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DECEMBER, 1885. VOL. III., No. 6.

C. Keough

Kosmos.

SCIENCE ASSOCIATION:
VICTORIA UNIVERSITY - - COBOURG, ONT.

CONTENTS.

KOSMOS (formerly *V. P. Journal*) is a monthly journal published at the beginning of each month, and is devoted to Science, Literature, Education, and the popular treatment of subjects of social, intellectual, and moral importance. It has been established and is controlled by the Science Association of Victoria University, which is composed largely of graduates, but is not restricted to either local or sectarian interests. Subscriptions may commence with any month. Extras to subscribers, 10 cents.

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TO OUR SUBSCRIBERS.

The Board of Management of KOSMOS have concluded to make a change in the method of publication, and to improve somewhat the material introduced. Hereafter, KOSMOS will appear as a *QUARTERLY*, the first number to be issued in *March*. The number of pages will be increased, and the material will consist principally of essays and articles on scientific subjects, accompanied by notes and criticisms The desire is to improve the quality of matter as far as possible, and we hope that the friends who have kindly given us their assistance during the past three years will continue, both by subscription and contribution. The price of the journal will remain the same as before.

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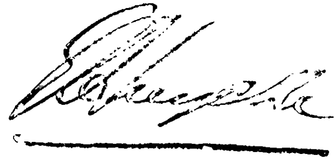

KOSMOS.

VOL. III.] DECEMBER, 1885. [NO. 6.

DEAF AND DUMB.

THERE is a celebrated group by Woolner, representing two children, the one deaf, the other dumb. "The speech denied passage through the lips, breaks out in rarer beauty from the eyes; and for the hearing denied entrance by the ears, there is, indeed, a subtle responsiveness of brow and cheek to the spirit utterance from the soul of the other." (J. M. Gibson.) Robert Browning has translated the idea into poetry:

"Only the prism's obstruction shows aright
The secret of a sunbeam, breaks its light
Into the jewelled bow from blankest white;
So may a glory from defect arise:
Only by Deafness may the vexed love wreak
Its insuppressive sense on brow and cheek,
Only by Dumbness adequately speak
As favored mouth could never, through the eyes."

PROFESSOR JOHN TYNDALL, who contributed every dollar of the profits of his course of lectures in this country in 1872 to the establishment of scholarships in physical science, is by no means a rich man. He lives in much simplicity with his second wife on the top floor of the Royal Institution Building, and has no children. Mrs. Tyndall is the daughter of a peer. Scores of professional men would consider Professor Tyndall's style of living very straitened, but no scholar ever cared less for money than he.—*Harper's Weekly.*

FARADAY.

"WHICH side am I on?" The question was propounded by the philosophic independent mind of a boy who felt his own identity, and who, having stuck his head between the bars of an iron fence, wondered which side *he* was on. The child was father to the man. The questioner was Michael Faraday, and through all the busy years of his eventful career, the characteristic which showed itself at that time marked his life. It followed him from the cradle to the grave. He was a great questioner. Even as a child he felt the throbbings of a great life within him, and of a great world around him, and he wanted to know.

Contact with scientific books early waked the genius of his mind and the long enquiry after truth began. This characteristic caused him to have a subject of thought or investigation ready for every spare hour, and in the active days of his scientific life, this spirit stood ever by his side in the laboratory and was his guide to many a grand discovery. It was a spirit that made him be satisfied with a fact, but never with a theory; that caused him to ask questions and use hypotheses merely to get at the truth.

Faraday's ancestry were all imbued with sincere respect for religion, and the English devotion to duty. Though they could not boast of Norman blood, yet they were men who brought no stain upon the yeomanry or mechanics of England. More than one of their descendants rose at least to popularity as a local celebrity, and among these was one "gem of purest ray serene"—one name which England delights to honor, and which the science of a world to-day pronounces with uncovered head.

In a room over a coach-house in Manchester Square, London, the young Michael was nurtured. And had we the daily history of life in that humble home, doubtless we would find its obscurity made brilliant by flashes of the light of genius from that intellect which was there gathering strength for its future career of conquest. At thirteen years of age Faraday was an errand boy, and at fourteen apprenticed as a bookbinder. Amid these associations were formed the habits of faithfulness and energy which led him to the greatness of his manhood and the honors of his old age. Amid these associations too the pleasures of science first appeared to him. He began to read such scientific works as he could get access to. He attended occasional lectures on scientific subjects. He began to seek as friends scientifically inclined people. The whole bent of his mind was henceforward toward science. A new hope had dawned upon him. He saw something in life worth living for. He saw blessings to aim at and ask for greater and dearer than his daily bread. But the brightness of the zone beyond him made the sphere of his daily life dark and unsatisfying, and oftentimes in those apprentice years a question like that of his boyhood, "Which side am I on?" must have come with sorrow to his mind, as he thought of his unfavorable position in life, and his spirit must have chafed like a caged bird against the bars, as he realized that while his hands were compelled to toil on one side of the fence, his brain was busy on the other. While his hands fastened covers upon volumes of scientific lore, his mind feasted on stray morsels caught from the work itself. His intellect longed to wander forth into those elysian fields which it would make the land of its adoption,—leaving the routine work of the bindery and the shop to spirits whose ambition soared no higher. His intense desire to be engaged in scientific occupation led him, thus early, to write, as he said, "in ignorance of the world and simplicity of mind, to the President of the Royal Society." As is too often the case, dignity despised devotion. The president passed by the 'prentice, and, unawares, lost the opportunity of welcoming and helping to his sphere "a prince and a great man" in science.

Faraday was more successful in an application, made a few months later, to Sir Humphrey Davy, for it resulted in his being appointed assistant in the laboratory of the Royal Institution. He was then 22 years of age. From that time his life's work lay in connection with that institution, and it was a steady triumphant march, till he was offered the presidency of the institution itself. Shortly after his appointment as assistant he went abroad with Sir H. Davy, on a scientific tour through several countries of Europe. After an absence of over two years he returned to his former position in the laboratory, and from that position advanced till the management of the institution was in his hand. His own researches, began about 1820, A.D., circled mainly, though not wholly, around the subjects of magnetism and electricity, and closed in 1862 amid a halo of victory and honor, and with a record that made all the world wonder that one mind could fancy and fathom so much. The great discovery of his life was the production of electricity from magnetism. From the time when he considered magnetism "an occult power, affecting only a few bodies," his researches were continued till he saw it influencing all bodies and possessing an intimate relation with all forces. There is something majestic in the conception of those lines of force as Faraday saw them, looping themselves around every atom as their centre, —lines which had "gone out into all the world."

In 1812 Faraday gave up trade and took to science. His spare minutes and spare money, had, even before that time, been turned to account in scientific experiment. In after life when his laboratory was crowded with the best apparatus of the world, much of it of his own designing, it must have amused him to look back at his first battery. Seven discs of zinc, seven half-pence and six pieces of paper soaked in a solution of muriate of soda, formed the instrument. His first contributions to science were published in 1816. For ten years he worked mainly along chemical lines, and some of his discoveries have been of great use, but he turned ever to physics, and in that realm the great work of his life belongs. The limits of vaporization and experiments in optics and acoustics occupied his attention for a while. The years 1830 to 1834 were filled with a series of experiments that immortalized his name and showed him possessed of a wondrous power of endurance. He was a great scientist. He loved to read in the book of nature and to enquire into her secrets. His independent mind sought walks unknown to vulgar spirits, and there beholding the forces that played and the entities that existed around him, he enriched his mind and enriched the world with scientific truth. He studied the various manifestations of matter not merely for the present benefit of knowing their practical use, but for the ever abiding profit and pleasure of knowing what they were. He asked of a substance not only, what can it do, but, what is it? He would see a force not only doing or acting, but being and becoming. His happiness lay not in the utility of his discoveries so much as in "the knowledge that." His was the reward of mental riches, and not the pay of a patent. Columbus-like he would discover new worlds; let others people their shores and gather their wealth. His love for knowledge was the moving principle of his life. Upon this love and the consequent enthusiasm in his work his great success was founded. He began at the bottom of his life's work and mastered every step as he advanced. He built the ladder by which he rose, and he climbed "to the summit round by round." In that upward toiling each hand was firmly clasped and each foot securely placed. He never rested in doubtful knowledge, unproved hypotheses. He was imaginative, but he loved a fact. To his active brain, one idea was the associate of another that waited but the master's time for its introduction. An idea would appear, would be examined in relation to many other things; a theory would inevitably result, and along its line his experiments ran till *false* was stamped upon the theory, or *eureka* written on a scientific fact. A fact once discovered was for him but a foundation—a basis of operations. From it he started out, ever increasing the circle of his reasonings, ever reaching wider conclusions. His decision was slow upon philosophical matters, and consequently he was free from prejudice. He did not place an opinion that was not open to conviction across the path of advancing knowledge. The vastness of nature's realm, and the intricate working of her laws, contrasted with the uncertainty of human perception, led him to pronounce against man's love for his own opinion, and to prefer doubt to a rest upon uncertain data. Holding these views his habits of mind became impartial and broad. There was, however, early developed in him a self-trust that was far from conceit, for he never became too wise to learn. This habit of self-reliance was one of the main pillars upon which the structure of his greatness rose. Dr. Bence Jones has given as his greatest characteristics, considered as a philosopher, first, his trust in facts, and, second, his imagination—almost divination—which led him to facts. Faraday seemed to be a prophet speaking by authority. He had a judgment so clear that it seldom mistook in declaring the cause of a phenomenon, or in foretelling the ultimate result of a series of experiments. That element of inspiration was the great characteristic of the man, and while it detracted from his intellectual symmetry, yet it was the power that waked his energies, that led him on unwearied, and undaunted, and that made the discoveries to which it had lighted his path gleam with a startling brilliancy. Faraday stood in the front rank of discoverers, and in the world of science he will "be ever remembered by what he has done." One of his admirers has referred to him as "the greatest experimental philosopher the world has ever seen," and added the opinion that the growth of knowledge and the criticism of coming years will but add lustre to the name and laurels to the fame of "this mighty investigator." In the realm of experiment physical and mental nature combined to make him a king. His hand was strong and every muscle true. His mind was so alert and his answering vision so intent that the minutest phenomena of an experiment, and the least unexpected, were detected. The fields of his rich harvest were thoroughly gleaned. Doubting past theories, delighting in a fact, using hypotheses merely because he knew not what was possible, loving experiment because it taught him the possible, using the principles, both of inductive and deductive science, and firmly relying on himself,—on his nerves, muscles, sight, and reason he went forth to the very border lands of scientific knowledge, and blazed his pioneer way into many an unexplored spot, investigating every phenomenon, experimenting with many a reality and bringing forth light out of darkness, knowledge out of mystery, fact out of theory,—enriching by his research and discoveries the laboratories and libraries of a world.

In less than three years from the time when he entered the Royal Institution, Faraday began a course of lectures on chemistry, at the City Philosophical Society, and he continued to lecture for 38 years at the Royal Institution. In this department of his work, too, he rose to eminence. Difficulties sufficient to have barred a less energetic spirit from success were overcome. His language and his manner received a constant careful attention, till he possessed a style clear, attractive and perfectly natural, which both secured and held the attention of all listeners. He carefully noticed the faults of others, formed his idea of what a lecturer should be, and thus laid broad and well the platform on which he stood for so many years, while a nation freely granted its praise and appreciation. Earnestly believing that in the physical sciences he had found the subject of subjects for lectures, yet he did not rely wholly upon the interest of new discoveries and wonderful properties. He sought to some extent to present in his lectures the "thoughts that breathe and words that burn." He desired help of the flowing rhetoric, and disdained not the classic touch, for he saw that "the generality of mankind cannot accompany us one short hour unless the path is strewed with flowers," and yet he would "not sacrifice the real importance and integrity of a subject to noise and splendor." The plaudits of the throng he never bought at the price of instruction in pure knowledge. He possessed the mind of the philosopher, and made large use of his imagination, was sometimes vague in his style, even inaccurate in his phraseology and speculative, but ever keeping a distinct object in view. Knowledge to him was a great possession and he never trifled with it. He worked at the utmost limits of scientific information and frequently the eyes of his understanding would peer into the shade beyond, and he would make a statement which would afterward be verified as a truth. His first lecture was delivered in 1816. Its subject was the general properties of matter. Forty-six years after, he delivered his last lecture on a Friday afternoon before the Royal Society. The notes which he took for that lecture show that he realized that the energies of life were failing, and that the mind which had sought to marshal the forces of the universe and pierce to their very centres, must obey their laws and relinquish its lease of power. When we turn to his character as a man we find him no less worthy of note in the private than in the public walks of life. He was affectionate. He loved the associations of his home, and was touched by anything that brought back the recollections of his childhood. He prized the sympathy of his fellow-men—prized it as the greatest reward and honor of his life's work. He had felt that "touch of nature" which "makes the world kin," and every true man was his brother, whose interests were his own. His presence brought peace with it, and his life seemed to have an influence of kindness and a halo of love. When at home his constant effort was to be true to all who trusted him and kind to all who came within his reach. When abroad his thoughts turned often to "England, home, and friends." He had many trials and much affliction to bear, but his nature grew refined and beautiful in the furnace. As the storm wind makes the tree roots take a firmer hold, so troubles made his manliness more majestic. As the tempest's retiring darkness oft spans the sky with an arch of beauty, so the storms that burst over his path but brought the beauty—the rainbow colors—of his character into view. Tyndall, looking back at his acquaintanceship with Faraday, says, "His soul was above all littleness, and proof to all egotism." As the blending of races produces the perfect manhood, so the union of very different qualities formed the well-balanced character of Faraday. In his nature were blended the spirit of the Celt and the perseverance of the Teuton. True-born gentleness shone in his every action, and he was clothed with humility as with a garment, but underneath all flashed the genuine, fervid, dignified pride of an Englishman, which no one dared insult. Order was his first law, but tyranny that to which he flung defiance. He paid just deference to worth wherever he found it, but was jealous of his own rights. He honored the claims of precedent and custom when he could, but in a case of right and wrong went direct to fundamental principles. Patriotic, warm-hearted, free from the petty jealousies which too often dim the lustre of genius and rob success of its happiness, conscientious in the employment of his time, the care of his health and the management of his resources, he did his duty nobly, he made life a success, and lived to see it crowned with honor. Among the characteristics of the man, his biographer has mentioned his truthfulness, his love for truth, his kindness, his energy, "his life-long, lasting strife to seek and say that which he thought was true, and to do that which he thought was kind."

Faraday was in every respect a self-made man, and while the advantages of early and liberal education would doubtless have enabled him sooner to reach the goal of greatness, and to travel farther in the pursuit of knowledge, yet it could not have made the man more admirable, nor the work he did more thorough. A mathematical training, for instance, might have made the poetry of his nature give place to cold reasoning, for mathematics is the logic of science. It might have lessened the force of that inspiration which urged him on. It might have clipped the wings of his imagination, and forbidden its flight to many sunny but unexplored climes, whither his intellect followed his imagination, alighted upon the shores of truth and, planting the *fleur-de-lis* and cross, claimed them in the name of science. In the absence of scientific and literary training, what were the influences which conduced most to his success in life? In the first place, his diligent employment of spare hours—his constant self-education. Combined with, necessary to this, was his humble spirit. Even when as an old man he stood waiting on the borders of another world, he felt himself yet a child upon the strand of the great ocean of truth. His talents and energies were directed to the best purposes, and his mind was open to the reception of truth from every quarter. Another great reason of success was the independence of his life. Alike in the intellectual and in the practical world did this characteristic show itself. He thought for himself, and acted on his own conclusions. He gave and he required cheerful obedience, but he was a man, before he was a servant, and obedience to unjust authority he would not demand, much less give. He took no man as a model of what he ought to be, but he did take some characteristics of some men as models of what he ought not to be, and ever seeking improvement, and ever profiting by the experience of the past, not upon the foundation of some other man, but upon the stepping-stones of his dead self, he rose to higher things. Another great reason of his success was, that when he stood "in the ways" and saw, on one hand, a professional life leading to wealth, and on the other devotion to science, with a moderate living, he chose the latter and steadfastly pursued it to the end. Like one of old, he sought wisdom rather than wealth, and wisdom came bringing "length of days in her right hand, and in her left hand riches and honor." Honor was paid him by the institution to which his life's work had been given, by universities, by government, by his Queen, by royalty in other lands, and by a grateful people. There was a moral basis of his intellectual life upon which much of his success rested. It was the making his mind obedient to a strict discipline, so as to make the best use of all opportunities. What Hamerton has said of Alexander Humboldt, may well be said of Faraday: "When I think of his noble dissatisfaction with what he knew; his ceaseless eagerness to know more, and know it better; of the rare combination of teachableness that despised no help with self-reliance that kept him always calm and observant in the midst of personal danger, I know not which is the more magnificent spectacle—the splendor of the intellectual light or the beauty and solidity of the moral constitution that sustained it." These are strong words of praise to give to any man's character, but they will be justified to any one who reviews the vast amount of work accomplished by the mighty intellect and noble will of Faraday, and remembers that—

> "The stars keep their secrets, the earth hides her own,
> And bold must the man be that braves the unknown!
> Not a truth has to art, or to science been given,
> But brows have ached for it, and souls toil'd and striven."

It adds a rich lustre to his life, and sheds a radiance round his death, to remember that this leader of scientific thought, this man who hated doubtful knowledge and loved facts, who disliked theories and delighted in proof,—that the thoughtful, fearless Faraday clung ever to the realities of the Christian life, and the eternal verities of the Christian faith. He remained through life a member of the obscure sect of the Sandemanians. He was an elder of that Church, and before its people, for three and a half years, he preached every alternate Sunday. The tenets of his belief were those of simple gospel faith. He believed in a revelation as much as he did in magnetism. To him an hereafter was as certain as a present. He saw the power, intelligence, and benevolence of God manifested in nature. He held faith to be the gift of God, and took the revealed word as the rule of his faith and practice. True to his principles and desiring above every thing else to be thought an honest man, he longed to see the brightest intellects of earth defenders of the right, but was often pained to see high mental powers divorced from high moral sense. But often too, he wrote, his spirit was "cheered by observing in some lowly and uninstructed creature, such a heathful, and honorable, and dignified mind as made one in love with human nature." The great regret which must always be felt in connection with the work of Faraday is, that when he entered his place of worship he entered as plain Michael Faraday, and not as Faraday the scientist. He did not preach as he lectured. The eloquent thought, the flowing rhetoric, the lucid and impressive style were gone, and the great fund of knowledge and choice illustration, which made his lectures at once interesting and valuable, was wanting. One cannot help wishing that to the aid of that religious faith in which he firmly believed, he had brought the great arguments which were at his hand. It must ever be matter of sorrow that he separated science and religion in his preaching and in his conversation. But in the lecture-room, where his talents brightest shone, where the overflowing energy of his spirits and clearness of his style were best marked, he paid frequent and glowing tributes to the Creator.

Old age came on, his powers gradually failed, and his work was laid aside. Many happy days amidst the warmth of love and the rest of home were spent at his house in Hampton Court. There he watched the phenomena of the heavens, and loved to see the lightning's quick flash across the darkened skies, or to gaze upon the summer sunset as in "the line of light that played along the western sky," amber, gold, purple and gray succeeded each other. There, with a child-like trust, he looked calmly into the future. The many attractions of his life were supplemented there by a beautiful old age, and soon to the honors of that life was added a precious and undying memory. While he sat in his "old arm chair," on the 25th of August, 1867, the messenger came, and the great soul of Faraday was conducted into the great beyond—ushered into the great realm of the intellectual from the throne of which the electric flashes go forth, and to which they return crying, "Here we are."

In accordance with his wishes the funeral was private and plain, and a modest stone marks his grave and bears his name. What more could granite column do?

> "Can storied urn, or animated bust,
> Back to its mansion call the fleeting breath?
> Can honor's voice provoke the silent dust,
> Or flattery soothe the dull, cold ear of death?"

Faraday has gone, but his memory lives in many mighty intellects inspired by his career to nobler action. His influence yet impels the onward march of science, and his name is graven on our halls. "Fair science frowned not on his humble birth," and he paid his life's best homage at her shrine. He trod the paths of glory, and they led beyond the grave. E. H. KOYL.

ENERGY AND THOUGHT.

IN the midst of this everchanging world of energy man has been placed, made in the likeness of his Creator, endowed with a power superior to that of energy—the mysterious power of the mind. In man we see this mental power controlling matter and the different forms of energy that lie about him. By analogy we are compelled to rise above ourselves in our conceptions, and, as we gain some knowledge of the infinite world of energies that fill the universe, we are compelled to rise to the conception of a controlling mind, an infinite being who controls the universe and its energy with a power infinitely superior to that of the finite mind which rules this microcosm of flesh and blood and the little world of energies that surrounds it.

Science leads us back and also leads us forward through many ages in the transformation of energy, but her powers are limited; the origin and the final destiny of energy she cannot solve, the beginning and the end are wrapped in clouds and darkness to the scientist; ere the goal is reached Science stops and reluctantly yields the task into the hands of Faith.

The materialist holds that mind does not exist independent of matter, that there is only one underlying cause for the phenomena of both, that thought is but a motion of matter. If we agree with the materialist, we may class thought as a manifestation of energy, and though we may admit that life may end and the soul have no existence, yet, by the theory of the conservation of energy, death does not end all; for thought, being energy, can never die, but maintains an immortal existence as it "wanders through eternity." But we do not claim to side with the materialist; we think that there is more in man than matter, and that there is more in thought than the mere play of physical forces; we claim that the true essence of man lies in that hidden and mysterious mind that manifests itself through the agency of the body. We know not how mind and body are connected, nor do we propose to theorize respecting the connection, for nothing definite would result. All that we propose to do is to show some of the results of the connection which we believe exists. It is now satisfactorily settled that the brain is the abode of the mind (if so we may be permitted to speak), or rather that the brain is where the connection is made, that it is through the brain that the mind acts upon the body. The connection also is very close, so close that the state and nature of the brain seem to exert some influence over the thought. The mind is very active, and draws upon the stock of energy in the brain to supply the energy necessary for the thought.

The brain obtains its store of energy from the blood, and the amount required may be somewhat imagined when we are told that one-fifth of the whole amount of blood in the system finds its way to the brain. Here, then, we see, is conveyed a large store of energy which the mind, through its mysterious connection and influence, makes use of and changes as it thinks. Every action of the body, we know, is accompanied by some waste of muscular tissue; so every action of the mind, or every thought, is always accompanied by some waste of the brain, and the amount of waste matter, in the form of alkaline phosphates derived from the nerves and brain, is proportional to the amount of mental exertion. But if thought, as we see, causes waste of brain tissue, and thought is so diversified, we should conclude that a difference of thought would be followed by a difference of waste, and such is the conclusion to which physiologists have come, viz., that there is such a close connection between the mind and body, unknown as it is, that each specific thought is followed by some specific waste of brain tissue; in other words, every thought makes an impression upon the brain, and there is as much difference between the different impressions as between the thoughts that make the impression.

Starting from these same facts, Prof. Huxley has endeavored to account for memory by saying that these changes or sensations leave behind molecules of the brain competent to reproduce the sensation. We do not, however, follow him thus far. The mind cannot think or produce these changes, as far as our consciousness goes, independent of the store of energy of the brain; that would be the creation of energy anew; it merely takes the energy that is supplied, and marshals it to do its bidding as a general would his soldiers. We argue not that thought is a physical result, but that thought is always followed by a physical effect. So far is it dependent upon matter, and only so far. We have only to deal with mind and matter as they are at present conditioned. When their connection will be broken, the mind will be under different conditions, united to an immaterial body, and thought will then be independent of matter. Thought, therefore, produces waste or change of state in the brain, and this is nothing else than change of energy. Our lighter, less important thoughts, of course, transform but small quantities of energy, and their influence is limited, it may be, to the confines of the brain; but as the intensity and importance increase, the quantity of transformed energy increases, the influence is widened, the nerve systems are more widely agitated, and the eye, the most delicate and sensitive of external organs, unconsciously betrays the thought that so disturbs the brain. As the activity increases, the whole countenance reflects the doings of the mind; the muscles, violently agitated and beyond the control of the will, arouse the limbs, and now the whole being falls into harmonious action, portraying the secrets of the mind.

We are able to read character and obtain a knowledge of each other's mind by means of the bodily expression of feelings. How joy lights up the eye and spreads a smile over the whole countenance; pain causes the muscles to twitch, and twists the features into furrows; fear quivers in every muscle, disturbs the organs, and pales the cheek; how anger draws down the brow, and throws a dark and scowling mantle o'er the face; tenderness smoothes the tone, the glance, the touch; astonishment stares with a momentary powerlessness; while determination squares the lip and swells in every muscle.

> "Then might I shew each varying mien,
> Exulting, woful, or serene;
> Indifference with his idiot stare,
> And sympathy with anxious air."

Thus might be portrayed the bodily expression for every feeling, and perchance for every thought. How does the orator sway and influence the multitude? His feelings, thoughts, and actions harmonize, his whole being is in harmonious movement with the flow of energy his thoughts arouse. "Speech is the body, thought the soul, and suitable action the life of eloquence."

The poet, by his skill in linking thought and action, gives to his verse a lasting fame:—

> "There was a soft and pensive grace,
> A cast of thought upon her face,
> That suited well the forehead high,
> The eyelash dark and downcast eye;
> The mild expression spoke a mind
> In duty firm, composed, resigned."

The painter's brush spreads life and works out thought upon the canvas, while the sculptor makes the dull, cold marble think, though it is but a single changeless thought.

You know full well what effect the thoughts have upon the health; cheerful, hopeful thoughts and health are joined together; while with sad, gloomy thoughts and depression of spirit we always connect disease and death.

Imagination and faith exert a wonderful influence over the body. Experimenters say that the continued imagination of a bright color wearies the nerves of sight. Some say that the mental recollection of language is a suppressed articulation frequently manifested by breaking into actual speech. By imagination also some declare that we can affect the local circulation of the blood. And we see no objection to these ideas, but, upon the relation of thought to energy, we rather think them possible if the will be strong enough. Upon this power of the imagination over the blood has been based an explanation of blushing; the energy of thought suddenly aroused and concentrated causes a copious flow of blood to the head and cheek, covering the face with a mantle of red, and betraying to some extent the secrets of the mind, which the will, overcome by the suddenness of the attack, could not control and hold in check. The body, we see, is thus influenced by our thoughts; like a mirror it reflects the thinkings of that mysterious agent which we call the mind; and upon our ability to view the picture, to comprehend the outlines and follow the transformations, depends our knowledge of human character. Sometimes we can distinguish nothing, as the feebleness of thought casts but a dim and shadowy outline, which our limited vision is not able to perceive; at other times the great activity of thought casts such a well-defined and perfect outline that even the feeblest vision can understand the meaning. But the picture is always there; thought cannot exist without a change of energy, without making an impression, great or small, upon the body. Every thought is therefore followed by a special motion, and ability to interpret these motions means an ability to read the thoughts.

May we not in this find some explanation of the power of divinely appointed agents to read the thoughts of man through understanding the motions of matter that thought produces?

Do you think your thoughts are secret, that they are yours and yours alone, dependent merely upon your will? Science answers no! and says here also there is no such thing as independence, even thought exerts an influence upon the material universe. Thought can do much, but faith, surrounded by still greater mystery, is in its influence far superior to thought. No need, then, for us to question the power of faith over matter. If man's thoughts exert an influence in this manner over the energy of the world, the thoughts of the Infinite mind must certainly be far superior in their influence; the whole universe sprang into its present being as the result of divine thought.

As the motions of particles of matter become more fully understood and are brought within the range of man's senses, the secrecy of thought will be more and more removed, the knowledge of human character will be more complete, and truth and honest thought will be more apparent. Here, then, indeed is a wide and glorious field for science, which she must some day occupy; here is a mission which we hope she may some day fulfil. Then what an aid to truth and high morality she may become. But here as elsewhere in the path of science an impediment meets us in the limitation of our senses, but it will not stop her. *Ad astra per aspera,*—"To the stars through difficulties" is her motto, and over this obstacle she will find her way. She is not satisfied with showing her powers within so small a space as that confined by the senses; a limit has been set, and what delight she finds in surmounting the impediment to find an unlimited field of action in the great world that lies beyond.

We have said before that the world we know through our senses is only a small part of the whole universe, since our senses are able to take in only a limited range of phenomena. There are sounds too high and there are sounds too low to affect the ear, and so we do not hear them, although we know they must exist. There are rays that we cannot see: heat and light are the same rays, but you know that we cannot see all the rays that affect us as heat. The telescope and microscope are but external developments of our senses.

Science emphatically says that "now we know in part," and well bears out the words that "now we see through a glass, darkly," as all our knowledge is beclouded by the darkness of the senses.

To us there is no such thing as absolute rest; motion is interwoven with the whole universe; it is the foundation of all phenomena. We gain our knowledge of the external world only because it moves. The little molecules and atoms move; they strike against or transmit their motion to the molecules of the body, as in the eye or ear, and these motions coming through the different nerve channels to the brain are translated as light and sound.

But, recalling our example of the harp that is placed to catch the passing breeze, as every breeze does not arouse the music of the harp, but only that which harmonizes with the peculiar vibrations of the strings, so every motion does not affect the eye; as there are breezes which to the harp are silence, so to the eye there are visions which are but darkness.

Will it always remain thus? Will man be always thus shut in? Will he never be able to roam through the great universe that now is dark and empty to his senses? We look for better things. Tennyson says, "From state to state the spirit walks." As the bonds that bind the mind and body are broken, we are told to believe that a spiritual body will take the place of this natural body, and we have faith to believe that then we shall know, not only in part, but as now we are known, not through the darkness of an intervening glass, but face to face; we shall some day see things as they are. Man at some future day will be able to comprehend the various motions of matter, and follow energy in its most secret transmutations. As the breezes of eternity play upon the harp of vision, tuned to higher and to deeper strains, the grand immortal music of time and eternity, of the beginning and the end, of creation and of history, of mind and matter, of God and immortality will be aroused, and man's long-cherished hopes begin to be fulfilled.

All energy, we have shown, is gradually deteriorating into radiant energy, which is continually flowing out into space. Into this great ocean of ether in which the whole universe is floating, the streams of energy from all the worlds are pouring their volumes, and among the rest that leave this earth we can detect those that bear the impress of our thoughts.

Thus from the sun a history of the most minute details is gradually and constantly being written and dispelled through space, and so of every world, and of "this earth of ours." Nay, more; a history of everything upon the earth, and let us ever remember that we are not forgotten; an unseen hand is thus incessantly engaged in writing down our every deed, our every word, our every thought in characters that are indelible, a history that will continue for all time, so long as energy continues to exist. What a tremendous truth science thus presents before us; we move, and that motion is recorded forever; we speak, and the words are spoken for eternity; we think, and the thought is destined to an immortality. If this theory of the conservation of energy is true; if science in this is a faithful oracle to us, should we not think and speak and act with a purity and truth that deserve an immortality?

Let us also look ahead and see ourselves endowed with new and more comprehensive senses, capable of reading the whole history of the world, of scanning the record of our fellows, but especially of ourselves. Our history is no longer our own, it belongs to the great storehouse, the great and common memory of the universe. Will there be any pages that we would have blotted out from the gaze of others? Any to bring the blush of shame and sorrow to ourselves? We fear there will, but for the future let us remember what *science* dares to say—that every thought and deed must go with the tide of energy to maintain an eternal existence in the great memory of the past. Let us not forget that science ventures to predict,

> "That nothing walks with aimless feet,
> That not one soul shall be destroyed
> Or cast as rubbish to the void,
> When God hath made the pile complete."

A NEW SOURCE OF WORK.

A NEW vista of great promise in the inter-relation of the great natural forces is opened by the discovery of a method for the direct conversion of the energy of light into electrical energy, shown in Fritt's light sensitive plates. Dr. Werner Siemans, in a paper read before the Berlin Academy of Sciences, in describing these plates, says: "We have to deal with an entirely new physical phenomenon, which is, scientifically, of the most far-reaching importance." We can now declare it to be possible to convert the luminous energy reflected from a human face into electricity, send it through a wire and then convert it back into light, and so enable persons talking through a telephone to watch each other's changing countenances. Without going to London we may see the Queen. We may sit in our own parlor and the artist in Toronto take our photograph, telephone that the negative is ready, and holding it up before the machine, will ask us how we like it. Already we know how to store electricity, and therefore, on a sunshiny day, the roof of a house may be arranged to collect power from the sun's rays to be run into a storage battery and used to rock the cradle, run churn and sewing machine. We will be able to telegraph heat from the desert of Sahara, and warm and light Paris and London. We may use up the surplus heat at the equator in thawing out the North Pole, and thus re-create Dr. Warren's Paradise.

All the waste places of the earth will be sources of power when the supply of coal is exhausted, and life will be possible upon the planet till the sun forgets to shine.

These are stupendous possibilities, and their contemplation must stagger us, till we reflect how this earth has been made a neighborhood vibrating with voices from all its corners, which thrill along the mysterious nerves of modern civilization—the telegraph wires; how the lifting of a little lid has developed into the tremendous steam power which is ploughing our oceans, making a network of double lines of steel all over our continent, and filling our cities with the roar of machinery. The Ruler of human destiny is making life serious by making it grand.

We are living, we are dwelling
In a grand and awful time,
In an age on ages telling,
To be living is sublime.

THE only amaranthine flower on earth is virtue; the only lasting treasure, truth.—*Cowper.*

NOTES ON COLORADO FLORA.

THE west-bound traveller in July or August will be struck with the great difference between the flora of the States lying east of the Mississippi river and that found west of the same. The old familiar forms of our childhood give place to new and beautiful ones found on the prairies, foot-hills and mountains. In June, the plains of Kansas and Nebraska are verily carpeted with flowers of rare and brilliant colors. Colorado, too, has its own peculiar flora.

In very early spring—perhaps in March, in sheltered spots with southern exposure—is seen the pale purple cup of the Pasque or wind flower, *Anemone patens var. Nutalliana.* This is the Pulsatilla of early botanists. After a long, dreary winter, and even before a leaf or flower of any other plant appears, the Anemone peeps out at you behind a friendly rock, or pushes its way up through the snow as a harbinger of spring. Strange to say, the flower appears before a single leaf is developed. It is supposed to get its name from its habit of growing in exposed, windy places. It never attains a greater height than six inches, and seldom more than four inches. The stem has long, silky hairs, and a very peculiar involucre about an inch below the corolla. There are seven species found in the State.

The little Mountain Daisy (improperly so called), *Townsendia Grandiflora*, is a contemporary with the former, and has about the same habitat. The flowers usually grow from a number of stems branching from one root, which is much thickened at the summit; the short stems are also somewhat fleshy, and covered with downy, close pressed hairs, giving it a glossy appearance. The plant never rises above the ground, and so must be dug up in order to secure the flowers with stem enough to use.

A few days later appears the pretty little Sand Lily, or *Leucocrinum Montanum.* This is a beautiful little snow-white fragrant flower, growing in abundance on the mésas and plains. Its leaves are from six inches to eight inches long, and quite narrow. Usually but one flower grows from each stem, which is fleshy and so short that the plant is decumbent. The anthers of this flower are comparatively large and contain pollen whose microscopic appearance is very beautiful.

Among the later flowers are many species of the Pulse family. Perhaps the most brilliant is the Yellow Pea, *Thermopsis Fabacea.* The flowers are bright yellow, and grow in terminal clusters. The stems are numerous and branched; the leaves are slightly pubescent and have very short petioles. The habit of the flower is to seek low-lying, moist places, and when all the circumstances are favorable, it will grow two feet high.

E. L. BYINGTON.

(*To be continued.*)

EDITORIAL.

M. PASTEUR, the indefatigable and daring investigator of disease germs, announced to the Academy of Sciences on the 27th of October ult., that he had at last succeeded beyond all doubt in preventing hydrophobia by inoculation. His proofs were substantiated by Dr. Volpian. So says *Science.*

MAN.—The November number is on our table and presents a collection of interesting original and selected matter in literature, hygiene and domestic economy. It is an outgrowth of the *Sanitary Journal*, published at Ottawa by Dr. Edward Playter. Its price is $2 per annum.

WE have received "Two Months in the Camp of Big Bear," being the sketches of life and imprisonment during the late rebellion. Mrs. Gowanlock and Mrs. Delaney tell their stories in a plain, but entertaining, and at times thrilling manner. Every woman in Canada should read this account of the heroic sufferings of two Canadian women. The work, which is illustrated, is issued from the *Times* office, Parkdale. The authors do not lay claim to literary experience, or excellence and a typographical error here and there does not condemn the work. We hope it will have a large circulation.

THE 'VARSITY.—A new and neater form, an addition of a couple of good editors, an increased interest on the part of contributors and readers, a steady improvement in the quality of matter, and a surplus in the treasury—these sum up in a few words the position of '*Varsity* at the beginning of another year. The general tone is good, and we always open the number with the expectation of seeing something new and interesting—and we are not often disappointed.

THE resignation of Prof. Huxley left vacant one of the most lucrative and influential positions in science, that of the Professorship of Natural History at South Kensington Normal School of Science. Prof. E. Ray Lankester was thought to be the most probable successor, but, contrary to expectation and desire, the professorship has been abolished and a lectureship established at a lower salary. Prof. Huxley's assistant has been promoted to the position and is well fitted for the work, though many scientists are disappointed at the change.

GEOLOGY.—The International Geological Congress has lately been held at Berlin. There were in attendance 255 members in all, 163 being from Germany, 18 from Italy, 16 from Austria, 11 from Great Britain, 10 from France, 9 from the United States, and 6 each from Belgium and Russia. The language used was French. The principal work was the discussion and decision in reference to a new and complete geological map of Europe. The scale of the map is, 1 : 1,500,000. The map has been in progress since 1881. The Congress meets again in London in 1888.

RIVER NAMES.—In Virginia is a river called the Mattapony. At its source the river is called Ny; soon after, being joined by the Po, it is termed the Pony; the junction of the third component, the Ta, forms the Tapony; then flows in the Mat, and the river thus resulting is called the Mattapony. It is the most scientifically and sensibly named river known to geographers. Other examples of similar formation, though not so complete and satisfactory, are the Somme-Sonde, the Thames (Thamesis, from Thame and Isis) and the Gyronde (Gyr, Onde). Reclus says: "Those names of rivers which are formed by the contraction of the designations of their chief tributaries are, indeed, the only terms which are geographically correct."

THE treatment accorded to Canadian students, and their standing at Breslau University, cannot be better illustrated than by publishing the following letter, written by the world-famous geologist, Dr. Roemer, to Dr. E. Haanel.

BRESLAU, *23rd October, 1885.*

ESTEEMED SIR, —Mr. Laird has handed me your letter, and I have gladly given him the necessary advice with reference to the studies. To-day he is being immatriculated, and in a few days he will hear the first lectures. Since his knowledge of German is yet very deficient, he is advised to hear lectures only in a few subjects this semester. With pleasure I hear from Mr. Laird that you are prospering; I learn, however, with great sorrow of the sudden death of Prof. Hare. How has the strong young man been taken so prematurely? He was an open amiable man, who enjoyed while here the esteem and love of all who knew him. Through his dissertation on the geological condition of the region Reichenstein, his name remains to us in our mineralogical literature. With the greatest esteem and with greeting, Yours truly,

FERD. ROEMER.

THE GILCHRIST TRUST FUND.—Many of our readers will doubtless feel interested in the disposal of this fund bequeathed for educational purposes. The scholarship given for some years in Canada was practically withdrawn a short time ago. A correspondent to *Science* writes as follows from London: "Among the various agencies for creating an interest in the methods and results of scientific inquiry, on the part of artisans and persons of very limited means, the operations of the Gilchrist educational trust deserve notice. The founder, Dr. Gilchrist, a Scotch surgeon, left on an exceedingly open trust, for the benefit and advancement of scientific learning in any part of the world, the income of certain investments, which have since become very valuable. One of these is a piece of land now in Sydney, Australia, for which he paid $90, which was sold a few years ago by the trustees for $360,000. Part of the trust income is expended in scholarships, chiefly granted to students in Canada, Australia, India, etc., to enable them to study in England. Another portion is devoted to the delivery of courses of scientific lectures in English and Scotch towns, under local management, but subject to the condition that the charge for admission shall not exceed two cents. These lectures are specially addressed to large popular audiences, often comprising 2,000 persons or more. Ten such courses are now running in various towns, and the lecturers engaged in them are Dr. R. S. Ball (Royal astronomer for Ireland), Dr. Dallinger, Prof. W. C. Williamson, Dr. Andrew Wilson, and Mr. Wm. Lant Carpenter. A course usually consists of six lectures, one half on physical subjects, the other upon biological, and their aim is avowedly to awaken an interest in science. Usually the lecture halls are crowded to their utmost capacity."

ROBERT TREAT PAINE made a will bequeathing three hundred thousand dollars to the Harvard College Observatory. The generosity of the gift was loudly praised, as the money would be very acceptable at the present time. The heirs have, however, interfered and contested the will, on the ground of unsound mind and disability. The costs will, of course, come out of the estate, the lawyers will grow rich, and the professors will need their microscopes rather than their telescopes to enjoy the beauties of the bequest. They can meditate upon the aberrations of intellect, make allowance for personal mistakes, refer to the donor's inclination, but they will not derive much substantial fact from the reflections. Moral: If you intend to endow an institution, make sure that your money is paid over before your death.

BROWNING.—After glancing at the little jewel on our first page, picked out at random from a small collection of Robert Browning's poems, some of our readers may be disposed to have a look into a larger collection of his treasures. Send for "Pomegranates from an English Garden," by Robert Browning, collected by Dr. J. M. Gibson, and published by the Chautauquan press. You will find an interesting and critical introduction, also appropriate notes that will give you an opinion of Robert Browning entirely different from that which you now hold—we take it for granted that you condemn this poet. Do not despise and condemn the man until you have given his works a fair and honest reading. This edition costs sixty-five cents, and will prove a valuable addition to library or handsome ornament for drawing-room table.

WE have a problem for the consideration of our readers. Take three generations to the century, and let the average increase of population be that it doubles every generation; what should the population be to-day, after 6,000 years, or 180 generations? Now reverse the question; every person has two parents, four grandparents, and eight great-grandparents in the preceding century, and so on, doubling the number for each preceding generation. Following this calculation back eight centuries, you will find that your antecedents in one generation numbered 16,000,000—going back 6,000 years what must thay have numbered? How do you reconcile the two statements: two persons are in 6,000 years the progenitors of fourteen hundred millions, and each one of these fourteen hundred millions must have had antecedents numbering millions upon millions? The Mosaic account states the antecedents of all of us to have been two; the other consideration would make our antecedents to have numbered millions. Which is correct?

OYSTERS.—Man has been distinguished from the rest of the animal creation in various ways. One critic will tell us that man is essentially a worshipping animal; but again, it is very difficult to define worship so that it will not include qualities clearly manifested by other animals. Man has been called the laughing animal; but he certainly does not monopolize the enjoyment of this world, or the peculiar manifestion of it expressed by laughter. Again he has been termed the oyster-loving animal; but even this proud distinction must be given up. *Astesias Forbesii* is also an epicure—in other words the common star-fish is fond of oysters, and he has a way of devouring oysters that the enterprising American has neglected to patent. The reason may be apparent, however, on reading the following description by Mr. R. S. Tarr:—"A star-fish approaches its victim, slowly crawls upon it, and then bends its five arms around the shell. The mouth of a star-fish is so small than an oyster a quarter of an inch long could not be taken into it. So what does it do, when its arms are encircled around the large oyster, but begin to project its stomach out of its mouth and surround the oyster with its stomach entirely outside of the body. Then the oyster gradually opens its shell, leaving the star-fish to do as it pleases. After a while the star-fish moves off, and we see that a large part of the oyster is gone. When the stomach is first protruded a liquid is excreted which seems to have the power of either killing or weakening the oyster. Just as soon as the shells are open digestion is begun by the star-fish, and after a short time the hunger of the star-fish is satisfied and the oyster is dead. Before long the star-fish feels like another meal, and he attacks another oyster, leaving the old one as prey to small crabs and shrimp. And so it goes on day after day, thousands operating in the same manner. At times they come in immense swarms from deeper water, in a single night entirely destroying a large bed. In brackish water they do not flourish, but in the almost pure ocean water found in some oyster-raising districts the destruction is immense, and there is no remedy."

TREES.—There are sixteen species of trees in America whose perfectly dry wood will sink in water. The heaviest of these is the black ironwood (*confalia ferica*) of Southern Florida, which is more than thirty per cent. heavier than water. Of the others the best known are the lignum vitæ (*guaiacum sanctum*), and mangrove (*rhizphora mangle*). Another is a small oak (*quercus grisea*) found in the mountains of Texas, Southern New Mexico and Arizona, and westward to the Colorado desert, at an elevation of 5,000 to 10,000 feet.

A STRANGE OCCURRENCE.

MANY of our readers were doubtless as startled as ourselves in reading lately in the *Globe* the following note :—

"The *Times*, of Manitowoc, Wis., records the following strange incident:—The Rev. Dr. Bray, Rector of St. James' Church, had a very strange thing occur to him on Monday night, the 4th inst. About one in the morning he was in a semi-conscious state, when he heard a voice saying: 'R. B. Hare is dead.' On the following Wednesday he received a letter from Canada, a part of which reads thus: 'I suppose the sad news of the death of R. B. Hare has not reached you. He died last week after a brief illness.' He was Science Master at the Guelph Agricultural College. Dr. Hare, in their university days, was Mr. Bray's intimate companion."

In order to satisfy ourselves of the truthfulness of the above report, we wrote to Dr. Bray, and have just received a full confirmation, with some suggestions, from which we shall make a few selections. Want of space this month compels us to condense. Dr. Bray says that his mind had been much engaged about his friend of old, and he became peculiarly "receptive" in his mind concerning any news relating to him. Concerning Dr. Hare he says: "R. B. Hare was a faithful student and companion; what scholarship he had he might thank Victoria University for, whose halls were, and doubtless are to-day, frequented by as manly and thoughtful a body of young gentlemen as any I have ever met on this continent. But when I say, for what scholarship he had he might thank Victoria University, I must not be understood as meaning that he had not increased what he had received from her. Life is a school; science, a teacher of divinity; creation herself, an instructor; and the most learned, the most assiduous student.

"This state of my mind I regard as in part the cause of what I heard. I was not sleeping; I do not believe I addressed myself. I regard this state of my mind as in part the explanation—rather as a necessary condition than a cause.

"That I heard the words and wrote them in my *index rerum* nearly two days before they were naturally confirmed, I am certain; that the consciousness of this sensation was produced.

by the usual acoustic phenomena, I think not necessary; that I can explain the causes that led to my hearing them, I make no claim; but we know that certain states are necessary to certain activities of matter acting on matter, and it is but consonant with this that we say it is equally true, in the spirit world, of spirit acting on spirit. If we admit that the body of man is but a countless assemblage of anioebas peculiarly associated together, we do not therefore grant that he is but a bundle of protoplasm. He who thus thinks has yet to breathe the first pure breath of the noble soul permeated with an influx of divine energy. I doubt not that we might know more about the present and future worlds, and all those mysteries relating to them, if we would first acquire the state necessary to such investigations."

AMONG THE CLOUDS.

THE trip of the Canadian Press Association for the summer of 1885 included a run through the Green Mountains of Vermont, and the White Mountains of New Hampshire; thence to Boston by rail, and by rail and steamer to New York. The return trip was by way of the Hudson to Albany; thence home *via* the Suspension Bridge and the Falls. Of a mixed party of about fifty-five, the writer formed one, and the sight-seeing among the White Mountains, more especially from the summit of Mount Washington, has suggested the idea of writing a few rambling notes of a hurried trip.

Leaving Montreal early in the morning, by the Central Vermont R. R., the route lies through a flat prairie country, cut up into narrow French farms. Here and there an isolated hill rises from the monotonous level, and is honored with the name of mountain. But our mountains are far ahead; and on we rush, through St. John's, up the valley of the Richelieu, past St. Armand, the last place on the Canadian side. One stretches his head from the window to see "the line," but, strange to say, the dilapidated fence which enjoys the dignity of dividing line separates two farms peculiar only for their similarity. As we near St. Albans, the beautiful Champlain valley and lake open up on our right, and through the rising mists can be seen the shadowy outline of rounded summits far away in the distance —the spectre peaks are those of the chilly Adirondacks of New York State. We are now in Vermont, the Green-Mountain State, and we hurry on south-east towards Montpelier, the capital. Standing out prominently away on our left is Mount Mansfield—still glistening in the sun on our right is the lake—while to the south-east rise the gently sloping ridges of green-clad hills one above another. To him who has never seen a mountain, description of mountain scenery is useless; but to others we need but add that the naming of the Green Mountains was appropriate—the green carpeting and foliage are still characteristic of the gracefully-moulded hills of Vermont. At Montpelier we take dinner (a good one, by the way—in fact the best one we have yet enjoyed in the United States), and have a hasty glance at the beautiful capital, nestling at the foot of the mountain that overshadows it. Beauty of situation, care and cleanliness are apparent everywhere; but we must hurry on. Straight east we rush; now along the side of a mountain overlooking a valley wide and deep; now winding along the bank of a clear stream, threading our way from town to village, and from village to city; again dashing through a curved wooden bridge past a picturesque fall into "the forest primeval," only to emerge again for a succession of changing scene of mountain and valley, river and forest, until we reach the dividing line between the States of Vermont and New Hampshire. We cross from the Green Mountain region to the White Mountain region at Wells River. The railroad skirts north-east, and the puffing of the engine tells us that we are climbing the incline. We round a corner, and suddenly, away in the distance, between the two peaks on our right, looms up a dark, black, clearly-defined shadow, behind it another, beside it another—an instant more and the peaks beside us seem suddenly to dwindle and hide their heads, and our train of cars dashes into this mass of dark frowning mountains. We are looking for the White Mountains, but we have found them *black*, dark, threatening, awe-inspiring. We have left behind the farms and cities of Vermont, and as we look around we feel somewhat solitary and lonely. Round the bases of the frowning mountains we still continue, then plunge right into the midst of them, and after a short stoppage at Bethlehem Junction we pull up at Fabyan's, the best known resort in the whole region. Just beyond it is our mountain, long and rounded, but a few minutes' walk apparently. Some one points out to us the thread-like mark that runs from summit to base straight up the side. We again look and see it, like a scratch in the mountain's side; it commences at the base among the dense trees and goes up, up, right up *into the clouds*. We look in amazement at it; the mountain is covered with a drapery of fleecy clouds. One reason for the naming of the White Mountains at once is suggested. But the thread—the scratch? It is the railroad that is to carry us to the summit. Some of our companions shudder, but we—well, we follow the example of others and get ready our overcoat and gloves. A short ride brings us to the foot of the ascent, and we all change to the specially-constructed cars that transport passengers from the earth to the clouds.

The summit of Mount Washington is 6,293 feet high, the length of railway is $3\frac{1}{3}$ miles, and the grade nearly 2,000 feet to the mile. There are three trains, each consisting of a small car pushed by a powerful engine with inclined boiler. One hundred and fifty persons ascended during our afternoon trip, and the price was five dollars apiece for the ascent alone. An examination of the mechanism removes much anxiety—the most noticeable preventive of slipping being a third rail, a ratchet-rail, in which runs a cogged wheel. We were exactly one hour and three-quarters in making the ascent, and about the same time in returning. The sensations of the climb cannot be described: the peculiar feelings creeping over us as we slowly approach the snowy clouds—on the right piles of moss-covered rocks or shrub-covered cliffs, on the left the bottomless abyss, in and out of which the rays of the setting sun play hide and seek; beneath us the frail trestle-work of Jacob's Ladder. It is bitter cold, and growing colder. Soon it becomes foggy, and the clouds whisk about us—we are on the borderland of the sky. A few minutes longer and we are enclosed on all sides by piercing, chilling clouds that shut out everything from view. As we step off on the platform of the Summit House we feel as though we had landed in another world—not that of the reputed place of heat either, and a little too cool a reception to think it might be Elysian. Inside, all is warm and comfortable. We register, and sit down to a steaming hot supper of White Mountain delicacies, one mile above the point where we enjoyed our dinner. The rates are *reduced* to $5 per day, but do not on that account reduce our capacities or capabilities. An evening of sociability with American cousins in the large drawing-room; dancing, singing, reciting and speech-making follow; and by twelve all are sleeping or trying to sleep, tucked in under heavy blankets in the month of August. At four o'clock we are aroused by a sound as though all the bells of Heaven were rousing us from our graves. In a few minutes the platform, the sheds, the observatory are alive, and every available lookout place is filled with spectators. Never was the rising sun so eagerly awaited. During the night the clouds had settled; about a thousand feet below us there heaved and rocked a sea of snowy billows far as the eye could reach, with here and there a black, jagged island peak thrusting through its sleepy head; eighty miles away some solitary summits could be seen. It was a scene never to be forgotten. The streak of twilight in the eastern sky grew brighter; a red speck, and the rim of the sun moved up behind an eastern peak. At once began that play of colors, that chasing of shadows, that tinting of shapes, that mingling and commingling of lights and shadows, that unfurling and reefing of brilliant colors, that can be seen only in a sunrise above the clouds. Gradually the shadows flee toward the west, the early morning breeze winds the clouds in scarfs about the peaks, the sun's rays pierce far into the valleys, and the world begins to reveal its presence once again. To the east a silver thread, the Androscoggin, winds and disappears in Maine; to the south, west, and north are seen sparkling drops of burnished silver strung together with silver threads, a necklace of lakes and rivers. A panorama of mountain, valley and lake lies spread before us for a distance of over a hundred miles on either side. William Cullen Bryant has caught the inspiration of the moment, and gives voice to the thoughts of wonder and pleasure:—

"Thou who wouldst see the lovely and the wild
Mingled in harmony on Nature's face,
Ascend our rocky mountains. Let thy foot
Fail not with weariness, for on their tops
The beauty and the majesty of earth
Spread wide beneath, shall make thee to forget
The steep and toilsome way. There, as thou stand'st,
The haunts of men below thee, and around
The mountain summits, thy expanding heart
Shall feel a kindred with that loftier world
To which thou art translated, and partake
The enlargement of thy vision. Thou shalt look
Upon the green and rolling forest tops
And down into the secrets of the glens,
And streams, that with their bordering thickets strive
To hide their windings. Thou shalt gaze, at once,
Here on white villages, and tilth and herds,
And swarming roads, and there on solitudes,
That only hear the torrent, and the wind,
And eagle's shriek.

. . . .

To stand upon the beetling verge, and see
Where storm and lightning, from that huge gray wall,
Have tumbled down vast blocks, and at the base
Dashed them in fragments, and to lay thine ear
Over the dizzy depth, and hear the sound
Of winds that struggle with the woods below,
Come up like ocean murmurs. But the scene
Is lovely round."

We cannot tarry to speak of the many objects of interest around the summit: the observatory, the printing-office—for here we found the printer's devil as near to the world above as any other, and as energetic. The journalist has as high a position in New England as any other professional man. Who shall dare impugn the enterprise of the craft that publishes its productions twice a day, over one mile above other workmen! High-life and high prices did not agree with the state of our pockets, so we were compelled to come down a bit. A delightful ride brings us to the most picturesque spot in the White Mountains—Profile House, situated in a delightful little opening in the Franconia Notch. Behind it rises Cannon mountain, before it towers perpendicularly Lafayette mountain; on one side Echo lake, while on the other Profile lake nestles quietly between the hills overlooked by "The Old Man of the Mountain." Two hundred feet above the base is a profile of an old man's face, clear and distinct, formed by three different ledges of rock. Profile House and its surroundings were the nearest approach to an earthly paradise. The enjoyment of this paradise will cost you $5 per day for board; another $5 per day will ensure you a pleasant time. After dinner the stage-coaches, four-in-hand, drive up, and we mount the box beside the driver. Our load comprises nine inside and nine on top, and we take the lead. The drive over the well-beaten, shady mountain roads; past mountain torrents; over rustic bridges; down hills at break-neck speed; flying by the basin, the pool, and the flume; past mountain after mountain, with a huge slide to vary the outline —this ten-mile drive passes by too soon, and the recollection is now like a fairy dream. At Woodstock we take the cars, and fly down grade until we emerge at Plymouth from the White Mountain region, and skirt past Lake Winnepesaukee, rush through Concord, Manchester, Nashua, Lowell, and after dark are landed in the centre of the American literary universe: we are at Boston, the Hub, the city of quaint and crooked streets, the historic Boston, famous now and forever as the headquarters of baked beans and brown bread.

THERE is one art of which every man should be master—the art of reflection.—*Coleridge.*

BONES.

BONES are the framework of the human body. If I had no more bones in me, I should not have so much shape as I have now. If I had no bones in me, I should not have so much motion, and grandma would be glad; but I like motion. Bones give me motion, because they are something hard for motion to cling to. If I had no bones, my brains, heart, lungs, and larger blood-vessels would be lying round in me sort of loose-like and might get hurted: but not much, lest it is hard hit. If my bones were burned, I should be all brittle, and you could crumble me up, because all the animal would be out of me. If I was soaked in a kind of acid, I should be limber. Teacher showed some bones that had been soaked. I could tie a knot in one. I had rather be soaked than burned. Some of my bones don't grow snug, and close to my other bones, like the branches to the trunk of a tree do; and I am glad they don't; for if they did, I could not play leap-frog, and other good games I know. The reason they don't grow that way is because they have joints. Joints is good things to have in bones. There are two or three kinds. The ball-and-socket joint, like my shoulder, is the best. Teacher showed it to us, only it was the thigh-joint of a cow. One end was round, smooth, and whitish: that was the ball end. The other end was saucer-like: that is the socket, and it oils itself. Another joint is the hinge-joint, like my elbow. It swings back and forth oiling itself, and never creaks like the school-room door does. The other joint aint much of a joint. That is in the skull, and it don't have no motion. All of my bones put together in their right places makes a skeleton. If I leave out any, or put some in the wrong place, it aint no skeleton. Cripples and deformed people do not have no skeletons. Some animals have their skeletons on the outside. I'm glad I aint them animals; for my skeleton, like it is on the chart, would not look well on my outside.—*Composition by a boy in one of the lower grades of a New England grammar school.*

THE BIRTH OF MOUNTAINS.

"AS old as the hills" seems to most of us the extreme limit of possible age; and yet, since all created things must needs at some time have had a beginning, it is immediately obvious to the meanest capacity—and much more, then, to the courteous reader—that even the eternal hills themselves must in their own time have slowly passed through the various stages of infancy, childhood, adolescence, and full maturity. Old as they are, they have yet once been young and foolish; gray as they are, they have yet once been green and grassy; solemn as they are, they have yet once indulged in a boisterous, noisy, and even skittish youth, before settling down by slow degrees into the sober respectability of middle age. Every dog has his day, and the eternal hills have had theirs. As little hills they have skipped audaciously; they have grown and grown by slow increasement; they have passed gradually from a state of youthful activity and mobility and life to a state of discreet and immovable senile solidity. Yet many of them are young at heart even now, and some of them, that look demure enough on ordinary occasions, are still distracted by fiery passions within, which rend and tear them from time to time with fierce convulsions in their inmost bowels.

Yes, the eternal hills have had a beginning, and the beginning was often far more modern than most people usually imagine. There are small hillocks in these islands of Britain that were already great mountains while the Alps and the Himalayas still lay slumbering sweetly beneath half-a-mile of superincumbent ocean. Indeed, as a general rule, it may be said that the biggest mountains are very new, and that the oldest are very small. Size is here no criterion of age; for when once a mountain has ceased growing and attained maturity, it begins to grow down again, by mere wear and tear, until at last wind and weather, rain and river, have slowly beaten it back to the level of the plain from which it sprang. Let us look briefly at the whole life-history of an adult mountain, thus regarded as an organic unity, from the tim when it first begins to raise its young head timidly from the mother ocean, to the time when, decrepit and worn-out, a broken remnant, it loses individuality altogether in the broad expanse of the surrounding lowlands.

Everybody in these days knows, of course, that every mountain worth speaking of (bar the inevitable exceptions that "prove the rule") has once been a portion of the sea-bottom. Unless it be a volcano or self-made mountain, the rocks and stones of which it is composed have been laid down, some time or other, on the bed of some forgotten and primæval ocean. So much all the world has long known, ever since geology as a science first fought its way against severe odds into general recognition; but, strange to say, it has only been in very recent years indeed that any real progress has been made in the comprehension of the life-history of mountains. They had once lain *perdu* at the bottom of the sea; they now soar away among the moist, cold, and uncomfortable clouds:—that was all that science could tell us about them; but how they got there or what pushed them up was for many years an insoluble mystery.

Your volcano, indeed, may at once be put out of court in this respect, because every one can see at a glance the *modus operandi* of the common volcano. Like a clumsy conjuror, it does the trick openly before your eyes: it lets you see it in the very act of tossing out great showers of stones and ashes, which fall symmetrically on every side, and produce the well-known regular cone that one sees exemplified in the sugar-loaf outline of Etna or Fusiyama, or in the topmost summit of Vesuvius itself. Or again, in some other cases, your volcano works by squirting up a mass of viscid lava through a fissure in the earth, and allowing it to cool slowly into dome-shaped mountains like the Puys of Auvergne, or the odd-looking Mamelons of the African islands. Either of these cheap and easy ways of forming a mountain is simple enough to understand; but then, they explain only themselves; they cast no light at all upon that other and vastly larger group of mountains which have been slowly raised by secular action from the bottom of deep and ancient oceans. We don't, most of us, come across many active or even extinct volcanoes in the course of a lifetime. I could count, myself, on the fingers of one hand, the total number of confirmed smokers of this description that I have ever met with in all my wanderings. Teneriffe and Pico, Hecla and Cotopaxi do not fall in everybody's way casually during the average spell of a summer holiday. The mountain with whose personal peculiarities we are most of us most familiar—the average Swiss, or Scotch, or Welsh specimen—consists mainly or entirely of sedimentary material from the sea-bottom, and is only very remotely connected in any way with volcanic action. How did such an eternal hill as this begin to be, and what power raised it from abysmal degradation to its present proud and lofty position in the world of mountains?

Once upon a time there were no Alps—indeed, during the whole vast primary period of geology (embracing in all probability four-fifths of the duration of life upon this planet) there is every reason to believe that central Europe lay consistently and persistently beneath the depths of the sea. The German Ocean was then really conterminous with the whole of Germany, and the Sea of Rome embraced the greater part of Catholic Europe. It was only at the opening of the secondary period—the age of the great marine lizards—that the first faint embryo of the baby Alps began to be formed. Now, the origin of a mountain chain is not really due, as most people used once to imagine, to a direct vertical up-thrust from below, as when you push a handkerchief up with a pencil—the old lecture illustration; its causes and conditions are far more complex and varied than that; it is, in fact—strange as it may sound to say so—a result of subsidence rather than of upheaval—a symptom rather of general shrinkage than of local eruption. For nothing can shrink without wrinkling and corrugating its surface; a result which one commonly sees alike in a withered apple, an old man's hand, and a dry pond cracked and fissured all over by the hot sun. The Alps are thus ultimately due to the skrinkage of the earth upon its own centre; they are dislocations of the crust at a weak point, where it finally collapsed and threw up in collapsing a huge heap of tangled and contorted rubbish.

The beginning of the Alps, in fact, was due to the development in Permian times—everybody is, of course, quite familiarly acquainted with the Permian period—of a line of weakness in the earth's crust, right along the very centre of what is now Switzerland, but what was then probably nowhere in particular. The line of weakness thus produced showed itself overtly by the opening of a number of fissures in the solid crust, like cracks in a ceiling—not, indeed, visible to the naked eye of any inquiring saurian who may have chanced to investigate the phenomena in person, but manifesting their existence none the less by the outburst along their line of volcanic vents, hot springs, geysers, and all the other outer and visible signs of direct communication with the heated regions beneath the earth. From these fissures masses of lava, tuff, and other volcanic materials rapidly poured forth, some of which still form the core of the Alpine system, though most of them are buried at the present day under other layers of later disposition.

"Aha," you say, "so after all, in spite of promises to the contrary, the Alps themselves turn out to be at bottom of volcanic origin." Not a bit of it: let us suspend judgment for the present. The actual Alps, as we know them to-day, are of far later and more modern date. The very next thing the volcanoes did after bursting out frantically into action was to disappear bodily beneath the bed of the ocean. This is a very common and natural proceeding on the part of extensive volcanic ranges. First they pop up and then they pop down again. You see, the line of weakness had resulted in the pouring out of immense quantities of molten lava, in some places twelve or fifteen thousand feet thick; and that necessarily left a hole below, besides piling up a lot of very heavy matter on top of the hole thus occasioned. The natural consequence was a general collapse; the age of great volcanic outbursts was followed by an age of gradual subsidence. Of course the young Alps, already a very sturdy infant range, didn't sink all in a moment beneath the engulfing waters of the Triassic sea. All through the Triassic period—the age of the English salt beds—smaller volcanoes went on pushing themselves up more or less feebly from time to time, and doing their level best to frighten the big lizards with their molten ejections; but still the support was steadily removed from below this portion of the earth's crust, and the weight above made it sink slowly, slowly, slowly beneath the waters of the sea, just as southern Sweden is now sinking, an inch at a time, under the brackish waves of the enroaching Baltic. Streets in Swedish towns, originally built, no doubt (like most other streets), above high-water mark, now lie below the tide (which must be very uncomfortable for their owners), with other earlier and still lower streets beneath and beyond them. The whole peninsula, in fact, is gradually disappearing beneath the waters of the Baltic, as regardless as Mr. George himself of the vested interests of the landed proprietors. Just so, in all probability, by very slow degrees the Triassic volcanoes sank and sank, till at last the blue Triassic sea flowed uninterruptedly over the whole of Switzerland. During all the Triassic time, indeed, the igneous forces were getting gradually exhausted, and by the close of that long period they had fallen into a pitiable state of complete extinction.

Year after year and age after age the buried core of the future Alps went on sinking further and yet further under the deepening waters of an ever profounder and profounder ocean. One kind of sediment after another was deposited on top of it, and these sediments, of very diverse hardnesses and thicknesses, form the mass of the rocks of which the existing Alps are now composed. The line of weakness occupied most probably the centre of the great Mediterranean thus produced; for the sediments lie far thicker in the Alps themselves than round the shallow edges of the sea, in whose midst they were laid down. In fact, many of the strata which, away from the Alpine axis, measure only hundreds of feet thick, increase along that central line till their thickness may rather be measured by thousands. The united depth of all the sediments accumulated along the sinking line during the whole secondary age amounts to about ten miles. In other words, the core of the Alps must have sunk from fifteen thousand feet above the sea to at least ten miles below it. Not, of course, that the sea itself was ever ten miles deep, for the sediment went on accumulating all the time, and sinking and sinking as fast as it accumulated; but the volcanic core, which was once perhaps nearly a mile above sea level, must at last have sunk far beneath it, with not less than ten miles of accumulated rubbish lying on its top.

With the setting in of the tertiary period—the age of the great extinct mammals—opens the third chapter in the history of the origin and rise of the Alps. The trough-like hollow, filled with thick layers of sediment, which then covered the line of weakness in the earth's surface, began to be pressed, and crushed, and pushed sideways by the lateral strain of the subsiding crust. Naturally, as the crust falls in slowly by its own weight upon the cooling centre, it thrusts from either side against the weakest points, and in so doing it twists, contorts, and crumples the layers of rock about the lines of weakness in the most extraordinary and almost incredible fashion. To put it quite simply, if a solid shell big enough to cover a globe of so many miles in diameter is compelled to fall in, so as to accommodate itself to the shrunken circumference of a globe so many miles less in diameter, it must necessarily form folds every here and there, in which the various layers of which it is composed will be doubled over one another in picturesque confusion. Such a fold or doubling of the layers are the Alps and the Jura. Our world is growing old and growing cold; and as it waxes older and colder it shrinks and shrinks, and shakes and quivers, so that its coat is perpetually getting a little too big for it and has to be taken in at the seams from time to time. The taking in is done by the simple and primitive method of making a bulging tuck. The Alps are situated just above a seam, and are themselves one of the huge bulging tucks in question.

The inner hot nucleus of the globe (which is not liquid, as the old-fashioned geologists did vainly hold, but solid and rigid) contracts faster than the cooler outside. The cold upper shell therefore falls in upon it more or less continually, and thus, occupying less horizontal space, must necessarily cause great lateral pressure. Imagine for a moment a solid weight of millions upon millions and millions of tons all falling in towards a common centre, and all squeezing sideways the parts about the crack at which the crust of the earth is weakest. The present structure of the Alps shows us admirably how enormous is the force thus exerted. The solid rocks which compose their surface are twisted and contorted in the most extraordinary way, great groups of strata, once horizontal, being folded over and over each other exactly as one might fold a carpet in several layers. Professor Heim, of Zurich, has shown by careful measurements that the strata of rock which now go to make up the northern half of the central Alps alone once occupied just twice as much horizontal space as they do at present. The crushing and folding due to the lateral pressure has been powerful enough to wrinkle up the different layers, and throw them back upon one another like a blanket doubled over and over, in huge folds, that often reach from base to summit of lofty mountains, and stretch over whole square miles of the surface of Switzerland. According to Professor Heim, the folding of the crust has been so enormous, that points originally far apart have been brought seventy-four miles nearer one another than they were at the beginning of the movement of the pressure. In fact, Switzerland must have been originally quite a large country, with some natural pretensions to be regarded in the light of a first-rate European power; but its outside has been folded over and over so often that there is now very little of it left upon the surface. What it once possessed in area it has nowadays to take out in elevation only.

Of course, if you make such colossal folds as these in solid rocks and other comparatively incompressible materials, you must necessarily raise them a great deal above the original level.

You must put the extra material somewhere, and to heap it up in huge folds is the simplest and easiest thing to do with it. At the same time, the compression is so immense that it succeeds in hardening and altering the composition of the rocks themselves, so much so that even if you pick out a single small piece of the stone you will find it puckered and crumpled in the most intricate manner by the enormous side-thrust of half a continent. Masses of soft clay, like that sticky stuff thrown up in laying down London gas-pipes, have been pressed close into the condition of hard roofing slates by the lateral pressure. Soft muds have been hardened and thickened into crystalline rock, and sands converted into solid masses as dense as granite. The whole great fold of crumpled, hardened, and distorted strata thus piled confusedly one on top of the other is the modern Alps, and the minor folds that lead up to it compose the lesser parallel ranges, like the Jura, that run quietly along their foot. In some parts of the Jura, these folds follow one another in regular undulations, exactly like so many thicknesses of cloth, puckered up into ridges and hollows by side pressure.

That, put briefly, is just how the Alps came to be raised visibly above the earth's surface. They are there, not because they were pushed up from below, but because they were crushed up sideways by the collapsing earth-crust: they represent, not vertical thrust, but lateral pressure. How terrific, says everybody, must have been the grand convulsion of nature to which so enormous a mass of mountains was originally due! Not a bit of it. The convulsion of nature was probably not in the least terrific. Indeed, there is every reason to believe that it continues its slow, quiet, and unobtrusive action uninterrupedly even down to the present day. The Alps are still being built up yet higher by the selfsame side-thrust, and the occasional earthquakes to which they have always been subject are good evidence that the work of mountain-making still proceeds slowly within them. What a comfort to reflect, when one's hotel is rudely shaken on the lake of Geneva or at Interlaken, that the shake has probably added half an inch to the stature of Mont Blanc or the Bernese Oberland! For aught we mortals know to the contrary, the Matterhorn itself may still be regarded in cosmical circles as a rising mountain. To be sure, during the period of greatest movement there may have been from time to time occasional paroxysms far more violent than any that have occurred in Switzerland during historical ages—terrific pangs of Mother Earth in labor—but on the other hand there may not. Slow and steady pressure long exerted would amply suffice to account for all the twists and folds, the distortions and dislocations, of the Swiss Alps as we see them at present.

But the existing contour of the various chains is not, of course, the contour due to the original upheaval or folding process. Nature is a very perverse goddess: the first thing she does is to heave up a mountain range, and the very next thing she tries to do is to knock it down again as fast as possible. No sooner is a ridge raised to an appreciable height above the surrounding plain than wind and rainfall, torrent and glacier, do their best to wear it down once more to indistinguishable uniformity with the neighboring country. Water, as we all know, is the great leveller, the most democratic among the forces of nature; it brings down the mountain from its lofty height, and fills up lake and valley and estuary and ocean with the powdered detritus it has slowly worn from the disintegrated summit. As rain, it washes away soil and crumbles rocks; as river or torrent, it cuts itself deep ravines and precipitous gorges; as ice, it grinds down hills, and wears profound glens among the solid strata; as snow, it equalizes all the rugged surfaces with its deceptive covering of virgin white. So, even while the upward movement of the Alps was still in active and constant progress, the reverse process of disintegration must have been steadily going on, side by side with it, in a thousand unobtrusive minor ways. The whole existing contour of dome and *aiguille*, peak and valley, gorge and scarp, chasm and corrie, is due to the continuous close inter-action of these two forces—the upheaving and the disintegrating, the building and the unbuilding.—*Condensed from an article in Cornhill Magazine.*

SELECTIONS.

NATURE is sensitive, refining, elevating. How cunningly she hides every wrinkle of her inconceivable antiquity under roses and violets and morning dew! Every inch of the mountain is scarred by unimaginable convulsions, yet the new day is purple with the bloom of youth and love.

CLIMATES OF CANADA.—Recent investigations on the subject of the climatic relations of Canada to European countries show that the Dominion has the latitudes of Italy, France, Germany, Austria, the British Islands, Russia, Sweden, and Norway, and has as many varieties of climates as have those countries. There is greater cold in winter in many of the latitudes of Canada than in corresponding latitudes in Europe, but the summers are about the same. The most southern part of Canada is on the same parallel as Rome, Corsica, and the northern part of Spain; it is farther south than France, Lombardy, Venice or Genoa. The northern shores of Lake Huron are in the latitude of Central France, and vast territories not yet surveyed lie south of the parallel of the northern shores of Lake Huron, where the climate is favorable for all the great staples of the temperate zone.—*School Newspaper (English).*

SCIENCE IN MONTREAL.—That Montreal, as the educational centre of Canada, is likely to become more conspicuous in the near future, and that Canadian science is to take a higher position before long, are both indicated by the recent important changes which have occurred at the leading university of the Dominion. The medical faculty have just completed additions to their building, which give most important advantages, especially in laboratory work, hitherto beyond the reach of the Canadian student. One of the most important of these changes is the provision of a special pathological laboratory and culture rooms, where investigations concerning the pathogenic importance of bacteriá and allied forms will be prosecuted. The work is in charge of Dr. Johnson, a zealous student of pathology, fresh from the laboratory of Koch. In the arts faculty, also, an additional course in vegetable histology, under Prof. Penhallow, has been provided. Altogether, the future promises well for increased activity in biological research in the Dominion.—*Science.*

GEMS FROM HENRY W. SHAW (JOSH BILLINGS).

IT may be a little vexatious, but I don't consider it any disgrace to be bit by a dog.

Ignorance is the wet-nurse of prejudice.

It is a great art to be superior to others without letting them know it.

Envy is the pain we feel at the excellence of others.

If you want to get a good general idea of a man's character, find out from him what his opinion of his neighbor is.

To be thoroughly good-natured and yet avoid being imposed upon shows great strength of character.

It is better to know nothing than to know just enough to doubt and differ.

I honestly believe it is better to know nothing than to know what isn't so.

The highest rate of interest that we ever pay is on borrowed trouble.

Curiosity is the instinct of wisdom.

Goodness is just as much a study as mathematics.

Beauty is the melody of the features.

You can't hire a man to be honest; he will want his wages raised every morning.

We should be careful how we encourage luxuries; it is but a step forward from hoe-cake to plum-pudding, but it is a mile and a-half by the nearest road back again.

If wit forms the blade, good sense should be the handle, and benevolence the scabbard of the sword.

CHAFF.

SOME men when beside themselves keep company with fools.

GNAWLEDGE: Rats are agnawing, and it is gnawt a gnawed thing after all, aw gnaw!

ADULTERATIONS.

PLACID I am, content, serene,
  I take my slab of gypsum bread,
And chunks of oleomargarine
  Upon its tasteless side I spread.

The egg I ate was never laid
  By any cackling feathered hen,
But from the Lord knows what 'tis made
  In Newark, by unfeathered men.

I wash my simple breakfast down
  With fragrant chicory so cheap:
Or for the best black tea in town
  Dried willow leaves I calmly steep.

But if from man's vile arts I flee
  And drink pure water from the pump,
I gulp down infusoriæ,
And quarts of raw bacteriæ,
And hideous rotatoriæ,
And wriggling polygastricæ,
And slimy diotomaciæ,
And hard-shelled ophryocercinæ,
And double-barreled kolpodæ,
Non-loricated ambodæ,
And various animalculæ,
Of middle, high, and low degree,
  For Nature just beats all creation,
  In multiplied adulteration.

—*Robert J. Burdette.*

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