NORTH AMERICAN REVIEW.

No. CCXXII.

JANUARY, 1869.

ART. I. — 1. *Gottfried Wilhelm Freiherr von Leibnitz. Eine Biographie.* Von G. E. GUHRAUER. Breslau. 1846.

2. *Des Freiherrn von Leibnitz Kleinere Philosophische Schriften, mit einer Vorrede* HERRN CHRISTIAN WOLFFS. Jena. 1740.

3. *Monadologie. Deutsch mit einer Abhandlung über Leibnitz' und Herbart's Theorieen des wirklichen Geschehens.* Von DR. R. ZIMMERMANN. Wien. 1847.

4. *Grundriss der Geschichte der Philosophie.* Von DR. JOHANN EDUARD ERDMANN. Berlin. 1866.

5. FRIEDRICH HEINRICH JACOBI'S *Werke.* Leipzig. 1815.

6. — LEIBNITZII, G. W. v., *Opera Philosophica quæ exstant Latina, Gallica, Germanica omnia.* Edita recognovit J. E. ERDMANN. Berlin. 1840.

IT is a significant enough fact, that of the philosophers of Germany those are comparatively most appreciated who move in a region of diffuseness and darkness. The art-criticism of the Schlegel-Schelling school is accepted with far greater avidity than the learned, thorough, and lucid criticism of Lessing; the mathematical exactness of Fichte's phraseology and method is thrown aside for the obscure, but, on that account, more awe-inspiring, diffuseness of Hegel; and how much higher a place is assigned to Spinoza than to Leibnitz as a philosopher! So true is it that the human race flies from light as if it were an enemy, and binds itself in subjection to mystery.

The transparent style of Leibnitz seems so commonplace in comparison with Spinoza's mystic utterances, that men cannot persuade themselves that it is not vastly inferior. What should become of them, indeed, if the former succeeded in making the whole structure of the universe as clear as the demonstration of a triangle? Would not mankind die of sheer *ennui*, if light were thrown into every region of human knowledge? Accordingly men — and more especially, at all times, the "upclearers," "friends of enlightened views," and "prophets of a new liberal religion" — rally around the incomprehensible, forswear the authority of the Bible for the authority of Jacob Boehme or Spinoza, and glory in the fact that there is still something beyond, some dark shadow, — generally called Being, — which we do not know. The two men of all others who have pursued this dark shadow and spectre of unknown Being into its most hidden recesses, and lit it up by the sunlight of reason, — Leibnitz and Fichte, — have, in so far as their labors had this object in view, labored in vain. Leibnitz is known as an excellent mathematician and scholar of most various attainments, and Fichte is cherished in the memory of Germany as a man of rare honesty and an earnest patriot; nay, some few have even heard of the curious theory of *Monads* of the one, and of the equally curious theory of the *Ego* and *Non-Ego* of the other: but that each of these men — both honest and in earnest search of truth, and neither of them in the least likely to deceive himself about the extent and range of his discovery — did discover, or said he had discovered, a universally valid science of knowledge, which settled all possible disputes about metaphysical problems, and left open for advancement and discussion only the natural sciences, — this is neither understood nor investigated, and probably will not be for a century, — not until this race of ours has grown to be less cowardly and more self-reliant than it is now. Nevertheless, it is well enough, once in a while, to repeat this statement, if merely as an historical fact; for amongst the younger generation it is always possible that there may be some who will feel sufficiently interested to make the investigation, and who again will incite others of the succeeding generation to a

like endeavor. In the case of Leibnitz this is all the more proper, as he rather lived his system than elaborated it in writing. Whenever he did so elaborate it, it was in a fragmentary way, the completest of his fragments being the "Monadology." An interest in the life of Leibnitz will therefore lead of itself to an interest in his philosophy, and perhaps even to a comprehension of its nature.

Gottfried Wilhelm Leibnitz was born on the 21st of June, 1646, in the city of Leipsic, where his father was established as a notary-public; and in the family Bible the latter has chronicled, that, on the occasion of the child's baptism, it opened and raised its eyes when the water was sprinkled upon it, which record is followed by this prophetic prayer: "And thus I wish and prophesy that this may be a sign of faith, and the best pledge that this my son will live a godly life, with eyes uplifted to God throughout all his life,—that he may burn with love to God, and through this love may do admirable deeds for the glory of the Highest, as well as for the welfare and growth of the Holy Church, and for the salvation of himself and us all!"

The father died when the child was but six years old; and yet he departed this life with full and oft-expressed conviction of that child's future celebrity. The mother—a pious, intelligent woman—now took sole charge of the education of her son. She sent him to school, where he soon evinced an uncommon love of knowledge, and a quickness of parts which excited general admiration. In a quasi autobiography, Leibnitz thus describes the manner in which he, characteristically enough, learned Latin. "I should doubtless have learned Latin with the customary slowness, had not accident led me upon a peculiar way. In the house where I lived I found two books which had been pawned by a student: the one, as I remember, was a Livy; the other, the Chronological Thesaurus of Calvisius. Scarcely were they in my hands when I began to devour them. Calvisius I understood easily enough, having a German book on general history which contained pretty much the same matter. In Livy, however, I often got stuck; for as the affairs and the manner of writing of the ancients were unknown to me, and as writers of history have, moreover,

a peculiar diction, remote from the common intelligence, I at first understood not a line of it, to speak the truth. But as it was an old edition, full of figures and wood-cuts, I carefully examined these, read here and there the subjoined words, caring little about obscure phrases, and skipping what I did not comprehend. When I had done this repeatedly, and had looked through the whole book, I understood more and more each time. Delighted at my success, I thus continued without a lexicon till most of it was clear to my mind. In the mean while, happening once to quote some passages which had fixed themselves in my memory, one of the teachers seemed surprised, and asked me how I had learned these things. When I confessed and communicated to him what I remembered, he grew silent. But he went to those who directed my education, and requested them to prevent my regular studies from being disturbed by premature reading. Livy, he told them, fitted me as well as a cothurnus would fit a pygmy. A boy of my age ought to be debarred from books written for a riper age, and to be kept to his little catechism and the picture-book of Comenius. He doubtless would have convinced them, had not a cultivated nobleman of the neighborhood, and a friend of our landlord, happened to be present. Struck with the schoolmaster's — shall I say envy or simplicity? — he told him how unfair and intolerable it would be, if the first germs of developing genius in a child were blasted by the brutish prejudices of teachers. He then called me, and receiving no absurd answers from me to his inquiries, he did not desist till he had forced my relations to promise him that I should have access to my father's private library, which had been kept so long under lock and key. How I triumphed, as if I had found a treasure!"

Thus he plunged deeply into antiquity, and in Latin acquired such fluency, that, at the age of thirteen, on the occasion of a recitation in school, he undertook to write three hundred faultless hexameters within the hours from daybreak to noon. Frequently, in later years, he referred to the early freedom and self-reliance which led him to the study of the ancients as of incalculable benefit to his whole character and life. The clearness and precision of expression in which the German

was at that time more wanting than any other European language, and which, since the days of Lessing and Schiller, it has again been losing to a deplorable degree, Leibnitz learned from the classics to value so highly, that, at that early age, he already resolved upon two rules for his whole future life: always to seek *clearness* in *words* and other mental symbols; but in *things* ever to look to *utility*.

Interested as he was in making Latin verses, this interest soon relaxed before the study of logic. "I saw at once," he writes, "as well as a boy of thirteen could see, that there was something great concealed in logic." No sooner had he seen this than — as throughout his whole life — he applied it. The divisions and subdivisions of logic he immediately began to employ for arranging his thoughts and recollections under such heads as tended much to facilitate his command of them. He used these categories, as he expressed it, "as a net wherewith to catch flighty game," namely, acquired treasures of mind. On the same principle he devised also *an art of questioning*, which might enable travellers in foreign lands, at any time and under any circumstances, to propound such questions as alone would be generally important. "These two circumstances," writes he to a friend, "that I was *self-taught*, and that immediately upon approaching a science, even when I scarcely understood its rudiments, *I sought for something new in it*, have been of extraordinary service to me. For thus I gained a twofold benefit: first, that I did not fill my mind with matters soon to be forgotten, and which are usually learned more out of respect to the authority of teachers than from any intrinsic value; and, secondly, that I never rested until I had discovered the first principles of every science I studied."

A closer study of those categories of logic led Leibnitz in his very boyhood to the conception which constituted the basis of all his future discoveries in the various sciences. "I hit," writes he, "upon the wonderful idea, that it would be possible to invent a certain alphabet of human thoughts, and that from the combination of the letters of this alphabet, and an analysis of the words formed out of them, everything could be discovered as well as judged. Scarcely had my mind seized this idea when I shouted in triumph, though certainly with a boy-

ish joy, for at that time I did not yet grasp the full greatness of the subject."

The idea here alluded to is perhaps better explained thus. There is a necessary connection in our knowledge of all the manifold parts of the universe, and this connection may be apprehended from the analysis of any one fact in that knowledge. Given, therefore, a single fact of consciousness, and it is possible *a priori* to construct out of it by mathematical analysis the whole system of the universe in all its details. Nay, more: since even the products of freedom, in so far as they manifest themselves through the medium of objective Nature, are limited by the laws of that Nature, it is even possible for the philosopher to construct *a priori* every possible free product of reason. Every possible piece of music, every possible work of art, can thus be known and described beforehand. As the whole infinity of number, with all its combinations and order of sequence, lies involved in the 1 and the 0, so does every fact of consciousness, as the synthesis of the Ego and the Non-Ego, involve all possible facts of consciousness, as well as their combination and order; and if this order could but be established in the latter case (in philosophy) as it has been established in mathematics, the human race would have made an advance more important than any revolution since the coming of Christ. Such a science of the order of the synthesis of the Ego and the Non-Ego, such a true science of knowledge, would be an instrument wherewith every problem could at any time be solved by one who understood its mode of operation.

But the great obstacle to the communication of such a science — not to its first full comprehension by the original inventor — would be the absence of signs for those orders and sequences of acts of the mind. In arithmetic we deal with numbers, which no person can mistake, and in geometry with lines, which can be perceived; but in this science of knowledge we should only have intellectual contemplations, acts of the mind, which there are no means of verifying or of communicating to others. True, we use terms of language to designate such of them as have in the course of human life arisen into consciousness, and hence such terms as *substantiality*, *causality*, are supposed to designate certain conceptions; but

we can never feel sure that the person to whom we wish to communicate an act of the mind under such a name will have a true comprehension of that which it is intended to designate. This latter consideration suggested to Leibnitz the plan of inventing a philosophical terminology after the manner of algebraic signs, since mere signs would clearly be the best guaranty against misconception of existing words; and through his whole life he busied himself with this thought, as did a century later Fichte, who, in his "Sunclear Statement," confesses the same necessity for a philosophical algebra. But as Leibnitz did not need it for himself, but only for communication, he left the project, like many others of his life, unrealized.

Thoroughly in possession of all the subtilties of logic, and having, moreover, completed a course of study of the Schoolmen, Leibnitz, in 1661, at the age of fifteen, entered the Leipsic university to prepare himself for active life by the study of law. He excelled here as everywhere. In 1663 he read his dissertation, *De Principio Individui;* and in 1666 published a little work, *De Arte Combinatoria*, wherein all his future achievements in philosophy are already contained, as it were, in the germ, and which led him later to the discovery of the Differential Calculus. But, to his great chagrin, he found it impossible, by the rules of the Leipsic university, to obtain the degree of *Doctor Juris* until after the expiration of five years; and when finally this time had expired, he was rejected by the Board of Examiners, there being a number of older candidates for promotion, whom it was considered expedient to admit in advance of the younger ones. Longing to establish himself professionally in the law, he felt extremely annoyed at this action of the board, and having already acquired a name of some celebrity abroad, and his mother having died meanwhile (in 1664), he resolved to emigrate. Accordingly in the autumn of 1666 he left Leipsic, — which he never afterwards liked to revisit, — and went to the university at Altdorf, where, by his excellent dissertation, *De Casibus Perplexis*, he immediately obtained the degree which his native city had churlishly refused him. "I thus received the title of Doctor," he writes, "in my twenty-first year, amidst general approval. For at the public

disputation I spoke so happily, and developed my thoughts with such clearness, that not only the auditors admired this new and, particularly in a lawyer, unusual sort of precision, but even my opponents expressed their extreme satisfaction. . . . . One professor stated publicly that never yet had verses been spoken from the platform like those which I spoke at the promotion." So successful was he on this occasion, that efforts were made to retain him at the university as a professor; but Leibnitz had other objects in view. He remained during the winter in Nuremberg, studying the works of Kepler, Galileo, Bacon, Gassendi, and Descartes, perfecting his law studies, and in an odd way becoming also somewhat of a practical chemist. There was in Nuremberg a society of Rosicrucians, of which Leibnitz had a great inclination to become a member. But being, as he thought, too young and unknown to make admittance probable, he set to work to read various profound chemical and mystical works, noting the obscurest phrases, and from them composing a letter to the president, which he himself could not understand. The president, however, was so overwhelmed by the learned nonsense, that he pronounced the writer one of the greatest chemists living, and not only invited him to join the society, but made him its secretary.

It was while at Nuremberg, in the spring of 1667, that Leibnitz made the acquaintance of the celebrated statesman, Baron Boineburg, formerly prime-minister of the Elector John Philip of Mentz, but who now lived a retired life in Frankfort, more devoted to the sciences than to politics. Boineburg soon recognized the genius and uncommon acquirements of the young lawyer, and at his solicitation Leibnitz accompanied him to Frankfort. Leibnitz was then of rather an ambitious disposition, and immediately upon his arrival at Frankfort made himself thoroughly acquainted with the political complications then enveloping Europe. In order to gain an entrance into political life he wrote his famous essay, *Methodus Nova discendæ docendæque Jurisprudentiæ*, which he sent to the Elector of Mentz, proposing to supplement it by a chart *which would enable any lawyer or judge to decide immediately any given case of law according to the fixed principles of jurisprudence*, — a conception which, like other

projects, arose naturally from the fundamental idea already described, and set forth by him in *De Arte Combinatoria.*

John Philip was so much pleased with the essay, that he appointed Leibnitz to a somewhat lucrative office at his court, as assistant to Dr. Lasser in the elaboration of a reformed code of Roman law for the Electorate. Leibnitz soon made himself the chief of this work, although his time was largely taken up by labors in the interest of Boineburg. But his facility of labor fully equalled his extraordinary knowledge. Hence Boineburg was able to say of him: "He is a young man of twenty-four years, learned beyond anything that can be said or believed. Philosophy he understands thoroughly; and he is a happy mediator between ancient and modern philosophy. He is a mathematician, knows physics and medicine, is very much devoted to mechanics, and exceedingly industrious and zealous. In religion he is self-reliant, but a member of the Lutheran Church. He is master of the principles of jurisprudence, and at the same time, what is remarkable, is well versed in the practice of the law." Besides his political and legal writings, Leibnitz, among other things, made a catalogue of Boineburg's extensive library, — "a catalogue," writes Leibnitz himself, "such as has never been seen before," — that is, in the way of arrangement and for easy reference. During this time his name became so generally known throughout Germany, that he received repeated offers from different courts, all of which he declined; and after a few years his unremitting devotion to the interests of the Elector of Mentz was properly rewarded by his appointment as member of the Chief Court of Appeal of the Electorate, the highest tribunal of that state.

We have not space to dwell at length upon the particular relations of Leibnitz to Boineburg during this time. Suffice it to say that he supported with great acuteness both the political measures of this statesman, and his endeavors to bring about a reconciliation between the Protestants and Catholics. Throughout his life he followed up this latter project with incredible perseverance, and it was indeed in discussions with Boineburg on the question of the real presence of Christ in the host that he attained the first great

insight which in natural philosophy carried him beyond the standpoint of the Cartesians: for the Cartesian theory, that the whole essence of bodies consisted in figure, extension, and motion, was irreconcilable with the theory of both Catholics and Lutherans respecting the Eucharist. Leibnitz was thus led to investigate the problem whether the conception of a body is merely that of an extended moving figure or atom, and soon came to the conclusion that it was not, but that it also involved the characteristic of substantiality or self-activity, — in short, the atoms became monads; and through this result he believed that he had paved the way for a union of Protestants and Catholics, at least on the subject of the real presence, since the Protestant doctrine of the real presence seemed to him now identical with the Catholic dogma of transubstantiation. During the autumn of 1671, Leibnitz carried on a correspondence with the Jansenist Arnaud in Paris on this subject, — a correspondence which caused M. du Fresne, the ambassador of the Elector at the French Court, to write of him as "*ce merveilleux Saxon*," — adding, "*C'est un prodige d'esprit à étonner les autres.*"

But Boineburg did not put all Leibnitz's time in requisition for the discussion of theological questions. Important political problems demanded unusual measures. Louis XIV. threatened all Germany; and the Elector of Mentz was much disposed to resist his encroachments, and for that purpose to effect coalitions with the other German princes. But Boineburg, more prudent, strenuously insisted on pacific measures and friendly negotiations; and his reputation as a statesman of uncommon shrewdness gave to his advice, which was always sought, a peculiar influence.

Leibnitz zealously supported the views of Boineburg, and at a meeting of the Electors of Mentz and Trèves, which Leibnitz attended with Boineburg, he elaborated an important memorial, which on the 8th of August, 1670, he submitted to these princes. In it he earnestly deprecated making an enemy of France, pointing out the dangers of such a policy for all the princes of the Rhine countries, but at the same time advocated an alliance of the German princes, which, though not openly directed against France, and hence unobjectionable to

Louis, might nevertheless serve to unite Germany against all future encroachments. After sketching the details of such an alliance, Leibnitz proceeds: "Certainly, whoever elevates his view, and takes in the state of Europe with one glance, as it were, will concede that this alliance is one of the most useful projects ever invented for the general good of Christendom. Germany is the centre of Europe. Germany has in past times always been a terror to her neighbors. But now that she is divided, France and Spain have grown formidable, and Holland and Sweden more powerful. Germany is the Eve's-apple, as was Greece in former times, and in later times Italy. Germany is the ball thrown by those who play the game for a universal monarchy, and the battle-ground upon which the fight for the supremacy of Europe is waged. In short, Germany will not cease to be the subject of her own and of foreign shedding of blood, until she is aroused and united, and has thus taken away from all her wooers the hope of ever becoming her masters." Together with this alliance, Leibnitz conceived the plan of a union of all Christendom against the Turks, — Germany to undertake the war in Europe, and France in Egypt and Algiers. The more this plan was revolved in Leibnitz's mind, the more earnestly he cherished it. If Louis XIV. could be induced to undertake such an expedition against Egypt, Germany, he thought, would be safe from all danger from France. He communicated his scheme to Boineburg, who heartily indorsed it; and as Louis was then meditating his enterprise against Holland, Leibnitz drew up an elaborate memorial, urging him to abandon a direct war against the Dutch, and stating that the writer of the memorial knew of a project which, if undertaken by France, would quite as certainly, and with far less risk, destroy Holland by ruining her trade. This memorial was sent by Boineburg to Louis with a note, speaking of the author in favorable terms, and stating that the latter was ready to explain the project hinted at in a private interview. The king replied in the early part of 1672, through his Minister of Foreign Affairs, that he would be happy to learn the nature of the project from the author of the memorial either in person or by letter. Excited to the bold-

est hopes by this favorable answer, Leibnitz, on the 19th of March, set out on his remarkable journey, with the following note from Baron Boineburg to Arnauld de Pomponne, the French Minister of Foreign Affairs.

À Mayence, le 18 Mars, 1672.

Monsieur : —

Voilà celui que le Roi a demandé par celle qu'il vous a plu de m'écrire. C'est un homme qui, quoique l'apparence n'y soit pas, pourra fort bien effectuer ce qu'il promet, et dont je voudrais que les bonnes qualités fussent uniquement appliquées au service de sa Mté pendant son séjour auprès de vous. Je vous supplie de lui prêter le bien de votre protection et votre faveur, et de permettre incessament, qu'il s'explique avec vous, ou avec celui que le Roi commandera, le sujet nommé ; étant prêt de répondre de plus au plus à tout ce qu'on en trouvera soumis à des difficultés, qui semblent au commencement un peu surprenantes et quasi insurmontables. La plupart et le fond et le sort de l'affaire consiste dans le dernier secret et dans une mûre considération des circonstances actuelles, laquelle soit par piéces bientôt achevée, sans quoi la chose paraît sujette aux intrigues du temps. Vous apprécierez donc mes instances, par lesquelles je vous prie de prendre un soin très particulier, que cet homme soit entretenu sans bruit et sans discommodité pour songer seulement à son fait, et qu'on lui rende les avances, qu'il a reçues ici pour son voyage à Paris. Il est seul avec un valet, n'a rien de son chef qu'il puisse contribuer, si non son étude, sa fidélité, et son application, qu'il employera parfaitement à l'exécution des ordres de sa Majesté. Je m'en remets à votre disposition, et vous assure de nouveau, qu'il n'y a plus de personne, qui soit autant que je le suis, Monsieur,

Votre très obéissant, &c.,

J. C. Baron de Boineburg.

The details of Leibnitz's interview with Louis XIV. have never been made public. His project was doubtless unconditionally rejected by a monarch astute enough to see the true purpose which had prompted its suggestion. Nevertheless Leibnitz remained in Paris, partly on political duties for the Elector, and partly to transact some business affairs of Boineburg. His leisure time he devoted to the acquisition of additional learning in the various branches of science and industry. He buried himself in the splendid libraries of Paris, made extensive historical researches, and, above all,

perfected his mathematical knowledge, which hitherto had been comparatively neglected. He visited the various large manufactories of the city, watched the operations of the laborers, and sought to make himself acquainted with all the details of their arts, — often courting the personal acquaintance of the workmen, in order to learn from them professional minutiæ. Through his wonderful *art of combining*, he was always ready with practical applications of his fundamental principle, and his head thus became filled with innumerable inventions and projects of inventions. Having heard of Pascal's calculating-machine, he at once set about the invention of one far more perfect, and which won for him the admiration of the scientific men of Paris. He intended to add to it a geometrical calculating-machine, with which "it would be easy to calculate all conceivable figures and lines of whatever curve," together with an instrument to enable navigators to discover their whereabouts at sea without the aid of sun, moon, or stars. He also invented a ship, "to be driven by compressed water, which could sail against any storm," — besides various other machines, which he mentions at length in a letter to the Duke of Brunswick-Lüneburg. He was interrupted in these labors by news of the death of his friend Boineburg, in 1673, which obliged him to leave Paris for London on political affairs and business matters of the Boineburg family. But he had been scarcely a month in London, when he was recalled by the still sadder news of the death of the Elector of Mentz. He did not return home, however, but obtained leave to remain in Paris, where he continued his studies with a zeal heightened by his short stay in England, and his introduction to some of the famous scientific men of that country. Through his political position he formed an extensive acquaintance in the French capital, and obtained access to the highest circles of society. He thus perfected his knowledge of the French language, then in its bloom under Racine and Molière, and a relish for the life of a great metropolis, which made him resolve to buy a state office and permanently settle down in Paris. He therefore twice declined an offer from the Duke of Brunswick-Lüneburg of a position at his court; and it was not until he found himself unable to pur-

chase the office he desired — his family having refused an advance of money for this purpose, from the fear that he would join the Catholic Church, if he remained in Paris — that he accepted the Duke's third offer. He left France for Hanover in 1676, just at the time when he had hit upon the discovery of the Differential Calculus, by applying the same principle to geometry which in *De Arte Combinatoria* he had announced as applicable to number.

The calculation of infinite quantities was a difficulty which to mathematicians had always seemed insurmountable, — there appearing to be no possible method of handling them, except in an indefinite way. "Every determined quantity is a finite quantity," — so ran the argument, — "and hence to have an infinite quantity is to have an undetermined quantity, or nothing." The problem was, therefore, to show the possibility of handling infinite quantities and relations of quantities in a determinate manner, and hence with the same absolute certainty as finite quantities. Leibnitz solved the problem by showing that *finite* and *infinite* are merely terms reciprocally determining each other; that the infinite is therefore as much determined as the finite, and the finite as much undetermined as the infinite.

If we take, for instance, the fraction $\frac{1}{3}$, we can resolve it at once into the infinite series 0.3333 . . . , which we can never compass, which ever eludes our grasp because imagination always extends it, and which is therefore called by Spinoza an infinite of the imagination. On the other hand, we can again change this infinite series into the determined relation $\frac{1}{3}$, which is then an actual infinite, but can be taken hold of like any finite. In like manner the finite 2 can be resolved into the infinite series $1 + \frac{1}{3} + \frac{1}{4} + \frac{1}{8}$, etc. The fundamental principle upon which this interchange of the terms *finite* and *infinite* rests Leibnitz developed at length, and it may be concisely expressed as resulting from the fact that the ego must always limit itself by positing a non-ego, a finite, in order to apprehend itself as the infinite. Hence, likewise, we can posit space both as a determined totality, an actual infinite, (like $\frac{1}{3}$ above,) and as an undetermined infinite series, an imaginary infinite; and hence also — and it was this consideration which led Leibnitz to his doctrine of Monads — we may regard every smallest

particle in the universe as not only an atom, a non-ego, but likewise as a monad, or ego.

To make possible a calculation of infinite quantities, therefore, all that is necessary is to change the infinite of the imagination into a determined relation; and in that manner, although we never may know all the links of a series like $1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} \ldots$, we know, that, however far this series may extend, it will always have the determined relation $+ \frac{1}{4n+1} - \frac{1}{4n+3}$; precisely as, after all possible relations between the ego and non-ego have been deduced, we know that every possible event or fact in the universe is subsumable under one of those relations, although the infinitely possible links of such events or facts must remain forever unknown to us.

A still greater difficulty, however, than the calculation of infinite quantities in number is presented by the problem of the calculation of infinite quantities in extension; and hence it was quite natural that Leibnitz should have finished his *arithmetical* calculating-machine before hitting upon the invention of a *geometrical* calculating-machine. For number embraces merely one sort of infinity, namely, that of time, but geometry adds to it the infinity of space; and it is upon the combination of these two kinds of infinity that the famous puzzles of Achilles and the tortoise, of the squaring of the circle, of the impossibility of motion, etc., rest. Thus, if the sides of a square are lengthened, the area of the square increases in a certain proportion to the increase of the length of the sides. Through arithmetic this ratio can of course be computed for a *determined* increase. If the length of the sides increase, for instance, from ten to eleven feet, the area has increased from one hundred to one hundred and twenty-one feet. But this ratio is for a determined time, and is not the absolute ratio; nor is it possible for mere arithmetical analysis ever to fix this ratio absolutely. Achilles can never catch the tortoise, since time and space are equally infinitely divisible. By seizing this difficulty, and demonstrating how a finite formula may with absolute correctness express this infinite relation between two factors, Leibnitz established the Differential Calculus. And here it also clearly appears how

Leibnitz was necessarily led to say, that, although everything else can be reduced to mathematics, mathematics must be based upon philosophy; since the conception of pure relation, without any regard to actual quantity, and yet applicable to all quantity, the science of mathematics can in no way obtain from itself.

Before proceeding to Hanover, Leibnitz revisited London, and upon his return passed through Amsterdam, where he called on Spinoza, the sun of whose life was then near setting. At Hanover many efforts were at first made to convert him to the Roman Catholic Church, but his courteously firm rejection of these overtures soon put a stop to further attempts. In 1678, the Duke of Brunswick-Lüneburg, in recognition of his many labors in the interest of science and the country, the extent and variety of which appear almost incredible, conferred upon him the rank of Councillor, which made him a member of the Supreme Court. Besides the judicial duties of this office, the political cares which devolved upon him as friend and general counsellor to the Duke, and his voluminous correspondence in favor of church union, Leibnitz took almost exclusive charge of the extensive mining operations which the Duke was then conducting in the Hartz. He studied not only the practical details of the art of mining, but likewise mineralogy in general, and thus was soon led to a study of comparative geology, a science then scarcely known. He made extensive collections, sought information as to the structure of the earth in all quarters to which his correspondence extended, and worked out a detailed plan for a geological examination of all Europe. In like manner he began to interest himself in the study of philology, and to investigate the construction of languages. Amidst these labors he yet found time to write his work, *De Jure Suprematus Principum Germaniæ*, wherein he developed his views on law, politics, and religion.

In 1679 the Duke of Brunswick-Lüneburg died, and was succeeded by his Protestant brother, Ernst August, afterwards Elector of Hanover. Leibnitz nevertheless retained his position and continued his labors as before, nor did he relax his efforts in behalf of a reunion of the churches. His extensive correspondence shows his earnest interest in this cause; and the basis upon which he hoped to perfect it is

perhaps best exhibited in a small pamphlet which he had elaborated as a sort of philosophical statement of the Catholic dogmas. In most matters he certainly leaned more to the Catholic than to the Protestant side, particularly in the matter of church organization, which was indeed the chief object he had in view in his agitation of this subject: for Leibnitz could not hold a theoretical conviction without immediately endeavoring to realize it in practice. His conviction of a moral world within the natural was the breath of his life; and this moral world could find realization only in the Church, particularly as all forms of civil government were in his time rotten to the very core. It seems to have been the great dream of his life to labor for the establishment of such a compact church organization of all Christendom as the Catholic Church in some degree possessed, and by extending it through missions all over the world, and making it likewise the protector of science, to constitute it effectively the ruling power of the earth. Hence in his work on jurisprudence, before mentioned, he does not treat law separately, as a pure and complete science in itself, such as Fichte in later days set forth in his Science of Rights, but in connection with and subordination to morality or the Church.

But all these labors have faded out of sight in comparison with Leibnitz's important achievements in the field of mathematics during this time, beginning with his discovery of the Differential Calculus, which he made public in 1684, and followed up by applying that Calculus to the various branches of science, and inviting all fellow-laborers to free and generous competition. Two years later, in 1686, Newton published his *Principia*, and it is of interest to observe the persistent opposition which Leibnitz made to Newton's theory of gravitation, announced therein. Not that Leibnitz denied the validity of that theory, so far as it involved a mathematical truth; but what annoyed him was the term "attraction," as implying an actually existing and occult force, operative in the various planets and stars. The conception of such a force he held to be an absurdity, since no ground could be assigned for it. Hence, in his letters to Dr. Clarke, Leibnitz was always very careful to add to his objection to the theory of attraction,

"when we take that force in its *scholastic* sense." "For how," he writes, "can it be shown that the sun attracts the earth through vacant space? Is it God through whom this attraction is effected? This would certainly be a greater miracle than any other. Or are there some immaterial substances, or certain rays of spirit, ... or something else, which serves as such a means of attraction? According to Dr. Clarke, the force of attraction is invisible, not susceptible to touch or sensation, and not mechanical. I might add at once that it is an inexplicable, incomprehensible force, accepted without proof, having no ground, and not to be confirmed by any example. But, says Dr. Clarke, it obeys a certain order, is constant, and hence natural. I reply, that it cannot be regular, if it is not at the same time rational, and that it cannot be rational, unless it can be explained through the nature of things. . . . . *It is a pure thought of the brain*, an occult quality of the Schoolmen." *

Now in this argument Leibnitz is as correct as Newton is in his theory. One body moving around another, no matter in what curve, *may be viewed* as moving in obedience to two forces, — its own centrifugal force, which always remains the same, and an attractive, centripetal force of the central body, which varies with the squares of the distances. From this necessity of viewing the motion arises the *a priori* certainty of Newton's theory, which, precisely because it is purely *a priori* and mathematical, is indisputable and universally valid. At the same time it is equally clear that this is merely a mode of viewing a phenomenon, ("a pure thought of the brain,") and Newton was very careful never to claim anything more for it. Nor do modern astronomers pretend that there are actually such centrifugal and attractive forces. Mechanically — and mechanically we must view all Nature, when we want to explain it upon natural grounds — there is only one force, which occurs through one body impelling another, and such a force will always impel bodies in straight lines. As Leibnitz expresses it: "Matter is an incomplete affair;

* Swedenborg, in his *Principia*, also opposes Newton's theory with great energy, on nearly the same grounds.

it shows merely the source of an act. Hence, if an impression be given to a particle of matter, that particle comprehends nothing beyond this impression. Therefore matter is not capable of observing a circular movement, if left to itself; since such a movement is not simple enough for matter to recollect it, if I may say so. Matter can only recall what happened to it in the last moment, or rather *in ultimo signo rationis*, that is to say, the direction in the tangent, — and cannot recall *a rule* for moving away from this tangent, which it would be necessary for it to do, if it should always continue in a circular movement. Hence bodies follow no circular movement, although they may have begun it, unless there is a special cause for their doing so. Thus an atom can move only in a straight line, it is so very simple and imperfect. But quite different is it with the soul, ... which not only remembers its movement, like the atom, but likewise *the rule of a change* from this movement, or the law of the curve, which an atom cannot remember."

Leibnitz, with that firm conviction of mechanical order in the universe which resulted from his view of the relation between mathematics and philosophy, could not possibly admit a force in Nature not reducible to mechanical impulse, and therefore held it incumbent upon a thorough philosophy of Nature to explain all movements in Nature by mechanical causes. Hence all rotary, or rather spiral, movement was looked upon by him as the final result of various impulses acting upon a body, and the famous theory of vortices was regarded as the only one which had truth in it, however conveniently Newton's theory might come in as an easier means of calculation. Leibnitz consequently clung all his lifetime firmly to that theory of vortices which Descartes had elaborated, — and which perhaps no one has supported with so much profundity, or exhibited in its applicability throughout Nature with more erudition, than Swedenborg, in his — almost unknown — *Principia*. How unsatisfactory Newton's postulated force is, when regarded "in the scholastic sense," that is, as an actually existing force attracting bodies through space, probably all students have experienced; and some astronomers still hold it probable, or at least possible, that there may be bodies in the universe of which that force cannot be predicated.

But what made Newton's theory still more objectionable to Leibnitz was its denial of the law of continuity, and assertion of empty space. To the mind of Leibnitz it was an absurdity to speak of space without matter filling it, or as anything more than the mere product of our imagination. "If space were aught else than the mere order of things," he says, "we should never be able to show why God placed bodies in it as He did, and not rather in the reverse order, — why, for instance, He did not make the sunrise sunset, and *vice versa*. But precisely because space is nothing but the order or relation of things to each other can we show clearly the ground of this order: for no matter how He had arranged it, we should see it in the same manner; the two *status*, namely, the universe as it now appears to us, and the universe as it would be if reversed in order, would be one and the same. The distinction between the present order and the reverse would be only in our imagination; in point of fact there would be no distinction at all, and hence no one would have any right to ask why one state of things was preferred by God to another."

This argument, which Fichte also loves to use, Leibnitz applies likewise to those who foolishly ask why God created the world at a certain time, and not long before. "Of course," he replies, "if time were anything else than the order of things which happen in it, no reason could be assigned why God did not create the world before He did. But *when we show that a beginning of the world is a beginning, no matter at what time we place it*, the whole question why it was not at another time becomes absurd." By the same argument he loves to demonstrate the infinity of space and matter. "For show me," he asks, "a sufficient reason why matter should not be everywhere." And in another place he argues, rather more in a theological way, "Let us assume that God did actually put all the perfections into things which He could put into them without detracting from their other perfections. Now let us imagine an empty space, and we shall find that God could certainly have placed matter in it without taking in the least from the other things. Hence He must have done so; and hence there can be no perfectly empty

space. . . . . The same conclusion proves, moreover, *that there can nowhere be a smallest body which is not again divisible into more bodies.* . . . . For the perfection of matter is related to the perfection of empty space as something to nothing; and the same holds good of indivisible atoms. What ground could, indeed, be brought to show that Nature must have an end, where it can no longer divide? Such notions are pure inventions, based upon our arbitrariness, and unworthy of true philosophy."

The whole direction of English literature at that time could not, indeed, but be unsatisfactory to the comprehensive mind of Leibnitz. For in England,— as in our own country at present, — only two one-sided tendencies of mind had been developed: the one a Puritan orthodoxy, believing in an enthroned man-God, who ruled the world according to a capricious pleasure, and of this tendency Newton's system showed the unmistakable influence; the other a materialistic scepticism, represented by the school of Locke. Admirably has Leibnitz criticised Locke in one of his letters. He says: "He did not clearly see into the nature of the mind and of truth. Had he sufficiently considered the distinction between necessary truths, or truths which can be demonstrated, and those truths at which we arrive through induction to a certain degree, he would have perceived that necessary truths can be proved only from principles ingrafted in the mind, or from innate ideas; for although the senses teach us what occurs, they do not teach us what occurs necessarily." In other words, only *a priori* truths are *known;* all *a posteriori* facts are merely assumed with a greater or less degree of certainty. And again: "Nor has Locke observed that the conceptions of Being, of Substance, of the One and the Same, of the True and the Good, are inborn in our minds, *because* the mind *is itself* inborn in itself, and in itself apprehends all this. For *nihil est in intellectu, quod non fuerit in sensu, nisi ipse intellectus.*"

In conferring upon Leibnitz a judicial office, it had been specially agreed that its duties should never interfere with his more important scientific labors. Hence, when, in 1687, it was deemed advisable to send him to Italy, (as Goethe a cen-

tury later was in somewhat similar manner sent,) it was easy to procure leave of absence from his court. Various motives had inspired the project of this journey, some of a political nature, and looking to an improvement of the prospects then opening for the Houses of Brandenburg and Hanover, — the Princess Sophia Charlotte of Hanover, Leibnitz's pupil, having married the Prince of Brandenburg, future king of Prussia, — together with others, to Leibnitz probably the most important, of a generally scientific nature; but the chief purpose of the journey, and around which all other objects centred, was to collect materials for a history of the House of Brunswick from its earliest origin. Leibnitz proposed to make this a work such as should not have its like in all literature, and it in fact became the great work of his life, although, strange to say, it has never been printed, and is still, with many other unpublished manuscripts of his, rotting in the Hanoverian Library. With a view to secure the requisite materials, Leibnitz travelled slowly through Germany, visiting libraries and cloisters, examining tombstones, and picking up all sorts of curious information. He also visited the manufactories, noted any original productions and modes of workmanship, and made the acquaintance of such men as had a repute for learning or eminence in any branch of science. The libraries of Vienna, where he arrived in May, 1688, were a perpetual delight to him; and nothing can give a better insight into the wonderful industry, ease of labor, and many-sidedness of the man, than to observe him, during his stay in Vienna, intriguing for the House of Brandenburg, corresponding in the interest of a union of the churches, visiting the gold mines of Hungary, copying a Hebrew writing in the great library for a Rabbi friend whom he had met on his travels, and offering to copy with his own hand a rare Greek work for the library of Colbert, the French Minister of War. In January, 1689, he left for Venice, where he visited the quicksilver mines. On his return, in crossing in a boat, a storm arose, and he heard the sailors, who did not know that he understood Italian, agree among themselves to throw the heretic overboard, as the probable cause of the storm. Whereupon he quietly drew a rosary out of his pocket, and began counting the beads, —

whence the sailors concluded, that, being evidently a pious Catholic, the storm could not be owing to him.

His sojourn in Rome was almost one prolonged ovation,—and this not simply from the admiration inspired by his celebrity and genius, but also because of his courteous, amiable behavior, endearing him to everybody. There was not a learned society in the city which did not elect him a member. Nay, the important position of custodian to the great library of the Vatican, with the prospect of a cardinal's hat, was offered him, on the sole condition that he should join the Catholic Church, which of course made him decline it. All the treasures of the various libraries and public institutions were placed at his disposal. These courtesies Leibnitz richly repaid. He exerted himself to reconcile the Church with Science, and to convince the Catholic clergy that the cause of religion and the progress of the natural sciences do not conflict with, but rather support, each other. With much zeal he pointed out the immense advantages which might be drawn from the cloisters, by employing the monks to gather astronomical, geological, philological, and other observations, and make experiments. He insisted that their piety would thus be increased, and that knowledge would advance more in ten than it had done in the past hundred years, if his plan were carried out. With missions established all over the globe, Leibnitz had hopes that a grand and comprehensive scientific organization might thus be realized. He arranged a permanent correspondence with the famous Jesuit missionary Grimaldi, who was then leaving Italy for China, pointing out to him the vast importance of a comparative study of languages, and particularly of the languages of Asia. For Grimaldi he also elaborated his science of Dyadics with 0 and 1, wherewith to prove to the Chinese the creation of the world out of nothing. His curious letter on the subject of this proof, accompanying a medal made for the emperor of China, is published in Erdmann's edition of his works.

From Rome, Leibnitz went to Naples, and thence to Florence, arriving at the close of the year at Modena, the real end of his travels, where he discovered, as he had expected, the connection between the German house of Brunswick and the

Italian house D'Este, and, moreover, assisted in arranging a marriage between the Duke of Modena and the Princess Charlotte of Brunswick-Wolfenbüttel. He returned to Hanover by way of Vienna, and shortly after his return was appointed custodian of the Wolfenbüttel Library, made famous in later days through Lessing. Of his many labors, during this period, he thus speaks, in a letter dated September, 1695.

"It is scarcely to be expressed how extraordinarily diversified my activity is. I hunt up various matters in the archives, and examine old papers, or collect unpublished manuscripts, with a view to gain more light for my history of the House of Brunswick. I receive and reply to a very large number of letters; and I have so many new things in mathematics, so many thoughts in philosophy, and so many other literary observations, which I would not like to see perish, that often I do not know what I ought to do first. It is twenty years since the French and English first saw my calculating-machine, and since then Oldenburg, Huygens, Arnaud, and others have frequently requested me to publish a description of it; yet I have always postponed doing so, because I had only a small model of the machine, sufficient for the demonstration of the mechanism, but not for common use. But above all things I should like to complete my Dynamics, wherein I believe I have discovered the true laws of material Nature, and by means of which I can solve problems concerning the activity of bodies, which previous rules are unable to solve. My friends, who have a knowledge of the higher geometry founded by me, urge me to publish my Science of the Infinite, which contains the basis of my new analysis. Add to this many general matters of invention. But all these labors, except the historical ones, I do by stealth, as it were: for you know that politicians seek and expect quite other things." In another letter on the same subject he closes with these memorable words: "If you consider all this well, you will doubtless pardon my neglect, and will wish that I had assistants, young men, and other friends of learning, talent, and industry, who might help me. For I can suggest many things, but I cannot myself carry out everything that suggests itself to me; and cheerfully would I leave this to others, if they could thereby obtain glory, pro-

vided it would serve the commonwealth, the welfare of the human race, and thus the glory of God."

Ernst August, who had in 1692 become Elector of Hanover, died in 1698; and although his successor, George,— future king of England,— retained Leibnitz in his position, the charm which the Hanoverian court had hitherto possessed for him was now gone. Under the new *régime* little interest was manifested in science or general culture. Leibnitz, therefore, gratefully accepted permission temporarily to follow his former pupil, the Princess Sophia Charlotte, to Berlin. Here he established the scientific society which has since grown into the famous university, and lent all his energies to assist in the development of the embryo kingdom. He showed much zeal in attempting to introduce the culture of silk, caused measures to be adopted for the more thorough study of medicine and anatomy, and with persevering energy urged the establishment of Protestant missions in China. He also spent much time to realize what even at this day seems an impossibility,— a social union of all learned men for the advancement of science,— each one to attend to a particular department, in order to insure thoroughness and systematic progress.

His *Projet de l'Éducation d'un Prince* was written about this time. In it he developed his ideas upon education, taking ground in opposition to the purely classical system then in vogue. "Time is life," says Leibnitz, in that most interesting work, alluding to the necessity of educating a prince in the practical sciences,— a significant variation of the maxim, "Time is money." He adds: "The great use of money is, that it enables us to gain time through the assistance of others," and by this addition, moreover, reverses the latter saying into "Money is time." On this subject of education he wrote thus to a friend who had urged him to lend his aid in behalf of the cause of education in Germany.

"Whenever I meditate upon the ways of promoting the general welfare, I always arrive at the same conclusion which you correctly hold, that the human race will perfect itself whenever the education of the young shall have been reformed. But this is not possible without the aid of those men who,

through their position, knowledge, and good-will, are prominent in a country. The Jesuits could have accomplished great things, particularly as their projects had the support of religion; but looking at their results to-day, we must confess that they remained below mediocrity. Amongst ourselves those who undertake similar efforts lack assistance, and their labors are treated with contempt. Nay, although there is nothing more important to religion and piety than education, still piety shows it no favor, and religion no reverence. I have often thought that a society might be formed by those who in different places exhibit zeal and knowledge. But mutual acquaintance and connection are wanting, and many who hold certain opinions demand that all others should indorse them. . . . . Thus, while they have the same end in view, they stand opposed to each other through a pitiable error; whereas, if they understood each other, most of their wishes could be realized."

In 1700 Leibnitz again went to Vienna, partly to negotiate some matters in connection with the establishment of the new kingdom of Prussia, and partly to make a further attempt to unite the Protestant and Catholic churches. He returned to Berlin at the end of the next year; and at that time made the acquaintance of his future great scholar, Wolff. In Berlin he began to feel the influence of English scepticism, which had already worked its way considerably into France, particularly through Bayle, the precursor of Voltaire, and was now beginning to take root also in Germany. To the comprehensive mind of Leibnitz the shallow reasoning of this scepticism could not be otherwise than repugnant. He felt called upon to combat it, and to vindicate the eternal truths of Christianity against the attacks of Locke and Bayle, as Kant defended them many years later against Hume and Voltaire. Leibnitz was not a one-sided partisan, however. He did full justice to the materialistic views of his adversaries. Their whole case could not be stated more fairly than he states it in the following passage.

"I have found that the majority of sects are in the right, as regards a good portion of what they assert, but not as regards what they deny. Thus the formalists, as the Platonists and

Aristotelians, are in the right when they find the origin of things in the final and formal causes; but they are wrong when they neglect the effective material causes, and conclude that there are appearances which cannot be mechanically explained. On the other hand, the materialists are wrong in rejecting all metaphysical studies, and in pretending to explain everything through the action of the imagination. I flatter myself that I have penetrated into the harmony of the various sciences, and have seen that both parties are in the right: *that everything in the appearances of Nature occurs at the same time both mechanically and metaphysically, but that metaphysics is the source of mechanics.* It was not easy to discover this mystery, for there are few who take pains to unite these two studies. Descartes did so, but not sufficiently. He had adventured too rashly in most of his dogmas, and it may be said that his philosophy stands in the antechamber of truth."

Leibnitz's public opposition to the materialistic tendencies of English empiricism was due to the solicitations of the queen of Prussia, who had been reading with him Locke's "Essay concerning Human Understanding," and Bayle's famous Dictionary. She incited him to reply to their arguments, and he was thus led to write his *Nouveaux Essais* and his *Théodicée*. The former work he did not finish before the death of Locke, and, with rare considerateness, refused to publish it, now that the man who was to have refuted it was dead; the latter has gained a celebrity even beyond that of the "Monadology." But the noble queen to whom he dedicated the *Théodicée* died soon after, in 1705, — "to see with my own eyes," as she said, "those things which I have so often discussed with Leibnitz." The death of the queen was a sore blow to him. He now busied himself more than ever with science, leaving no occasion neglected to advance its cause. Thus, when, in 1711, he met Peter the Great at Torgau, he induced that far-sighted monarch to have observations on the magnetic declination undertaken throughout his dominions, to found libraries and observatories, and to make common the latest useful inventions. Peter was so much interested in Leibnitz, that the next year he invited him to a second conference at Carlsbad, appointing him at the same time Councillor, with a considerable

pension. In 1716 Leibnitz met the Czar once more, "full of admiration," as he writes, "not only for the humanity, but also for the rich mass of knowledge and the quick judgment of this monarch."

In 1714 Leibnitz visited Vienna for the last time,— a visit which resulted in the most famous and complete of his works, — the "Monadology," — which he wrote for Prince Eugene, who held it so precious that he kept the manuscript in a locked box as a sacred relic. This "magnificent poem," as some Frenchman calls it not improperly, was Leibnitz's swan-song. Soon after it was finished, his master, the Elector George, who was then about to leave for England to assume the regal crown, ordered him to return home at once and attend to his official duties. Leibnitz had entertained hopes of accompanying his master, but the Elector was somewhat displeased with him, and did not respond favorably. Leibnitz arrived in Hanover too late for a personal interview. He therefore settled down quietly, took up his life-work, the History of the House of Brunswick, which he finished; and in the midst of some scientific labors, whereof he himself said, "Ce siècle n'est point fait pour les recevoir," death overtook him, on the 14th of November, 1716. Not a single courtier, not even a clergyman, no one but his friend Eckhard, followed him to the grave.

In passing from a review of the life of the man to his so-called "system," no better method of effectively representing what is characteristic of this system seems possible than to take up separately the distinguishing points upon which he has laid most stress in his writings. Among these stands foremost

The Principle of the Sufficient Ground. The significance of this principle is best explained by Leibnitz in his second letter to Clarke, where, alluding to Clarke's assertion that the doctrines of the materialists do much to support wickedness and infidelity, Leibnitz replies, that this cannot well be so, as long as the materialists remain logically within the limits of mathematical science, and do not contradict themselves by entering the field of speculation to prove speculation im-

possible. The materialists, he says, are not so much at fault in the mathematical principles of science, since these same principles are upheld by, and are valid for, Christian philosophers, as in the fact that they do not go beyond matter; whereas Christians assert a substance as the ground of matter. The materialists accept the existence of matter as manifested through the senses as an indisputable fact, and reject all further questioning concerning the ground of such matter. They are therefore worshippers of authority, and dogmatic, holding up, as they do, something incomprehensible as the ultimate of human knowledge. But true philosophy asks for the sufficient ground of matter, and in the course of its investigations discovers this ground to be the ego (or monad); and since the ego could not be an ego, if it could show a higher ground for itself, it is the "sufficient cause" for itself, and all inquiry for a higher cause is now cut off, not by the positing of an ultimate incomprehensible, but by establishing that the inquiry cannot at all be rationally put in the case of the ego, and hence by the same proof that establishes the ideality of time and space.

Leibnitz develops this in the above letter by the following statement. The fundamental principle of mathematics is the principle of contradiction or of identity, namely, that a proposition cannot be both false and true, and that, if A be A, it cannot be at the same time not-A. "This principle alone," he says, "is sufficient for the proof of arithmetic and geometry, or of all mathematical science. . . . . But in the higher region this principle does not suffice, as I have shown in my *Théodicée*. There we need another, namely, that of the sufficient ground, which must show why this is so, and not rather otherwise" (i. e. why A is A, and why it cannot be at the same time not-A). "Even Archimedes, therefore, when proceeding from mathematics to physics, establishes in his book *De Æquilibrio* a particular instance of the *principium convenientiæ*. He accepts as certain that the two arms of a scale, if exactly balanced, will be at rest, because there is no sufficient ground why one arm should fall below the other. Through this one principle of a sufficient ground, natural religion, or the science of metaphysics, proves a Divinity; nay,

in a certain manner, through it we confirm the first principles of the natural sciences, in so far as they are not based upon mathematics, — as, for instance, the doctrine of dynamics, or of the forces of motion."

Nowhere does the harmony of the philosophy of Leibnitz with Fichte's Science of Knowledge appear with greater clearness than in this letter. The very example of A = A and not-A not = A, is the one from which the Science of Knowledge proceeds, asking, as is proper, for its ground, and showing that ground to be, The ego posits itself, and posits at the same time a non-ego. The great obstacle which prevents the acceptance of this settlement, and therewith the recognition of the Science of Knowledge, is this, that every one asks again for *the sufficient ground of the self-positing of the ego.* But the inquiry is absurd, since the conception of the ego and the conception of self-positing are identical, and since, consequently, the inquiry demands, in point of fact, the sufficient ground why the ego should not be self-contradictory. This strict *reductio ad absurdum* Leibnitz applies everywhere to prove contested points, and Fichte has employed it in the same manner; yet such is the self-distrustful character of men, that they cannot content themselves with the independence of reason, but must go on and ask why reason should be independent, — by that very question thinking of it again as dependent.

The next most important principle of Leibnitz's system is his

Doctrine of Monads. To apprehend this famous doctrine correctly, it is necessary to remember that in all philosophical inquiries the question should be, not what this or that is, but how we must view it. Thus it will appear, that, precisely as in physical science we must view all matter as composed of infinitely small particles or molecules, so must we also view the ego as present everywhere, and in this omnipresence in space we must view it as an infinite space full of ego-points, or ego-atoms, limited by equally infinite atoms of matter. For the ego, being an infinite activity, or self-positing, posits itself everywhere. And since, in order to posit itself, it must limit itself, it posits not only itself, but also a limiting matter. In so far as it posits itself everywhere, it

posits all matter infinitely divisible or porous; in so far as it posits matter, it posits an infinite number of atoms. The conception of every possible point of concentration of the ego is the conception of a monad; and as thus all possible individual points of the ego differ only in position, it follows both that all must have the same world, and that each must be different from the others. For the ego is in every one altogether the same, and being nothing but the power of self-positing and whatsoever this self-positing involves, it in each one develops itself according to the same order and laws, an exhaustive representation of which laws results in a science of the ego or of knowledge. But the ego is likewise in every one of these monads determined differently, through the limit; and hence, in so far as every monad is not pure ego, but determined through a non-ego, it differs from every other. No two monads are alike in so far as they are determined through a non-ego; but they are all one and the same in so far as they are pure ego. In so far as they are pure ego, they posit the pure ego, and are thus equal; but in so far as through their "dark consciousness they posit matter, in order to arrive at clear consciousness through it," to use the words of Leibnitz, they are unequal.

Infinitely filling up all infinite space, and each monad self-active, that is, a motive power, there thus arises the conception of infinite directions of motion crossing each other, each, however, a direction in a straight line, and straying from it only in obedience to another direction.* The science of these motions is the science of mechanics, and explains the whole universe. Each monad is thus impelled by all other monads; and if each had complete self-consciousness of all the determinations which thus occur in it through motion, each would have a *complete* knowledge of the whole universe. But as each has clearest consciousness only of what happens up to its limit, that is, within its body, and more and more dim consciousness of motions which occur at greater distances from that body, — a dim consciousness which may be said to be the reason why the monad creates matter, — there arises that fa-

* Fichte also describes the ego as a power of line-drawing.

mous gradation of monads which extends from the lowest worm to the highest seraph. All possible monads (and every dust-speck is an infinity of monads, — and the distinction between organic and inorganic matter is wholly arbitrary, since the whole universe is one infinite mass of living beings) are distinct from each other as monads only in this greater or less degree of consciousness. There is no death in the universe, nor is there perfect creation, but everywhere development into self-consciousness and self-determination. There is no increase nor decrease of matter, nor is there any increase or decrease of force; for every infinite atom of matter, being a monad, has an infinite force or self-activity.

Force is never destroyed: for a monad cannot be destroyed: only its relation changes, and the whole interchange of forces is "like changing large money into small." There is only one force: for all monads are alike: but this force has greater or less degrees of movement, and through this difference of movement one force changes into an infinite number of correlated forces, and every monad becomes different from every other. From the conception of a self-active concentration-point,* moving and re-moving its self-posited limitation, — from this pure conception of a line-drawing ego, the whole structure of the universe explains itself, with its wonderful variety of motion, which motion changes according to this variety into heat, or electricity, or light, or tree, or stone, or sun, or star, or the nebulæ of Orion. In the concentration-point of the ego everywhere, in the mind of every man, the everlasting order of the stars moves on its course, and the history of the whole race accomplishes itself.

Not only does the quantity of force remain the same, however, but likewise the direction of that force, — a point which Descartes had overlooked, — and hence arises the third great principle of the

Pre-established Harmony. For if, in Nature, not only the sum of force and its manifestation, but likewise the sum of its

* It is interesting to compare Swedenborg's Natural Point in his *Principia* with Leibnitz's Monad, as also the Maximus Homo of his theological works with Leibnitz's Highest Monad, and his Law of Correspondence with Leibnitz's Pre-established Harmony.

directions, must be viewed as always remaining the same, only the sum of motion increasing and decreasing in mechanical order, it follows that every movement in Nature, in so far as it has a direction, may be viewed as purely the result of a mechanical force; and since it will be possible to trace it thus to a mechanical source, it will be impossible to prove it to be originated by the self-conscious soul. If every movement of and through our body can thus be explained as the result of the universal mechanical law of motion, clearly "our body operates as if there were no soul in it, and our soul as if there existed no body." Hence the possibility of a pure mathematical science of Nature, without reference to a God or soul as a power in Nature, and of an explanation of all possible phenomena upon mechanical principles.

But this would exclude all relations between the monads as such, that is, as concentration-points of the pure ego. No ego could ever become conscious of itself, if the movements of Nature could be explained altogether by the law of mechanics. The ego could not be for itself an ego, and, since it is ego only in so far as it is for itself, could not be at all. The question arises, How can the characteristic of intention or the conception of an end find expression in movements which can be comprehended at the same time as purely mechanical? And the answer is: Absolutely because it can. There is a *harmony* between the world of rational ends and mechanical changes in Nature which makes this possible; and this harmony is absolute, has no external ground. When a rational being sees a piece of material Nature which has been moulded for the expression of some rational end, that expression makes itself absolutely known to the beholder.* To ask how would be absurd; since, if you could assign a ground, you would be merely pushing a new link between reason and matter, without at all making the relation between reason and the new link clearer. Thus you might continue to ask for a further ground, and insert new links, without at all approaching nearer to the solution. On account of the absoluteness of this relation between mind and matter, Leibnitz usually terms it a harmony;

* Compare Fichte's Science of Rights.

and it is this harmony which shows how we must view the existence of a world of the pure ego within a world of pure mechanism. The world of mechanism "corresponds," as Swedenborg would express it, to the world of intelligence; or, in Fichte's terminology, the world of Nature can be comprehended *in its relation to the ego* only as a moral world.

The same principle which lies at the basis of the doctrine of a pre-established harmony fixes Leibnitz's exposition of freedom. Precisely as every change in Nature effected by reason may be viewed as the product both of moral reason and of mechanical Nature, so may every act of freedom be viewed as both free and determined. For the ego, in so far as it posits itself, posits itself as the absolute totality of all activity; and only in so far as it posits itself as limited does it posit this totality of activity as an infinite series of acts. It may view itself either way; both modes of viewing are merely different expressions of the same thing; and reason would not be reason, if it did not view everything in this double synthetical manner. The truth lies in neither view, but in comprehending that this duplicity of views is necessary for a rational being. Act, and you *are* free; but the moment you begin to reflect upon that act, in order to see whether it is an act of freedom, you subsume it under the laws of all reason. You manifest your freedom in one of the infinite series of acts; but when you begin to reflect, you find that you must also think it as determined by the totality. Without strictly scientific utterance, Leibnitz clearly enough points out this general synthesis of freedom and determinedness in all moral acts. "The fact," says he, "that God has, in being impelled by the highest cause to select amongst infinitely many orders of things and possible worlds such a one, wherein free creatures would frame such or such resolutions, although not without His assistance, most decidedly determined and fixed once and forever that order of things, by no means limits the freedom of those creatures; for this divine resolve changes nothing in their freedom, but only *makes visible their free nature*. . . . . In like manner it is no detraction from freedom, if a wise being, and more particularly God, the wisest, selects the best; since so to select is rather the highest freedom, and presupposes freedom. . . . .

Nor is it a contradiction of freedom to hold that our choice is always determined by motives; for these motives do not act upon the soul like weights in a scale; but it is rather the soul that acts through the motives. . . . . If the soul were to act in opposition to its strongest motive, it would act in opposition to itself, which is a contradiction." In other words, we may view the soul as acting under both absolute self-determination and impelling motives; the two are merely different views of the same act.

In like manner Leibnitz's pre-established harmony is the clew to his doctrine of God, perhaps the least clearly expounded part of his system. The harmony of the infinite series of monads must certainly have a ground, if each monad is to be regarded as an independent, absolute ego. But it is not so to be regarded; and hence, in our present exposition of it, we have stated the relation in this manner: The pure ego, in order to posit itself, must posit itself in an infinite number of ego-points, or monads. To ask now for a further ground of the pure ego, or of a harmony between the infinite series of ego-points, would be absurd and self-contradictory, since this ground is already posited in the pure absolute ego. Reason is self-sufficient, and cannot properly ask for any further ground of itself. But when each individual monad thinks the unity and harmony which unite all with it into one, it has the conception of a Divinity, of whom there can, therefore, be predicated no category of Being, — since all Being is the pure creation of the ego, — but merely categories of activity. The conception of God is, therefore, not properly that of the highest monad, although Leibnitz sometimes, for the sake of analogy, expresses it thus, but rather the conception of the totality of activity of all monads. It is the conception of the harmony, regularity, and wise arrangement of the monad universe, the conception of the totality of that universe of which each individual monad apprehends itself only as one of an infinite series. To the conception of this totality all monads are to elevate themselves, and sensuously to represent it upon this earth is more particularly the duty of mankind. In so far every man is an artist, and the process of turning the world of Nature into a world of reason is the great art-work

upon which humanity is engaged. To accomplish this, now that the science of eternal truths or of knowledge has been discovered, it is above all things necessary to gather facts and make experiments, in order to arrive also at a knowledge of the truths contained in these facts. Hence the incessant efforts which marked Leibnitz's life to establish academies, observatories, etc., and to collect empirical data on all possible subjects, in order by means of them to arrive at a knowledge of such truths. This is accomplished by arranging them in tables, and, in Leibnitz's phrase, "using them like logarithms." They must be combined, on the principle announced in *De Arte Combinatoria;* that is to say, they must be gathered into regular order, as we gather numbers into tens, hundreds, etc., and must thus, as it were, be harmonized in this regularity. The great object of mankind's art-work is, indeed, this elevation of all facts, data, objects, etc., into regular harmony, so that all of them shall ultimately combine in one unity. This clear, harmonic agreement and regularity are what fills us with æsthetical joy; and hence, in proportion as our knowledge of this harmony advances, our delight increases. Thus the true, the good, and the beautiful are one and the same; and to know is to be happy and to be good; and to be happy is to know and to be good; and to be good is to know and to be happy. Knowledge, goodness, and happiness can be equally traced back to order and regularity; and nothing proves more clearly that the mind of man is created in the image of God than this order and proportion of all things.

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