—No reader of the *Century* should pass over the account of the late Bishop Whipple of Minnesota, contributed to the March number by the Rev. H. P. Nichols. A frontier bishopric would not naturally be regarded as the best stage from which to secure the attention of the civilized world, and had Mr. Whipple been seeking the distinction which came to him, he would doubtless have striven for a different locality. In the Northwest, however, he found the stimulus of a great cause—the downtrodden Indian—and responded to the call with a degree of vigor and consecrated common sense that accomplished large results. He believed in the inherent worth of the Indian, treated him with absolute sincerity, and had the rare gift of ability to put himself in the Indian's place. It should be needless to say that it is no credit to our Government that he was never drafted into service as conspicuously the fittest man in the whole country to take official charge of Indian affairs. The imminent admission of New Mexico as a State of the Union gives an added interest to Albert E. Hyde's account of "The Old Régime in the Southwest," when a Colt's 45-calibre was circulating-medium in New Mexico, good for its cost as a stake in any game or over the bar. The career of "Billy the Kid," shot down by an officer at the age of twenty-one, and yet credited with twenty-one murders committed by his own hand, furnished a fitting climax to the lawlessness which had reigned in the Territory down to the early eighties, and by its very violence started a reaction which has made New Mexico a fairly safe place for any man who knows how to conduct himself. Two papers of scientific interest deal with Marconi's achievements in wireless telegraphy and the much (but unintelligently) discussed researches of Professors Loeb and Mathews, on the "Nature of the Nerve Impulse." The results of these researches, probable and possible, are too technical for any valuable recapitulation here. They are set forth by Professor Mathews with due modesty in the main, but one is somewhat staggered by a prima-facie promise of eternal physical life, in the statement that "there is apparently no inherent reason why a man should die, except our ignorance of the conditions governing the reaction going on in his protoplasm."

—For a second time, *Mélusine*, that learned "repository of mythology, popular literature, traditions, and usages," founded in 1877 by Henri Gaidoz and E. Rolland, has been obliged to suspend publication, "pour une période indéterminée." So we read with sincere regret on the cover of the December number, concluding the tenth volume. Folk-lore in the widest sense was certainly never edited in more scholarly or *spirituel* fashion than by M. Gaidoz, who stays his pen now not because of exhaustion of material or his own delightful gift of treatment, but, we may be sure, in consequence of a too limited and precarious support. He has at least the satisfaction of having amassed in the files of *Mélusine* a treasure available for all time to the curious. The closing number well exemplifies the range of this periodical. It opens with a discussion of a Breton custom of giving satirical puppets, supported on a crotch, to the victim of an engagement broken in favor of another lover. The illustration shows a handkerchief in the man's hand, symbolical of tears; and, in analogous customs noted, onions are employed with the same significance, hung upon a bouquet of willow. M. Camélat continues his animal fables from the valley of the Lavedan (Hautes-Pyrénées); one, in contrast with the fable of the fox and the crow, telling of the cock's escape from the fox's jaws by the happy device, as the bell announced high mass, of saying, "Let us pray; they are elevating the host." "Yes," said the witless fox, "let us pray God," and lost his hold in the act. M. Gaidoz chases the rainbow (we remember he began the pursuit in 1884 in the first number of the revived *Mélusine*) to the 43d chapter, and gives his 25th illustration of popular etymology and folk-lore, and his 10th of "Little Red Riding-hood," with a parting word on the nomenclature of the Devil, this time in English. Breton proverbs and sayings and the lark's song are other rubrics, and finally we read the last of the invaluable critical reviews bearing the authoritative initials, H. G. *Encore une étoile qui file.*

—Mr. M. Morison's 'Time-Table of Modern History' (Macmillan) is a series of synoptic charts which embraces the years 400-1870. In some respects the work resembles Professor Nichol's 'Tables,' but its scope is on the whole less comprehensive. Literature and art are left out in order to provide more space for politics and war. There is a further difference, which is equally noticeable. While Professor Nichol uses almost every line, Mr. Morison does not fill up anything like the whole of his space. For example, at the outset Scotland is allotted one-third of a large page, receiving equal prominence with the Eastern Empire and the Western Empire. However, as the annals of the Picts and Scots are somewhat meagre until the ninth century, the Scottish column remains almost void for eighteen pages. It is likewise with the entries under India, when a column comes to be assigned to that country. For page after page the history of India is apparently a complete blank. In such a work economy of space is a prime consideration, and we cannot altogether praise an arrangement which leaves vacant so large a part of so many columns. Where the historical records are defective or the events too trivial for notice, it is surely not the part of good judgment to lavish space upon the countries in question. They may be kept in the background until they have become important.

—The difficulties of preparing a date-book on parallel columns are obvious. Accordingly, we shall not dwell alone upon what may be termed the shortcomings of Mr. Morison's scheme. He certainly brings together a great many historical facts in such wise as to show their chronological relations. His pages are large, and towards the close of the work he divides each into seven columns, representing seven countries, with columns devoted to seven other countries facing them on the opposite page. This compilation will have its use, but, quite apart from one's conception of how a comparative synopsis should proceed, its merit would be enhanced had more pains been taken to render it accurate. While we cannot pretend that we have read the whole work, the part which we have read discloses an unnecessarily large number of slips. *E. g.*, p. 7, Albion, three times instead of Alboin, and the Empress Theodore for Theodora; p. 12, Eudo for Eudes; p. 13, Omayyad in one column and Ommeyad in another; p. 19, "Nicholas I. publishes the False Decretals, including the Donatim of Constantine" (apart from the misprint, the statement would not be altogether easy to prove); p. 20, under France and the year 910, "Foundation of the Abbey of Cluny"; p. 22, under Germany and 960, "Foundation of the Abbey of Clugny"; p. 24, Otto I. is crowned by the Pope and deposes the Pope (what Pope?); p. 26, the degree of the millennial excitement is exaggerated, and, p. 28, there is a misstatement regarding the day of the week on which the Truce of God began. We need not accumulate examples. The book is by no means impeccable. At the same time its weaknesses are largely those which are incidental to compilations of its class, and we can see no reason why it should not be of considerable value as a work of reference.

PASTEUR.

The Life of Pasteur. By René Vallery-Radot. Translated by Mrs. R. L. Devonshire. McClure, Phillips & Co. 1902. Two volumes. 8vo, pp. 301, 304.

Pasteur was heartily a Frenchman, but not after the fashionable light-hearted pattern. A heart more completely unsullied by all there is in its world to sully it—egotism, chiefly, in *his* world—is not to be found in what land or age you will. It happened that his discoveries shone brilliant to those who regarded them from the side of utility—to wit, his improvements of wine and beer, his cures of the silk-worm trouble, the chicken cholera, the swine fever, anthrax, diphtheria, hydrophobia, etc. Nor was it accidental that his discoveries had that character. Still, it was not that which made him the great man he was, but his strength in research, which cracked every nut, however redoubtable, with such surprising promptitude that one really cannot think that it was ever fully tested. When we wish to remind ourselves what scientific logic really is, we may think of Pasteur, his investigations, and his life, and ponder them well on every side, without overlooking the intimate vital link between the intellectual and moral parts of him.

He may be said to have commenced business on a certain day early in 1847, when Auguste Laurent, another chemist of clairvoyant eye—a poet, too—at that time his co-assistant in Balard's laboratory, showed him, under a microscope, some tungstate of soda, and made him remark that it was a mixture of three distinct kinds of crystals. That was enough. Pasteur forthwith set to work crystallizing tartrates and racemates. It is a pity that the biographer has not seen fit to set forth the motives which determined this momentous selection of a subject for such experiments, for it not only would have explained just what Pasteur's feat was, which is often misstated, but would also have afforded an instructive illustration of how science gets gradually built up. Tartaric acid had been one of the numberless discoveries of that muse-visited apothecary Scheele, made apparently in 1769 or 1770. In 1809 Weiss had first set forth the crystallographic systems, but it seems to have been some ten years before his work attracted much attention. In 1811 Arago had

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discovered some of the phenomena of circular polarization, which Biot, beginning in 1813, had explained as a rotation of the plane of polarization. Biot had shown, too, that not merely certain crystals, but also certain solutions and even certain vapors, exhibited this phenomenon. He had found that some slates of quartz cut perpendicular to the axis turn the ray to the right, while other specimens turn it to the left. In 1821 John Herschel had remarked that, of the three kinds of quartz crystals that Haüy had noticed (namely, first, those which can be held vertically so that, of two prismatic faces to the right and left, the former has two small facets impinging upon it below to the left, the latter two similar facets above at the right; second, those which are exactly like the first except that right and left are interchanged; and third, those which are tolerably regular dipyramids), the first invariably rotate the plane of polarization to the left, the second to the right, and the third neither way. This was strong evidence, though far short of proof, that the rotation of the ray was somehow due to some molecular structure of the general nature of a right-handed or left-handed screw; and, what fired scientific imaginations, dynamics was utterly baffled to suggest what sort of force it could be that should regularly produce such an arrangement.

The year (1822) of the publication of Herschel's discovery had been that of another discovery, made two or three years previously, which no single mortal then dreamed had the remotest connection with Herschel's. The manufacture of tartaric acid is a somewhat delicate business, not unlike sugar-refining. Among other places where it was then carried on was the pretty town of Thann in Alsace, which no tourist will have forgotten, if he has been there, on account of its church. A Mr. Kestner was conducting the manufacture there by a regular routine when he one day found, to his surprise, that a certain batch of his acid, made by the regular process, had hardly any tartaric acid in it, but consisted of a new acid, less soluble than the tartaric, though closely similar. He at first mistook this for oxalic acid, but, after having been set right on this point by the Hollander John, he named it after the little town that so well merited fame, *thannic* acid. But when he tried to make more of it he failed, and so did other manufacturers, although some of them found that, when tartaric acid was wanted, this thannic acid was very apt to put in a distinctly uninvited appearance. Before 1826, Gay-Lussac had compared the new acid, which he (we think first) called by its now usual name of *racemic*, with the tartaric, and had found that their chemical behavior was identical, except toward certain bodies with which one or the other seemed to have some underhand relations, where strong contrasts appeared. By 1830 Gay-Lussac and Berzelius had severally proved that the composition of the two acids was one and the same; in Berzelius's phrase, they were *metamers*—the third or fourth instance of this phenomenon to become known. In 1835 Biot contributed the information (destined to prove so important) that tartaric acid and the less complex tartrates rotate the ray to the right.

In 1842, Eilhard Mitscherlich had published the fact that sodium-ammonium racemate is seen under the microscope to crystallize in the same shapes precisely as sodium-ammonium tartrate, although the latter rotates the ray, while the former does not. The following year, his amanuensis, Werther, took for the subject of his dissertation for the doctorate the crystal forms of the tartrates, and this dissertation was frequently used by contemporary French chemists. Although it appears that Mitscherlich had overlooked the unsymmetrical facets of the sodium-ammonium tartrate, which are certainly small, we can hardly believe that they escaped the careful study of Werther. At any rate, the crystals are geometrically just like those of ordinary Rochelle salts, which must have come under the eye of Pasteur himself, so few things escaped it. Thus, in one way or another, it is altogether probable that Pasteur had been for some time already aware of the unsymmetrical forms of the tartrate. Indeed, we find it recorded that in a conversation held in 1844 with his bosom friend Chappuis, Pasteur repeated *verbatim* a paragraph of Mitscherlich's 1843 paper, to the effect that, although the two salts in question formed crystals geometrically indistinguishable, yet the tartrate rotated the ray, while the racemate did not. Now there would hardly be anything in this so impressive as to cause Pasteur to carry the very words in his mind, if the tartrate crystals were symmetrical. If, however, he was aware that they presented a screw-like configuration, there would be a hope of resuscitating the theory of Herschel to which Mitscherlich's observation would otherwise deal the deathblow. It is evident that he must have cherished the wish to examine the racemates—salts not easily obtainable—to see whether they were not destitute of the unsymmetrical facets. This idea, then, had been in his mind since 1844; and, accordingly, when Auguste Laurent showed him that soda tungstate under the microscope, and he saw that it consisted of three kinds of crystals mingled, we can now understand why he at once set to work making crystals of tartrates and racemates. It had evidently struck him as one of the possibilities that the racemates likewise were mixtures.

Upon how many men's backs was Pasteur mounted when he attained to the making of this memorable experiment, which marks the opening of a scientific era to the close of which our great-grandchildren may not be able to look forward! The novelty of the discovery may, for aught one can clearly discern, be attributable to Pasteur's good fortune rather than to his merit. Yet it certainly illustrates his mysterious faculty of rightly guessing at Nature's ways (a privilege upon which he never presumed); and what at any rate was a property of the man alone, and is truly surprising, was his prompt recognition of all the importance of the thing, even to its remoter consequences. We are told that the moment he first got the fact solidly in his grasp, he sprang up quite wild, and ran out, embracing the janitor in the corridor, and, though no man ever more economized minutes, betook himself to the garden of the Luxembourg, where he occupied the rest of that day in setting his disordered ideas to rights. Before long, we find him writing to his beloved Chappuis that this discovery of right-handed and left-handed tartaric acid is destined to lead to the conquest of the most dreadful diseases! What a marvel of clairvoyance! For we now know that, without being aware of it, he had set foot upon the territory of that Unsymmetrical Carbon Atom which sets the pretensions to supremacy of attractions and repulsions at defiance, and carries one of the chemical keys of life.

When Pasteur first exhibited the experiment to Biot, who had been appointed by the Academy of Sciences to report upon the matter—the aged Biot, who, though reared in and sternly attached to the materialistic school of Lavoisier and Lagrange, of Laplace, Carnot, Monge, and Berthollet, had yet never ceased to be Catholic, and in his old age was become even *dévot*—at the critical moment, the old man exclaimed: "Hold a moment, my boy. I have so loved science that this makes me feel faint." Pasteur likewise was Catholic; and if he had not been possessed of that accurate logic which caused him to be as exact as Biot himself in scientific matters, but yet to make room for spiritualistic views of life, it is safe to say that not one of his great discoveries could have fallen to him. Somebody at the Academy of Medicine was one day urging the importance of a certain hypothesis. "Oh," exclaimed Pasteur, "as for hypotheses, we fetch them into our laboratories by the armful." *Mind*, he *did not* absurdly pretend to keep them out, as some do; nor want them only in homœopathic quantities, like many more. No, he would order large supplies of them; he would consume them in armfuls. And what would he do with his armful of hypotheses, when it was fetched? He would begin by sorting them over, with unwearied industry, as he had done his right-handed and left-handed crystals. First, those that could be shown upon consideration to involve something in conflict with known facts were weeded out. Then, by a skilful alternation of excogitation and experimentation, the mass of the others would be successively bisected until all but one were discredited, while that one was made gradually luminous with apparent truth. To a less cautious man it would have seemed demonstrated. But now began the main work of the investigation. This one hypothesis which had been winning favor until it was become prime favorite, had now to be treated as an enemy, and ingenuity had to be racked in trying to find something which the hypothesis would require to be true, but which experiment should refute. This fight was always an obstinate one—it sometimes lasted for years; and it was not until every device that could be thought of for bringing the theory to grief had been tried and had been found to avail only to put its truth into stronger light, that at length Pasteur would bring it before the world. Then his scientific friends always urged upon him the view that here the business of the man of science ended, and that he should now pass to another problem; and Pasteur himself might assent to this, in his head, but his heart always overruled such counsels. He *must* see the thing accepted and acted upon, so that here would begin those struggles with all the agencies of conservatism and of night that brought Pasteur to his comparatively early death.

As an illustration of Pasteur's style of dealing with such controversialists, a little

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episode that concerned Colin may be recounted. Colin wished to impress people with the belief that he knew much more about anthrax than did Pasteur. So, one day when, in a paper before the Academy of Medicine, Pasteur incidentally mentioned that fowls do not take anthrax, Colin jumped up and said that nothing was easier than to give a hen this disease. Thereupon Pasteur said that in two days he should be sending Professor Colin some specimens that he had demanded of him, and, since it was so very easy to give a hen anthrax (which develops almost immediately), he would be very much obliged to him if, in exchange, he would send him a hen dying of anthrax. "You shall have it," said Colin. At the next meeting Pasteur remarked that he had not received that hen, and Colin made some excuse, promising to send it in a few days. But at every meeting, Pasteur recurred to the hen, which was never forthcoming, though always promised. At length, after this had been going on for months, Colin rose and said that he had found that he had fallen into an error, and that it was impossible to inoculate a hen with anthrax. Upon that, Pasteur remarked that his colleague was now going much further than he had ever done, for he had only said that hens *do not take* anthrax; but that it was possible to give it to them, he would demonstrate by experiment. So the following week he brought to the Academy three hens—one dead of anthrax, a second dying of it, a third recovering from it. Colin was silenced for the moment, but at a subsequent meeting he said, with an air of insolence: "I wish we could have seen the bacteridia of that dead hen, which M. Pasteur took away with him without showing us the necropsy and microscopical examination." Thereupon, Pasteur demanded a committee of investigation, of whom Colin should be a member, so that the skeptic was thus obliged to sign his own refutation. The secret of the matter was that Pasteur had ascertained by experiment what temperature was the highest at which the bacillus of anthrax could live; and, since this had been found to be two or three degrees below the temperature of the blood of fowls, they could not under ordinary circumstances contract the fever, and he was confident that Colin, looking at the matter from quite another point of view, would never light upon the proper way of giving chickens anthrax, which was simply to immerse them in a cold bath until the disease was developed.

This book will serve to correct many a misapprehension. It shows us clearly, for example, that Pasteur was not at all, as he has so often been represented, the exponent of a certain philosophy. The extreme simplicity of his heart, the childlike single-mindedness of his gaze at truth, at one with a childlike insight into things, seem to have prevented the intense concentration of his observational and intellectual energies from becoming a source of fallacy to him. His simple peasant's religion probably did aid him to keep clear of metaphysical entanglements which might very probably have prevented his researches into spontaneous generation; but, except in this alexipharmic way, they did not influence his scientific work in the least degree. He considered the logic of science to be one thing, and the logic of life to be another, and quite independent, matter. Another mistaken notion which has been current among those who busy themselves with Borioboolah-Gha, and which was perhaps fostered by Pasteur's severity of countenance, has been that he was a monster of cruelty, whose treatment of animals and children ought to have been restrained by law. The fact we find to have been that his susceptibility and tenderness of heart were quite excessive. Again, those histories of chemistry that are written with the German determination to concatenate events, albeit at the expense of spinning threads from the substance of the writer's being, tell us that "it was his work upon optically active compounds which led him on to the treatment of biological questions." This is certainly a most rational view, and is open to no criticism whatever, except that it happens to run counter to the facts. Those facts are to the effect that, with a single partial exception, every one of his incursions into biology resulted, not from any inward leading, but against the passionate longings of his heart, from external propulsion and the compulsion of that sense of duty to which his too emotional nature was all his life enslaved.

The whole of this noble life is laid open in these pages. It is a relatively small book, and its greatest fault of which the reader will be sensible is that there is not more of it. In such limits it could not be a Boswellian mirror; nor would the life of Pasteur, who was no show-specimen of a man, lend itself to such treatment. But we rise from Boswell's volumes knowing indeed perfectly what Johnson was, or, at least, how he appeared in society and in intimate conversation, but still perplexed to imagine how he came to be the man he was; whereas, here, Pasteur is not only exhibited but explained. The whole evolution of him from his seventeenth-century ancestors, the nurture and formation of mind and heart, are made comprehensible. The father, especially, stands out distinct as an old acquaintance, no character in novel sharper lined—a veritable contribution to our knowledge of men.

The scientific world in which Pasteur lived is veraciously and vividly portrayed, and this is one of the most valuable features of the work. Many portraits are hit off with as much truth as *chic*. One of them is Biot's. Happy would be the reader who was not familiar with the 'Causeries du Lundi,' since he would have one of the joys of life still to taste; but probably the reader does know that second of two articles in the second volume of the 'Nouveaux Lundis' which describe Biot. Of course, Sainte-Beuve, as he himself confesses, could not estimate Biot. The writer was too sophisticated and fine-drawn for his subject. All that he says is true; but what rating is to be placed upon the different features as elements in the make-up of a scientific man is quite another question. The portrait, on the whole, is not agreeable; in this book, on the other hand, Biot appears in the most charming light, and, since the whole man is viewed, in a much truer light. There are points of interest that both avoid. Gay-Lussac, too, Thénard, Balard, J. B. Dumas, E. Mitscherlich, Liebig, Henri Ste.-Claire Deville, Bertrand, Lister, Virchow, Vulpian, all come upon the scene, with many a younger man. We know not where to point to so truthful and useful a picture of the world of science. If you want to understand the typical man of science, you will find the creature here veraciously expounded. Behind the chief figures there is a life-like and animated background, where Napoleon III., the Emperor Friedrich, Dom Pedro, Littré, Sainte-Beuve, Renan, Alexander Dumas *fils* (very charmingly), Henri Regnault, and other painters will be noticed. Verily, the French still maintain their clear supremacy in the art of making a book, especially a characterism.

The translation is in excellent English. Only rarely have we come across a sentence which, we are persuaded, cannot have been quite rightly rendered, or a word not just the usual scientific expression; and on the whole the translator's work has been done with so much care, and has to so high a degree the rare virtue in a translation of making agreeable reading, that we cannot help feeling particularly grateful to her. The index is excellent, notwithstanding a few misprints. The photographic portrait is a likeness. The get-up of the book is extremely beautiful, with black type and uncalendered paper; the volumes are light to hold; the linen covers, simple and in good taste. In short, the book is an unalloyed delight—the clothing to the senses, the contents to the heart and spirit.

THE MOHAWK VALLEY "AS SHE IS ROMANCED."

The Mohawk Valley: Its Legends and its History. By W. Max Reid. G. P. Putnam's Sons. 1901.

Cardigan: A Novel. By Robert W. Chambers. Harper & Bros. 1901.

The Backwoodsman: The Autobiography of a Continental on the New York Frontier during the Revolution. By H. A. Stanley. Doubleday, Page & Co. 1901.

The valley of the Mohawk, "the Flanders of America," the theatre of uncounted wars, the floor on which many races were threshed, the pathway of empire, the granary of the Revolution, has not been quite so "sadly neglected by historians and writers of fiction" as Mr. Reid, in his preface, would have us believe. Among local accounts of our Revolutionary struggle it is hard to match Campbell's 'Annals of Tryon County' or Stone's 'Life of Brant.' To the history of the valley in the Seven Years' War is devoted another valuable work, 'The Life of Sir William Johnson,' begun by the elder William L. Stone, and completed by his son and namesake. The pen of Francis Parkman himself has described not only that war, but also the wonderful earlier struggle with France, when for a century and a half the magnificent schemes of the first Power in Europe were foiled, and its armies held in check, as at another Thermopylæ, by the three hundred Mohawks and the few Dutch and English settlers who at length joined with them; and within a year the history of the valley for three centuries has been faithfully recounted in one of the most satisfactory of recent historical writings, Halsey's 'The Old New York Frontier.' Cooper's muse, it is true, walks only on the borders of the valley, avoiding its soil as it were quarantined; but even in those early days we had Hoffman's 'Greyslaer' to match the vigorous description and omit the wearisome dialogue of the choleric

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