INFLUX THE SOURCE OF INVENTION.

Your correspondent, G. G., in a very learned and able article on "The Evolution of Ideas," on page 97, has, I think, laid himself open to attack in some of the views advanced. He says, "Science declares that ideas are the results of the same natural forces which act in organic nature; and mental phenomena are not different from other natural phenomena in kind, but only in greater complexity," and upon this unsubstantial foundation builds up the theory that "evolution in nature on our globe has reached its highest stage in man, and with him terrestrial development has arrived at a remarkable turning point." "Instead of producing higher organisms, nature has given to the human species the faculty of invention." In other words, having created a being in all respects equal to itself, it has transferred to him all its powers, and has retired from the scene of action for ever, leaving to him and his mysterious mistress Evolution the government of the world on which he dwells.

G. G. quotes Herbert Spencer to prove "that no idea or feeling arises save as a result of some physical force expended in producing it;" but a greater than Spencer has said: "Man's mind is his spirit, and the spirit is a man, because the mind means the whole will and understanding, which exist in first principles in the brain, and in derivatives in the body, and they therefore include in their forms the whole man. Therefore the mind rules the body in all its particulars at will. Does not the body execute whatever the mind determines? It directs the ear to hear, the eye to see, the tongue and lips to speak; it impels the hands and fingers to do what it pleases, and the feet to go whereit wills. Is not the body, therefore, mere obedience to the mind, and could it be such unless the mind were in its derivatives in the body? Is it conformable to reason that the body should obediently act because the mind so wills? They would thus be two, one above, the other beneath—one commanding, the other obeying. This no reason will admit; therefore it follows that man's life is in first principles in the brain, and in derivatives in the body. All the constituents of the mind relate to the will and understanding, and the will and the understanding are receptacles of love and wisdom from the Lord and constitute man's life."

"That the first principles or primary forms of life are in the brain is obvious: First, from sense itself; for when man exerts his mind and thinks he feels that he thinks in the brain; he introverts his sight, contracts his brow, and feels a speculative process going on within, especially in the upper part of the forehead. Secondly, from man's formation in the womb; for the brain or head is first formed, and for some time continues larger than the body. All the external senses, sight, hearing, taste, feeling, and language, are located in the fore part of the head, and by means of fibers communicate immediately with the brain and draw from it their sensitive and active life. The affections, which are derivatives of love, portray themselves in the face; and the thoughts, which are derivatives of wisdom, portray themselves in the light of the eyes. Anatomy teaches that all the fibers descend from the brain through the neck into the body, and that none ascend from the body through the neck into the brain.

"Where the fibers are in their first principles and primary forms, there life is in its first principles and primary forms."

Will Herbert Spencer or G. G. maintain that the origin of life is not at the origin of the fibers? What, then, becomes of the proposition that "all ideas are the result of some physical force expended in producing them"?

If I interpret correctly the teachings of the great Swedish philosopher, we must look higher for the source of life and inspiration than to the wonderful organization of flesh and blood known as the natural man, which the scientists say is "the highest stage yet reached by evolution."

Within the smallest particulars, as well as in the larger members, organs, and viscera of the human body—the grand microcosm of the universe—there is a conscious, breathing, pulsative soul in constant communication with the author of life. So in and above the world of matter there is a world of spirit, through which life from the Divine is constantly flowing into all forms and organizations of matter fitted for its reception. If this was for a moment suspended, all animal and vegetable life would immediately end, the revolving earths and the mighty suns be consumed like meteors, and chaos would come again.

But as the heavens are eternal, and material worlds and systems of worlds are but representatives of the grander glories of the spiritual and celestial degrees of life, so will the physical universe endure for ever. Here, then, is the source of all inspiration. The poet, the artist, the inventor, or the divine may drink from this inexhaustible fountain.

As the blazing center of our solar system is daily seeking in the crevices of the rocks for seed to germinate, or in the fathomless oceans for leviathans to bring forth; so the great Sun of the spiritual universe is sending forth his light and heat to bless with new inventions for the comfort, new delights for the eye, new harmonies for the ear, and new joys for the hearts of his children. Not a step do we take but by his permission, not a mouthful of food that he does not provide, not an hour of sleep that he does not send.

Man, the crowning glory of the universe, comes into the world more helpless than the vilest worm. Without assistance he would soon die for lack of nourishment, whereas all other forms of animal life are born into full knowledge and ability where to seek their food, to know their companions, which are friends and which are enemies; construct houses, form marriages, bring forth young, love them tenderly, provide for them until able to care for themselves, and to perform the same offices, and by procreation perpetuate their kind.

Man is born without any knowledge whatever, and yet he has the capacity to attain the wisdom of the highest angels, and light is given in proportion to his power to receive and appropriate. All inventions are given by influx from the world of spirits. When the printing press, the steam engine, the sewing machine, and the telephone were needed suitable mediums were found for transmitting the knowledge of them to mankind. No amount of "physical force" could have produced one of them.

Within the past one hundred years a greater flood of light has been poured upon the earth than has fallen during any ten centuries since its creation. What tongue can tell the progress of the next golden cycle? When higher altitudes are attained by the spiritual man on the earth and in the heavens, the natural will rise to higher stages of development than have yet been reached. When the new schools of philosophy, instead of attributing all things to *nature*, and *evolution*, and *force*, will "render unto Cæsar the things that are Cæsar's, and unto God the things that are God's," when science and religion, hand in hand, drink together from the fountain of divine revelation, and reason and rationality prevail over skepticism and pride of opinion, then will come the golden age of the world.

CHARLES REESE.

Baltimore, August 9, 1880.

ARTIFICIAL CITRIC ACID.

Among the latest triumphs of the synthetical chemist we have to record the preparation of citric acid by Messrs. Grimaux and Adam, of France. All the principal acids found in the vegetable kingdom had already been prepared, and for several years citric acid, the acid of the lemon, the currant, and gooseberry, has been the only one of which it could be said, "this acid has not yet been made artificially." Tartaric acid had been made several years ago from dibromsuccinic acid, and malic acid, the acid of unripe apples, from monobromsuccinic acid, an acid obtained from amber; but succinic acid itself was made from ethylene cyanide.

It would be hard to tell why the synthesis of citric acid had never before been attempted, since the process involves no unusual operations or unexpected reactions. As early as 1872, C. Bischoff, in Berlin, began the study of the dichloracetone, from which citric acid has recently been made, in the hope, as he said, of making artificial citric acid. Having learned that Glutz and Fischer were also studying the compounds of this dichloracetone, he withdrew from that field. As these gentlemen had not published anything further on that subject for several years, one of our own chemists in this city again began the synthesis of citric acid, but stopped on learning that Grimaux and Adam had preceded him, and secured the field by a communication made to the Paris Chemical Society in May last.

The details of the preparation of citric acid, as published in *Comptes Rendus* (xc., 1,052), are nearly as follows: Glycerine is subjected to the action of hydrochloric acid gas, whereby two atoms of hydrogen are replaced by chlorine, forming a liquid called dichlorhydrine, $CH_2Cl,CHOH,CH_2Cl$. This substance when oxidized by a mixture of potassic chromate and sulphuric acid yields dichloracetone, CH_2Cl,CO,CH_2Cl. This product was next treated with concentrated prussic acid, which formed with it a cyanide readily convertible by hydrochloric acid into dichloracetonic acid. This acid had not previously been prepared, although Bischoff long since made an acid isomeric with this one from another form of dichloracetone. The graphic formula of Grimaux's acid is:

$$\begin{array}{l} CH_2Cl \\ | \\ C(OH)COOH \\ | \\ CH_2Cl. \end{array}$$

This acid was distilled in vacuo and then extracted with ether, which left on evaporation a sirup that gradually became solid, forming transparent tabular crystals, soluble in water, alcohol, and ether, and fusing at 90° to 92°, and sublimable at a gentle heat, but cannot be distilled.

The concentrated solution of the soda salt of this acid was heated with two molecules of potassic cyanide, when the chlorine exchanged places with the cyanogen, producing potassic chloride and dicyanacetonic acid:

$$\begin{array}{l} CH_2CN \\ | \\ C(OH)COOH \\ | \\ CH_2CN. \end{array}$$

This substance, as expected, proved to be a *nitrile, i. e.*, a substance which by saponification with potash yields an acid, or rather its potash salt. The acid thus obtained is identical in every respect with that obtained from lemons; in fact, is really citric acid, thus establishing the formula of this acid as:

$$\begin{array}{l} CH_2COOH \\ | \\ C(OH)COOH \\ | \\ CH_2COOH. \end{array}$$

The synthesis of citric acid is looked upon at present as a triumph of more theoretical than practical interest, because citric acid can be made more cheaply from natural sources than by this new process. Since citric acid, too, is much employed in flavoring and in medicine, the use of cyanides in its manufacture is highly objectionable, lest in its manufacture a trace of this deadly poison remain in the finished product.

Now that the constitutional formula has been fully established by this synthesis, there is more probability of citric being made by other methods, and although the preparation of an acid from a cyanide is the easiest and best known, other processes may yet be devised which shall remove this objectionable feature. For use in dyeing citric acid made from cyanhydrine would be as good as any other, if the process can he improved so as to render it profitable on a large scale.

Some encouragement can be derived from this synthesis as showing that in some departments, at least, chemistry has reached the point where it is possible to predict what will be the result in certain cases. Like an engineer planning a series of works, these chemists started out with a definite object in view, planned each step, and followed the plans which lead to the expected point. In this sense, at least, it is a victory.

E. J. H.

A GOOD YEAR FOR STATISTICS.

Besides being a "census year," 1880 has the distinction of showing the largest foreign commerce, both in exports and imports, ever known in the history of the country. The grand total for the fiscal year ended June 30 amounts to $1,503,679,489, an increase of 30 per cent on the foreign trade of 1879, and about 81 per cent on that of ten years ago. The "balance of trade" in our favor, or the excess of exports over imports, amounts to $167,908,359, although we have imported, as partial payment of this balance, $75,891,391 in gold and silver coin and bullion, more than our coin and bullion exports; it is probable, however, that no inconsiderable proportion of the remainder has been taken up as the profits of carriers, a service in which American ships find comparatively little employment.

There is hardly an intelligent American but would feel greater pride than is now possible were the large exports we are making to a more considerable extent of manufactured articles. The enormous increase in shipments has been made up almost exclusively of breadstuffs, cotton, and provisions, while in manufactured articles our foreign trade for the past year has been almost at a standstill. The principal explanation of this is probably to be found in the great and sudden advance in prices which took place last fall, with the general revival of trade here, but values have again dropped, in most articles, nearly to where they were a year ago, and those who are endeavoring to enlarge the foreign market for American manufactured goods are now working under more favorable conditions than they have been at any previous time within the past twelvemonth. It may be interesting, however, to note that in some important specialties of American manufacture the exports show an increase. The complete figures have not yet been collected from all the custom houses for the year, but, taking the last statement of the Treasury Department, which brings down the returns to May 31, we find that there has been a small increase in our shipments of all the following articles: Plows and cultivators; railroad, passenger, and freight cars; car wheels; stationary steam engines; firearms, cannon, and gunpowder; clocks and parts of; mathematical, philosophical, and optical instruments; organs and melodeons; paper and stationery; printing presses and type; scales and balances; wines; tin and manufactures of; and watches and parts of. That we have been able not only to hold our own, but actually to increase our exports in all these specialties during a year when the home market has been so disturbed, presents an outlook for the future which contains much of promise.

When, however, we turn to our imports, and find that they exceed those of 1879 by 50 per cent, and that many of the articles which help to make up the increase are such as we excel in the manufacture of, and on which have to pay a high duty, we then are presented with a practical demonstration of the cheapness of labor and capital in Europe and the far more favorable situation of all classes here. These increased imports are of every description of staple and fancy articles, but the larger trade is principally conspicuous in manufactures of cotton, flax, iron and steel, silk, and wool. Our own manufacturers in all these lines have had a full business, but, besides what they have produced, we have been taking liberal supplies from abroad in exchange for our bountiful agricultural products. The circumstances under which this trade has been done, showing no accumulation of foreign indebtedness, and a liberal balance to our credit abroad, to be covered by gold shipments to this country, are more favorable to our continued prosperity than they have ever been in any former period of excessive imports.

The St. Lawrence River Tunnel.

Surveys were begun August 9 for the long-talked of tunnel under the St. Lawrence River at Montreal. The line contemplated is from the Liverpool wharf, Montreal, to the Hudson Cotton Factory, at Hochelaga. The river has a depth of 42 feet, and the tunnel will be 40 feet below the bottom. The work has been undertaken by the South Shore Railway and Tunnel Company. Mr. Walter Shanly, well known through his connection with the Hoosac Tunnel, is chief engineer.