

Palace and gathering of its collections. Extensive works at Tivoli and Ostia find detailed treatment in this volume. The accounts of the establishment of the Church of S. Maria degli Angeli within the Baths of Diocletian, and many other fruitful excavations within its limits; the removal of the equestrian statue of M. Aurelius to the square of the Capitol, where it still stands upon a pedestal carved by Michelangelo out of an immense block of marble from Trajan's Forum; the building of the great bastions of Sangallo—these and a dozen other chapters furnish most agreeable and stimulating reading.

The author occasionally displays his personal bias, as when, for example, he protests (p. 96) against the position of those who would deny the present commune of Rome the moral right to keep its own collections of antiquities apart from those of the state, and under its own exclusive control; or when (p. 219) he refers to Boni's yet uncompleted work about the Sacra Via as "the recent devastations." In this day of the investigation of Roman origins one may wonder whether the hydriae mentioned by Marlian in connection with "ossa cadaverum" as discovered within the Porta Salaria, not far from Sallust's gardens, could have marked the primitive necropolis of the Quirinal settlement.

The Becquerel Rays and the Properties of Radium. By Hon. R. J. Strutt. London: Edward Arnold, 1904. New York: Longmans.

From the son of Lord Rayleigh one anticipates intellectual superiority—not necessarily individual force, but that superiority which comes from sitting often at table during many years with the leading physicists of Europe; and one is not disappointed in the event. The promise of his preface is only "to give as clear and simple an account of the phenomena of radioactivity as the subject admits of, without sacrificing accuracy," binding him to no more than compilation; but in generous fulfillment he gives us a most interesting discussion of all the questions that have been opened by the discernment and skill of Mme. Curie. Indeed, his only fault worth mention is that he has not realized that the majority of those who will attach a value to the volume would have been glad if, somewhere between its covers, somewhat fuller details could have been found. They are mostly quite able to read mathematics, be the motive for doing so sufficient; they would have liked references to the original papers; and they would have been glad to know that they had only to take down this book from their shelves to find, for example, the value of Mme. Curie's determination of the atomic weight of radium, and other minutiae of that nature. It is a most interesting book, brimful of information and of thought; but it falls just a little short of the kind of perfection that an experienced bookwright would have imparted to it. The lacking matter we have spoken of might have been relegated to the appendices, of which there are three as it is, besides a direction to "see" an unembodied fourth. It will not be long before a new edition of this work is called for—or if there is not such a call it will be only because of this irrepletion. Let us hope there soon will be a second edition, and that the little conveniences we speak of will have been put in

before the work is offered again to the public. Probably Mr. Strutt did not wish his volume to dispute the ground with Rutherford's 'Radioactivity.'

Beginning with an account of Crookes's exquisite experiments (for let us not forget that it was Crookes's surpassing genius that started the whole development), Mr. Strutt first treats of the cathode rays, and shows how it was a happy idea of Henri Becquerel's—albeit, most curiously, a totally mistaken one—that brought about the discovery of radioactivity. Mr. Strutt says this was a circumstance unparalleled in the history of science, and the remark (which, we doubt not, expresses not only his own impression, but that of a whole circle of the first physicists of the world) merits our attention as illustrating, in despite of Dr. Karl Pearson, what very great significance those men attach to successful prediction. The case was this: The cathode rays of Crookes's tubes produced a peculiar green phosphorescence in the glass where they struck upon it; and this led Becquerel, after Röntgen had discovered that from the outside of the glass at that point his wonderful X-rays were given off, to surmise that salts of uranium, which likewise phosphoresce with green light, might perhaps emit similar rays. To test his guess, he wrapped a photographic plate in black paper, and, having placed some uranium nitrate upon the paper, awaited results. Sure enough, after a few days, on developing the plate, he found a perfectly distinct impression of the crystals pictured there. Now the thing that Mr. Strutt, in common with physicists generally, finds so extraordinary and downright unparalleled is that, notwithstanding this successful issue of a quasi-prediction, it nevertheless turned out, as he says, (1) that the green fluorescence of the glass of Crookes's tubes has nothing to do with the production of Röntgen rays; (2) that the green fluorescence of uranium salts has no connection with their effect on photographic plates, and (3) that those uranium rays which affected the plates are of a radically different nature from the Röntgen rays which duplicate the effect. It was, indeed, a remarkable case, conveying the important lesson, not that prediction or quasi-prediction is not a vitally important factor of physical research, far less that it is unscientific or even anti-scientific, as Professor Pearson contends, but that one or two fulfillments of predictions do not suffice to prove that the hypothesis upon which they are based is so much as a recognizable likeness of the real truth. The experience of Becquerel was, it is true, not so unprecedented as Mr. Strutt represents it to have been. He goes too far in saying that the Röntgen rays, the uranium invisible rays, and the green phosphorescence "have nothing to do with" one another. It can hardly be doubted that there is some connection between them, although we cannot say what it is, and although the phenomena are certainly not directly allied. Mr. Strutt can surely have no difficulty in calling to mind many and many a chemical induction, virtually predictive, which went on swimmingly for a long time and then broke down so one-horse-shay-ly that the favorable instances seem to us little more than accidental coincidences. Probably, however, time will show that they were not so utterly for-

tuitous as they at present seem to have been.

Several of Mr. Strutt's positions in the logic of science are questionable; but whenever he has set forth his reasons they appear very strong and very interesting, even if not fully convincing. Against his mode of attacking the substantiality of matter and his argument in favor of electricity as the only subject of spatial motion, it is impossible to hold out. (We speak of his argument, which, however, neither is nor professes to be absolutely demonstrative.) His doctrine of the transmutation of the elements is peculiar in making the course of development to proceed from elements of high atomic weight to elements of lower atomic weight. Moreover, he makes the transmutations run along the horizontal lines of Mendeléeff's table. The brilliant ingenuity exhibited by Curie, Ramsay, Rutherford, etc., in all these researches, and their astounding marvels of manipulative skill, are now an old story, perhaps; but, as narrated in Mr. Strutt's book, they appear more real and more fabulous than ever.

The Tomboy at Work. By Jeannette L. Gilder. Doubleday, Page & Co.

In this sequel to her 'Autobiography of a Tomboy,' Miss Gilder makes her heroine tell the tale of her first year's work. Her strenuous career began when, at the age of fifteen, she was engaged by a historian of the civil war to search the records in the Adjutant-General's Office at Trenton. To do this work, she had to take the six o'clock train every morning from Birdlington, but this only lent zest to the employment. At sixteen, "Miss Gilbert" obtained work in the Mint in Philadelphia. There she had to weigh gold, and, when gold was scarce, to make cotton flannel bags to hold it when it should begin to come in again. From the Mint she went with her family to Newark, and at first colored photographs for a living. Then came an appointment in an auditor's office, where, as she was quite unable to add figures correctly, the head clerk obligingly did her work as well as his own, declaring himself more than repaid by her whistling of tunes from the Italian opera. Next came a post as proofreader, then another as copyist in the office of the Registrar of Deeds. Finally, at about eighteen, as far as we can calculate, this enterprising young woman, having already discarded five or six different pursuits, settled down as a newspaper writer in Newark.

But hers was not the temperament that enjoys being settled, and she is soon in New York interviewing "the proprietor of the most famous newspaper. . . . The interview was short. 'Well,' said he, regarding me with piercing eyes, 'what do you want to do?' 'I should like book-reviewing, or anything that comes to hand.' 'You can do the books, if you like,' said he, 'but be original; don't give us the same old cut-and-dried stuff. Your salary will be \$30 a week—good morning!' " No wonder that "Miss Gilbert" had to restrain an impulse to drop on her knees and kiss his "strong, shapely hand." In order not to be cut-and-dried, on the advice of Miss Kate Field she wrote her reviews in dialogue form: "I had a family take up the books of the day and discuss them, giving

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collecting, is a revelation of the possibilities of the art that will no doubt incite others to collecting on their own account. Not that anthology-making is a mere matter of going out hunting. There is a knack in it, and many a serious reader might range over the same manor as Mr. Matthews, but never put up the same game. In the short essay on "American Epigrams" the author has brought together a number of ingenious couplets and quatrains in which are recorded some of the chief crises of American history. The best are by Lowell, such as this, with a squint at Benjamin F. Butler:

"B—, taught by Pope to do his good by stealth.
Twist participle and noun no difference feeling;
In office placed to serve the Commonwealth,
Does himself all the good he can by stealing."

When Sir Frederick Bramwell was called on at a dull dinner in London, after a dozen and a half speakers, to respond to "Applied Science," he said that "at this time of night the only illustration of the toast I can think of would be the application of the domestic safety-match to the bedroom candle." Whereupon Lowell promptly handed him the following, scribbled on a card:

"O brief Sir Frederick, might the others catch
Your happy science—and supply your match!"

Less accessible than Lowell's are the epigrams of John G. Saxe, chiefly directed against feminine weaknesses:

"Whenever I marry," says masculine Ann,
'I must really insist upon wedding a man.'
But what if the man (for men are but human)
Should be equally nice about wedding a woman?"

"The quatrain," says Mr. Matthews, "has never received due recognition." In the use of this form, as in the case of "American Satires in Verse," Lowell carries off the American honors; but H. C. Bunner, commonly known as a humorist, had an almost equal gift for the pathetic quatrain. To the uncollected poems of Bunner, whose early death was a real loss to American literature, one of these essays is devoted. In it Mr. Matthews collects certain "outcast" verses which their author and his executor did not think fit to include in the definitive edition of his poems. They are well worth saving, especially that *tour de force* of wilful mispronunciation entitled "Classic Journalism," which begins with the lines:

"The beautiful garland of justice awaits
The eminent poet and general Socrates,"
and ends with

"And Greek Journalism has vanished beneath
The silent oblivious waters of Lethe."

The eleventh and last essay is a recreation apparently unconnected with anthologies. It is an account of a feat of conjuring performed by Robert-Houdin before Louis Philippe and his court in 1846, with an explanation by Mr. Matthews how the thing might have been done. But the anthologist who haunts the by-paths in search of rare specimens may well find himself, in the company of prestidigitators when, like Mr. Matthews, he has loitered with plagiarists and gastronomists and the rest of the neglected writers to whom we are introduced in this entertaining little volume.

Industrial Organization in the Sixteenth and Seventeenth Centuries. By George Unwin, Sometime Scholar of Lincoln College. H. Frowde. 1904.

It is not too high praise to say of this

volume that it is the most important contribution to English industrial history since Mr. and Mrs. Webb's 'History of Trade Unionism.' It deserves to stand, so far as the subject-matter of the work is concerned, along with Ashley's 'Economic History' and the now famous work of the Webbs as one of the three indispensable special histories of industrial organization in England. It is the more welcome to the student of this subject as it bridges the chronological hiatus between the works of Ashley and the Webbs, and supplies a reliable outline of the period between the Reformation and the Revolution. How little authentic information has hitherto been available upon the industrial evolution of these two centuries one may judge by comparing in Palgrave's 'Dictionary of Political Economy' the two articles upon "Gilds" and "Livery Companies," and the appended list of sources on which the two articles are based. The gild early became something of a fad with the economic historian, while between it and modern industrial organizations, whether of capitalists or employees, there was seemingly fixed a great gulf of ignorance, bridged only here and there by a speculative guess or a superficial crust of conjectural history.

Mr. Unwin begins by pointing out that there are four well-defined types of manufacturing systems: household manufacture, the household consuming its own output; handicraft manufacture, with independent craftsmen each producing a staple article and supplying a narrowly localized market; the commission system of manufacturing, where capitalist-traders supply material to craftsmen at the craftsmen's homes, and market the finished product; and lastly,

manufacturing under the present factory system. Corresponding to this series of types is a constantly widening market. Mr. Unwin undertakes to show the historical process by which the second type (that of handicraft manufacture as embodied in the craft gild) was supplanted by the third type (the so-called domestic or commission system) as embodied in the so-called Livery Company. The transformation of the craft gild into the livery company was brought about by three different processes. In the fourteenth century certain closely allied crafts rose to a position of predominance over the other crafts. In the fifteenth century the trading function came to be mainly exercised by a select body within a single craft organization. In the sixteenth century, organizations which had arisen to represent the purely trading class acquired control over the craftsmen proper. Thus, in the Elizabethan century as in the century preceding, we find a bi-cameral trade organization consisting of the Livery with its Court of Assistants as a central body of control, and the Yeomanry, including the smaller masters and the journeymen, who had no prospect before them but that of remaining members of the lower house, and who were "therefore bound together by an increasing consciousness of a class interest which separated them from their employers."

The bulk of the book consists in tracing the three ways in which the transformation of the earlier craft gild was effected. The latter part of the volume is of interest as showing how the industrial corporation of the Stuart century tended to split in two through the efforts of the small masters to

assert against the larger masters an independent organization having a local monopoly of trade. The efforts of the smaller masters, though supported by the Crown, were defeated by forces making for a wider internal market and for the development of the export trade. Singularly enough, it was just this class of submerged small masters, reduced, as they commonly were, to the journeyman status, who kept alive the traditions of class solidarity which culminated in the eighteenth-century trade union. As Mr. Unwin puts it, "In tracing backwards the spiritual ancestry of the organized skilled workmen of the present day, the first link is undoubtedly to be found in the small master of the seventeenth century" (p. 200).

The most interesting contribution which this work affords to current economic problems is the theory which Mr. Unwin propounds of the early industrial maturity of Great Britain and the earlier emergence of workmen's free organizations in that country. He rejects *in toto* the view to which even free-traders have sometimes yielded a cursory assent, that the protective or mercantile policy afforded the matrix for the early growth of British manufactures; and contends that it was, on the contrary, "the freedom of internal intercourse" and "the comparative absence of mercantile restrictions" which gave the early impetus to manufacturing industry. As to trades unions he says:

"The passing of the Combination Acts and the early prosecution of trade unionists should not blind us to the fact that it was the comparative freedom of England in the eighteenth century which alone made the combination of wage-earners possible. At the very moment when the workers of England were laying the foundations of a free organization . . . the Governments of France and Prussia were putting a veto on any such spontaneous popular development, by transferring these same institutions into the hands of the police, and utilizing them as a part of the machinery of a more or less benevolent despotism" (p. 227).

The only adverse criticism to be passed on the volume is that the very extensive use of the comparative historical method often mars the narration by obscuring under a mass of detail the objective point. If the illustrations of analogous processes of industrial evolution drawn from Continental history had been heroically depressed into footnotes, however bulky, it would be much easier to follow the expository clue. The make-up of the volume is far below the deserts of the subject-matter. It is to be hoped that a later edition may present us the uninterrupted description of the transformation of English craft guilds into Livery companies, with foreign analogues set more in the background. It requires a resolute perusal if the student of the present volume is not to get bogged occasionally in the adventitious illustrative material.

An Introduction to the Theory of Optics. By Prof. Arthur Schuster. London: Edward Arnold; New York: Longmans. 1904.

As the title imports, this text-book, by a physicist of fairly high standing, relates, not to light in general, but only to the theory. The student is supposed to be acquainted already with the phenomena of light, so far as they are described in college books of general physics or "natural philosophy." Nor is this a regular treatise

on the theory of light, but only an introduction to that theory of a peculiar sort. The first two-thirds of the volume are elementary; that is, they explain only polarization, interference, diffraction, the theory of optical instruments, and the peculiarities of the different crystalline media—phenomena that result simply from light's consisting of transverse vibrations. The remaining third of the book contains the deeper theory of light, and is written on a novel plan, the idea being to direct students to the original memoirs without repeating their contents, unless Dr. Schuster has some simplification or amplification of the matter of a memoir to bring forward. This spoils the book as a work of reference, but we think that all good physicists will highly approve of thus forcing upon students the habit of reading original memoirs.

There is another feature that cannot pass unnoticed. Probably a large part of our readers are aware that of late years there has been among physicists a split of no ordinary kind. How many approved writers, metaphysical analysts of high pretensions, have explained to us that there necessarily is a science of physics whose essence consist in its assumption that matter moves according to the principle of inertia, which Hoeftling, for example (than whom no philosopher, perhaps, is more in vogue just now), calls, in his 'Outlines of Psychology,' "the fundamental assumption with which natural science comes into existence." Yet at this moment a growing moiety of the world of physics assumes this law to be only approximately true, and even that only for velocities not too great. The physicists of the nineteenth century

took for the sole aim of their hypotheses the explanation of phenomena as special cases under the general laws of dynamics. The new school, however, proposes to explain dynamics as a special case under the general laws of electricity. The peculiarity of Schuster's position is that he wishes to treat the matter as a party question, and says that the new opinion must be "strenuously resisted." Such language will tend to make us all hope the new doctrine may turn out true, as scientific propositions that excited "strenuous resistance" usually have turned out in the past. We note, by the way, that Schuster seems to regard the fact that Kirchhoff (in 1857) remarked that the velocity of electricity was about that of light, as in some measure detracting from the merits of Maxwell. Why, then, does he not mention that the electromagnetic theory of light was originally propounded by Faraday in 1846?

The Book of the Iris. By R. Irwin Lynch. (Handbooks of Practical Gardening. Vol. XXI.) John Lane. 1904.

This is a book by a cultivator for cultivators. The author is the curator of the Cambridge (England) Botanic Garden. He deals with his subject in a practical manner worthy of high praise. Of course, his directions as to the management of this attractive group of plants are designed primarily for amateurs in Great Britain, and within the limits of those islands, will be found wholly safe and useful. The directions have also a good degree of applicability to these plants under cultivation in all temperate exposures, and hence can be regarded as trustworthy even in our own

climate. Mr. Lynch has arranged the species of this interesting genus in a way to satisfy every purpose of the cultivator.

One of the groups of the more capricious species was entrusted to another hand (now, alas, a vanished hand). This chapter, by the late Rev. Henry Ewbank, formerly Vicar of St. John's, Ryde, Isle of Wight, is full of pleasant reading. Everybody knows with what enthusiasm English clergymen ride their hobbles, taking in them the same keen interest that their hunting parishioners have in the chase. Roses and all sorts of wayward plants have had their devoted clerical friends who have tried to win them from provoking ways, sometimes by coaxing, and more often by heroic measures hardly ventured on by the layman. The Irises known as the Onocyclius class stand rather by themselves in their extreme whims, but the Vicar seems to have induced them to be uncommonly responsive to his skillful management.

Our common blue-flag, and its kindred, delight in the wettest places they can plant their seeds and roots in. They have gone far away in their predilections from their cousins in the same order. These latter are true Xerophytes, plants of dry soil. They have well-marked devices for making the most of what water they can extract from arid ground. Many of them have vertical leaves, obviously an adaptation that greatly reduces the demand for water, which all plants lose by evaporation. Curiously, the species of Irises have retained this ancestral method of checking evaporation, although it is plain that they no longer need it in their chosen marshy homes. The sabre-like leaves of

Irises are folded in such a way that they have received the name equitant: near their bases they appear to ride astride, but nearer the top each leaf forms a veritable scimitar. From a cluster of these vertical swords there arise flower-stalks bearing blossoms of great beauty. Three of the divisions in the circles of protection stand as flaring banners, while, between these, three others droop gracefully in irregular and filmy folds, which sway in the lightest breeze. These often have striking contrasts of color, in spots or stripes, and cannot fail to catch the eye of even the most careless passer-by. The colors have been called nectar-spots and nectar-guides, and are interpreted as meaning to every welcome insect that here is plenty of nectar to be had. Allured by this attraction the insect visits the blossom, finding a convenient resting-place, while the head goes down along the nectar-guides into the flower, in search of the promised nectar. There it secures it, and, when the head is withdrawn, there is brought out upon the back of it a small amount of pollen from the anthers which were just behind. Now, flying away to flower number two, the same quest is made, but with this difference: the head just dusted with pollen is thrust down as before, but, in the early part of its descent, it comes in contact with a tiny shelf on which some of the pollen is taken off. This upper part of the sticky shelf is the stigma, the organ receptive of pollen, and from which the pollen tubes can grow down to the ovules, and thus secure the impregnation which brings about the ripening of them into seeds. This is obviously a very good way to prevent the self-impregnation of

the blossom, for the stigma cannot be touched by the pollen which lies underneath, except by insect intervention; and this is practically put out of the question by the arrangement of the parts. Although an insect could stop on its way out of a blossom after it had taken the sought-for nectar and clumsily turn around on the summit of the stigma and there place some pollen on the sticky surface, he never does any such thing. He deposits the pollen on his way in. It is, therefore, one of the charms which attach to this beautiful alliance of plants to watch the insects in their busy straight-away work.

The genus *Iris* possesses another charm which cultivators have not been slow in finding out, namely, that, well-used to grow in swamps, it can also patiently adapt itself to the drier places in the garden. Irises are, therefore, capable of wide employment as decorative elements in landscape gardening on the grand as well as on the small scale. Mr. Lynch's book will be of utility to all who wish to use them in this way. It will also be a pleasant companion for that increasing number of sensible people who are cultivating a few plants around which historical and literary associations cling. Among such plants the *Iris* (the *Fleur-de-lis*) holds a prominent place.

Eighteenth-Century Essays on Shakspeare. By D. Nichol Smith. Macmillan.

Of the nine essays in this volume, five are the prefaces to the chief editions of Shakspeare, and all but two (Dennis's, 'On the Genius and Writings of Shakspeare,' and Morgann's, 'Essay on the Dramatic Character of Sir John Falstaff') are still fairly accessible in the various editions of Malone's Variorum. It is well, however, to reprint all of these, and to give us Rowe's 'Account of Shakspeare's Life' unutilized. The introduction and notes are accurate and scholarly, but the book is disappointing to one who had hoped to find in it some discussion of the tendency and value of the numerous minor essays, as well as some sort of selection from them.

Mr. Smith does, indeed, mention familiarly over thirty essays by nearly as many authors, but, with very few exceptions, (c. g., Mrs. Montagu's 'Essay on the Writings and Genius of Shakspeare'), he gives us no estimate of their value, either intrinsic or as illustrating the critical attitude of the century. He has, in short, picked out only those essays which are of most critical value even to this century. Unfortunately, one needs only a little knowledge of the minor writers of a generation to realize that an acquaintance with merely the great names does not give a fair basis for comparison and inference; a study based on the bigger men alone inevitably ignores significant and important substrata of ideas and habits of expression.

Some of the essays which Mr. Smith mentions without estimate or citation have familiar titles, but nearly, if not all of them, are practically inaccessible to the general reader. It would be of great value to have a companion volume which should contain such further reprints as bulk would allow, accompanied by a full bibliographical account of all eighteenth-century essays bearing on the subject. For essays not reprinted in full, this bibliography should