and reddish color, the small and rather brilliant carmine scales separated by narrow whitish lines, the lower surfaces purplish and the claws nearly black. The tail—perhaps the most striking feature—was similar, its length half that of the entire bird, with two large black feathers much longer than the rest forming the center, and the lateral feathers shortening rapidly so that when spread in flight its outline was that of a diamond or rhomb with one of the acuter angles merging into the body of the bird; alight but alert, the tail pressed upward against the projecting wing tips so that the three united in a slender tapering point, though at complete rest and in balancing on a perch the tail dropped downward, separating from the wing tips. The form and general appearance were the same, the neck long, sinuous and extensible, the body elongated and slender, giving the appearance of smooth stream-lines as of a swift water craft, the exposed surface of the larger feathers smooth and glossy. The plucked skin was similar, dark purplish, especially over the breast, and grading through pink to nearly white over the back; and the flesh was similarly dark, and of the same flavor when cooked. The movement in flight was similar, the birds starting up with sharp clapping of the wing tips as they met below the body, commonly flying in easy swiftness with nearly continuous wing beating accompanied by endless tail movements, including contraction and expansion of the feathers from a narrow line to a width of fully six inches; and on approaching a perch the wing tips again clapping, though more softly than on arising. An unusual form or trick of flight noted in Iowa was that in which the bird descended from a lofty perch as on a high tree-top by a sort of dive without much wing movement; launching itself obliquely downward, with tail half spread and wings opened but strongly flexed, so that its outline was that of a trident moving stem forward, it vol-planed through the air so swiftly as to produce a low, rushing or whistling sound, veering laterally by tilting the body sidewise, in an up-curving trajectory carrying its movement above the horizontal with diminishing velocity as it approached low perch or ground, on which it came to rest after gentle flapping. At Tinajas Altas in May the pigeons (then nesting) commonly watered at one of the lower water pockets a hundred yards west of and a hundred feet higher than the camp, returning thence to the clump of trees containing the nests at the mouth of the canyon two hundred yards eastward and seventy-five feet lower; they generally arose from the water pocket so as to pass high above the camp, and then set themselves to a vol-plane flight back to the nest-trees, holding the flexed wings firmly fixed and guiding the course with bendings of tail and head and lateral rocking motions of body and wings—the fashion of flight being precisely that noted among the passenger pigeons of Iowa and never seen in any other bird. There was also a high water pocket 400 yards west of camp and 400 feet

higher, at which hawks and mountain sheep habitually watered. From time to time during May attention was caught by a rushing sound in the air above camp, for which no cause was for some time visible; it came unexpectedly, and by the time the eyes were turned in its direction nothing was to be seen. Finally my temporary companion, José —a Papago Indian trailer of notably acute vision—set himself facing down the canyon and watching the space above and before him; after some hours of patient waiting the sound recurred, and he was rewarded by sight of a pigeon coming into view in the line of his vision and vol-planing down to the nest-trees; and thereafter glimpses of passing shadows in the air were twice or thrice caught an instant before the rushing sound was heard—for sometimes the birds went up to the high tanque for water and vol-planed back with such incredible swiftness as to be nearly indistinguishable by the eye except when they chanced to cross the line of vision already directed and focused about their distance.

At Tinajas Altas some fifteen or twenty pairs of the pigeons were nesting in May. The nests, chiefly in the thick branches of an ironwood tree with three or four in neighboring mesquites in a little tree clump at the mouth of the canyon, like those in the haw trees of Iowa, were rude platforms of twigs partly covered with loose feathers and excrement, though apparently old and repaired for the season. The old birds were seen feeding on buds and seeds, including the fleshy blossoms of the *Dasylyrion* (none were taken at this time). Toward the end of May the young appeared in the trees about the nests, black, ill-fledged, fat and clumsy, and were apparently still fed and watered by the parents for a day or two; then the whole colony, young and old, unexpectedly disappeared about the first of June. Thenceforward until late July, midsummer heat held Tinajas Altas hard, and vitality waned save in the growth of the *Dasylyrion* on the rocks and the cacti on the plains; the chuckawalla went into estivation in deep crevices in the granite, and most of the other lizards disappeared, some of them to come out of their holes occasionally during the early morning; the active little striped squirrel no longer ran over the heated rocks; the buzzing insects and hummingbirds of May were gone, and the silence of the sun-scorching day was seldom broken save by the occasional shrieks of hawks far up in the air or by the rustle of the wings of vultures or the leap or bleat of mountain sheep seeking water. Toward the end of July the cactus fruits—chiefly of saguaro and pitahaya —began to ripen, and the seeds of the scanty grasses and other inconspicuous plants approached maturity; then California quail appeared in pairs of adults, each with an extensive brood of young apparently at first unable to fly (whence they came was a puzzle, since only a single quail—a solitary male—was seen or heard during May, and there was no other water within a score of miles). Next came doves; and by the first of August the pigeons returned, apparently in somewhat larger numbers than the parents and young of May combined—there were probably between a hundred and a hundred and fifty in all. Although all watered about the same time morning and afternoon, they gathered about the water, rested, and flew over the plain in search of food, in family groups of three or four, in which the young, although fully grown, were still distinguishable chiefly by pallid or mottled breasts.

The camp larder being about exhausted, some thirty of the pigeons with an equal number of quail and three or four doves were shot during August (two mountain sheep were also shot and eaten during the season). The crops of pigeon, dove and quail were filled chiefly with cactus fruits, with a few miscellaneous seeds. The weight of body and the food value of the pigeon were somewhat greater than that of the quail, two or three times that of the dove; and in a fricassee with rice and shredded bacon the birds were no less delectable than the memorable pigeon pie of Iowa during the sixties. Toward the end of August, rains occurred in the Cabeza de Prieta range, a dozen miles eastward, and the pigeon and quail (made timid by the shoot-

ing) suddenly disappeared, apparently crossing the valley to that range. Lack of facilities and unexpectedly hasty abandonment of the camp unfortunately prevented preservation of skins of the birds.

The Sonora pigeon (at least the bird observed at Tinajas Altas) differs so widely as to be readily distinguishable from the mourning dove in size, in form and relative length of tail, in mode of flight, in greater glossiness of plumage, in the rufous breast and sheeny neck and the absence of the dark spot on the side of the neck, in color of legs and feet and in color of skin and flesh; and it differs from the band-tail pigeon (well-known, *e. g.*, in Kern River Valley, California, where it was seen ingeniously snared by Indians) in more graceful slenderness of body, in mode of flight, in color, in trim and compact feet, red instead of yellowish, and especially in the elongated and mobile tail; and there seem to be no other southwestern forms with which it could be confounded.

W J McGee

Washington, D. C.,
December 13, 1910

Scientific Journals and Articles

Owing to the recent death of Dr. Christian A. Herter, editor in chief, inquiries have been made regarding the future of the *Journal of Biological Chemistry*. It is therefore proper that those who have been interested in the journal should be assured of its continuance in its present form. A statement of certain circumstances connected with the foundation of the journal will give this assurance. In order that it should not become wholly dependent upon one individual, Dr. Christian A. Herter, one of its founders, invited four others to join with him in the formation of a corporation, which should have as its sole purpose the creation, conduct and continuation of the journal. The corporation will now assume full charge of the journal and continue the publication without interruption. It is the purpose of the remaining members of the corporation to adhere to the traditions established by Dr. Herter. The loss of Dr. Herter from the management of the journal necessitates some reorganization of the editorial staff. This will be undertaken in the immediate future by the corporation. The office of the journal will continue to be at 819 Madison Avenue, New York, N. Y. Manuscripts may be sent to this address, or to Prof. A. N. Richards, University of Pennsylvania, Medical Department, Philadelphia, Pa.

The contents of *Terrestrial Magnetism and Atmospheric Electricity* for December, 1910, are as follows: Portrait of Robert Were Fox; "Proceedings of the Berlin Meeting of the Commission on the Magnetic Survey of a Parallel of the International Association of Academies," by Adolf Schmidt; "Proceedings of the Berlin Meeting of the Commission on Terrestrial Magnetism and Atmospheric Electricity of the International Meteorological Committee," by Adolf Schmidt; "The Work of the Magnetic Commission of the International Meteorological Committee, 1896–1910," Editorial Review; "Life and Work of Robert Were Fox, 1789–1877," by L. A. Bauer; "On Precursors of Magnetic Storms," by R. L. Faris; "Record of Lightning Stroke at Cheltenham Magnetic Observatory," by R. L. Faris; "The Physical Theory of the Earth's Magnetic and Electric Phenomena, No. II.," by L. A. Bauer; Letters to Editor and Reviews.

Botanical Notes

A much needed book

Every botanist who has had to help students who wish to know something as to the names and classification of the commonly grown shrubs in private and public grounds has felt the need of a book of moderate size and cost which deals with these plants. Even Dr. Gray felt this need, and more than forty-seven years ago he brought together a "Garden Botany" supplement to the fourth edition of his "Manual." A little later he compiled the "Field, Forest and Garden Botany," which in spite of its imperfections was very useful to the young botanists of that period, as is the now out-of-date second edition of the same book. When Professor Bailey