Eminent men are engaged today in a controversy regarding true and false ideas. Since this problem is of great importance for the knowledge of truth, and since even Descartes has not given an entirely satisfactory solution, I have thought it appropriate to explain briefly what I think must be said on the differences and the criteria of ideas and cognitions. All knowledge is either obscure or clear, and clear knowledge is again either confused or distinct; the distinct in its turn is either inadequate or adequate, and again either symbolic or intuitive. The most perfect knowledge is that which is both adequate and intuitive.

A notion is obscure when it does not suffice for the recognition of the represented thing. Thus, I may have a certain recollection of some flower or animal which I have seen once, yet this recollection may not suffice for me to recognize it when it is presented to me or to distinguish it from a flower or animal which resembles it closely. This is also the case when I consider some term insufficiently explained in the Schools, e.g., Aristotle’s Entelechy, or the term “cause,” which may equally well designate the material, the formal,
the efficient, and the final cause, and others of this kind of which we have no
precise definition. Hence any proposition which uses such a term also
becomes obscure. Knowledge is therefore clear when it suffices to let me rec-
ognize the represented thing; and such knowledge in its turn is either confused
or distinct. It is confused when I am unable to enumerate separately the marks
which are sufficient to distinguish this thing from others, although it actually
has such required elements and marks into which the notion of it can be
resolved. Thus we recognize with sufficient clearness colors, odors, tastes,
and other peculiar sense objects, and can distinguish them from each other,
but only through the simple testimony of the senses, not through describable
marks. We are, for instance, unable to explain to a blind man what redness is;
even to others we cannot explain such qualities unless we place them in the
presence of the thing itself and make them see, smell, or taste it, or unless we
recall to their minds certain similar sensations which they have experienced
in the past. Yet it is certain that the notions of these qualities are composite
and susceptible of being resolved, since each of these qualities has its cause.
Similarly we see that painters and other artists recognize perfectly well what
is well done and what is badly done, but are often unable to give reasons for
their judgment, and answer when questioned that in the work which dis-
pleses them a certain I-know-not-what is lacking. Now a distinct notion is
like the one which assayers have of gold, which enables them to distinguish
it from all other similar bodies by certain marks and tests. Such are, ordinar-
ily, the notions we have of objects common to several senses, such as number,
magnitude, and figure; such too are many affections of our minds, such as
hope and fear, and, in short, all those notions of which we have nominal def-
initions, which are nothing else but enumerations of sufficient marks. How-
ever, distinct cognition of undefinable notions is also possible, namely, when
the notion is primitive, that is, a mark of itself, or when it is irresolvable and
can only be understood through itself, hence lacks elements. With regard to
composite notions it may happen that the single notions which compose them
are in their turn clearly yet confusedly known, for instance, weight, color,
nitric acid, and other elements which constitute the notion of gold. This
knowledge, therefore, though distinct, is still inadequate. But when every-
thing which enters a distinct notion is in its turn distinctly known, that is,
when the analysis is pursued to the end, then the cognition is adequate. I
doubt whether man can give a perfect example of such knowledge; the
numeral concepts come very near it. For the most part, however, and particu-
larly when the analysis is long, we do not intuit simultaneously the whole
nature of the thing; rather, we use signs instead of things, and for brevity’s
sake usually omit explaining them in the present chain of thoughts, knowing or believing that to give the explanation is in our power. Thus, when I think of a chiliogon (a polygon of one thousand equal sides), I do not always consider the nature of a side, of equality, and of the number one thousand (that is, the cube of ten), but use these words (the sense of which is only obscurely and imperfectly present to the mind) instead of the ideas which I have of them. For I remember that I am in possession of the signification of these words, and therefore think it unnecessary to explain them now. I am wont to call this knowledge blind, or symbolic; we use it also in algebra and in arithmetic, and almost everywhere else. Certainly when the notion is highly composite, we are unable to think at the same time all the notions which enter into it. But where this is possible, or at least insofar as it is possible, I call the knowledge intuitive. Of a distinct and primitive notion no other knowledge is possible than the intuitive, just as for the most part we think of component notions only by means of symbols.

Hence it becomes evident that even of distinctly known things we do not perceive the ideas unless and insofar as we use intuitive cognition. Nevertheless, it sometimes happens that we falsely believe we have in our minds the ideas of things because we falsely suppose that we have already explained certain terms which we are using. And it is certainly untrue or at least equivocal what certain authors affirm: that we cannot speak of a thing, understanding what we are saying, unless we have an idea of that thing. For frequently we understand very well each of the words we are using or we remember having understood them before; yet because we content ourselves with this blind knowledge and do not pursue far enough the analysis of the notions, it happens that a contradiction which may be implied in the composite notion escapes us. Some time ago I was moved to a closer examination of this question by the argument, long famous among the Schoolmen and renewed by Descartes, which proves the existence of God by this syllogism: Whatever follows from the idea or definition of a thing may be predicated of the thing itself. Now, existence follows from the idea of God, since he is defined as the most perfect being or the being than which no greater can be conceived. (For the most perfect being implies all the perfections, among which belongs existence.) Ergo, existence can be predicated of God. But in truth it ought to be realized that from this argument only the following conclusion can be drawn: If God be possible, it follows that he exists. For we cannot use definitions to draw conclusions with certainty before we know that the definitions are real, that is, that they involve no contradiction. The reason for this is that from notions implying a contradiction, opposite con-
clusions can simultaneously be drawn, which is absurd. To explain this I usually avail myself, as an example, of the notion of the most rapid motion, which implies an absurdity. For suppose that a wheel turns with that most rapid motion; who would not see that a spoke of that wheel extended beyond the rim will at its extremity move with greater velocity than a nail on the circumference of the wheel? Therefore, the movement of this nail is not the most rapid, which contradicts the hypothesis. Yet at first sight it may appear that we do have an idea of the most rapid motion, for we understand thoroughly what we are speaking about, while of impossible things we possess absolutely no idea. For the same reasons it does not suffice to think of the most perfect Being in order to affirm that we have an idea of it. In the demonstration referred to above, the possibility of this Being must be proved or assumed to make the conclusion valid. Meanwhile, it is very true that we have the idea of God and that the most perfect Being is possible, nay necessary. The alleged argument, however, is not conclusive, and St. Thomas Aquinas had already rejected it.

By this means we also obtain the distinction between nominal definitions, which contain only marks to distinguish the defined things from others, and real definitions, by which the possibility of the defined notion is established. Thus we take care of Hobbes, who pretended that all truths are arbitrary, because they depend on nominal definitions. He did not consider, however, that the reality of a definition does not depend upon us and that not any notions whatever can be combined together. It is true that nominal definitions do not suffice for perfect knowledge unless it is established otherwise that the defined thing is possible. It is also evident therefrom which ideas are true and which false. An idea is true when the notion is possible and false when it involves contradiction. Possibility can be known either a priori or a posteriori; it is known a priori when we resolve the notion into its requisites or into other notions the possibility of which is already established, and when we find in it no incompatibility. This can be done, for instance, when we understand the way in which the thing is produced—hence the particularly great usefulness of causal definitions. We know the possibility a posteriori when we know by experience that the thing actually exists; for whatever actually exists or has existed is certainly possible. Whenever, then, we have adequate knowledge, we have also a priori knowledge of a possibility. For when the analysis is pursued to its end and no contradiction appears, the notion is certainly possible. However, I would not yet dare to affirm that it will ever be possible for men to perform a perfect analysis of notions, that is, to reduce their thoughts to the first possibles and irresolvable notions or, which comes to the same, to the
absolute attributes of God themselves, which are the first causes and ultimate reasons of all things. For the most part we content ourselves with gathering the reality of certain notions from experience and compounding them afterward into others, following the example of nature.

Hence I think it can be understood at last that the appeal to ideas is not always without danger and that many authors abuse this specious title to give some weight to certain products of their imaginations. For from the fact that we are conscious of thinking of something it does not follow that we have an idea of that thing, as I have shown above by the example of the motion of maximum velocity. It seems to me also that in our days men abuse no less frequently that often affirmed principle: whatever I perceive clearly and distinctly of a thing is true and can be predicated of it. For frequently what appears to be clear and distinct to people who judge superficially is actually obscure and confused. The axiom is therefore useless, unless we add criteria of clearness and distinctness, as we have proposed them, and unless the truth of the ideas is established with certainty. For the rest, the rules of common logic—rules which are also used by the geometricians—should not be neglected as criteria for the truth of propositions. Such, for instance, is the rule that nothing ought to be admitted as certain unless proved by accurate experiment or solid demonstration. A solid demonstration is one which respects the forms prescribed by logic. It is not always necessary to argue in the classical order of syllogisms as the Schoolmen did. . . . But it is necessary at least that the argument conclude by virtue of the form. Of such an argument in good form, any calculation correctly carried out offers an example. Thus, no necessary premise is to be omitted, and all premises must be either demonstrated beforehand or only assumed as hypotheses, in which case the conclusion also is hypothetical. If these rules are carefully observed, we shall easily avoid deceitful ideas. In his very famous dissertation on the geometrical spirit (of which a fragment is preserved in the excellent book on the art of thinking whose author is the great Antoine Arnauld), the very ingenuous Pascal has expressed much the same thing, saying that the geometrician should define all terms which are however little obscure and demonstrate all truths however little doubtful. But I wish he had defined the limits beyond which a notion or proposition is no longer however little obscure or doubtful. The necessary requisites may, however, be gathered by an attentive study of what we have said in the present essay.

• • •

ON THE UNIVERSAL SCIENCE: CHARACTERISTIC
All our certain knowledge is established through \textit{demonstrations} or through \textit{experiments}. In both, reason dominates. For the very \textit{art of inventing experiments} and of using them rests on certain reasons; it does not depend upon chance or accident.

Let us at present disregard experiments, which require the expenditure of money, equipment, and time, and are furthered by chance, and let us concentrate on that \textit{improvement of the sciences} which is \textit{based on reason}.

The advancement of the rational art of invention depends, to a large extent, upon the improvement of the art of characteristic symbols. Usually men seek demonstrative certainty only regarding numbers, lines, and the things thereby represented. The reason for this limitation is that, apart from numbers, we have no other \textit{convenient characteristic symbols which correspond to concepts}. This is also the reason why, up to now, not even geometry has been treated analytically, except insofar as it can be reduced to numbers by algebraic analysis, in which numbers in general are designated by letters. There exists, however, a \textit{higher geometrical analysis} using its own characteristic symbols, which operates much more elegantly and compendiously; specimens are in my possession.

That demonstrations also exist outside the field of magnitude may be evidenced by \textit{formal logic}. . . . The Platonists and the Aristotelians have said certain things which could without difficulty be rendered in demonstrative form. If we had some exact \textit{language} or at least a kind of \textit{truly philosophic writing}, in which the ideas were reduced to a kind of \textit{alphabet of human thought}, then all that follows rationally from what is given could be found by a \textit{kind of calculus}, just as arithmetical or geometrical problems are solved. . . .

I suspected something of such a great discovery when I was still a boy, and I inserted a description of it in the little book on the \textit{Combinatory Art} which I published in my adolescence.

I can demonstrate with geometrical rigor that such a language is possible, indeed that its foundation can be easily laid within a few years by a number of cooperating scholars.

The study of mathematical analysis provided me with the most genuine and elegant compendium of this \textit{general analysis of human ideas}. I pursued this study so intensely that I doubt whether many contemporaries have invested more work in the same pursuit.

Those who thoroughly delight in such studies will agree that I was the first to clarify certain recondite mathematical problems to the satisfaction of the most eminent mathematicians.
For the Euclidian axioms and theorems concerning magnitudes and proportions I substituted others of much greater importance and more general use, concerning coincidence, congruence, similitude, determinants, cause and effect, i.e., power, relations in general, containing and content, spontaneous and accidental events, the general nature of substance, the perfect spontaneity of substances and the impossibility of their generation and destruction, and concerning the union of all things and the mutual harmony of all substances. Based on these considerations, I also was able to elucidate the mystery of the union of soul and body, the way substances operate, the concurrence of God, the reconciliation of the cause of evil with human freedom and with providence, and the certainty and determinate truth of contingents. I also substituted metamorphosis for metempsychosis.

In my demonstrations I use two principles. The first is this: What implies contradiction is false. The other is: Reasons can be given for any truth (which is not immediate or identical); that is, the predicate concept always inheres in its subject concept, either explicitly or implicitly. This holds true equally in extrinsic and in intrinsic denominations, in contingent and in necessary truths.

The difference between necessary and contingent truths is indeed the same as that between commensurable and incommensurable numbers. For just as commensurable numbers can be resolved into common factors, so necessary truths can be demonstrated, that is, reduced to identical propositions. Moreover: in surd (irrational) ratios the resolution proceeds in infinitum and a common measure cannot be attained; yet a certain series is obtained, though it be endless. Analogously, contingent truths require an infinite analysis which can be performed only by God, so that He alone can know them a priori and with certainty. For although the present state can always be explained by the preceding, this preceding state can again be explained, so that the ultimate reason is not reached within the series. Thus this unending process itself takes the place of a reason. It could be understood at the very outset that the true reason for the whole series lies outside of it, in God, the author of the universe, upon whom earlier and later states equally depend, more than they depend on each other. Hence, any truth which is not susceptible of analysis and cannot be demonstrated by reason, but receives its ultimate reason and certainty from the divine mind alone, is not a necessary truth. All the truths of this kind I call truths of fact. This is the root of contingency, and so far as I know, no one has hitherto explained it. . . .

To come back to the representations of ideas by characters: I think that controversies will never end nor silence be imposed upon the sects, unless
complicated reasonings can be reduced to simple calculations, and words of vague and uncertain meaning to determinate characters.

What must be achieved is in fact this: that every paralogism be recognized as an error of calculation, and that every sophism, when expressed in this new kind of notation, appear as a solecism or barbarism, to be corrected easily by the laws of this philosophical grammar.

Once this is done, then when a controversy arises, disputation will no more be needed between two philosophers than between two computers. It will suffice that, pen in hand, they sit down to their abacus and (calling in a friend, if they so wish) say to each other: let us calculate. . . .

Even after this restriction, some may believe that this art will be of very little use in any matters which require conjecture, such as in research in political or natural history, in the art of assessing products of nature or persons, hence, in community life, medicine, law, military matters, and the government of the state. To this I reply: as far as reason is competent in these matters (and it is highly competent), so far goes the competence of this art, if not much further. For this art is nothing but the supreme elevation of reason and, through the introduction of symbols and signs, the most compendious use to which human reason can be put.

Therefore, we shall be able to reach a conclusion with the help of this analysis, when without it the result has not been determined by the data or cannot be expressed. In such cases we shall either attain an infinite approximation or, when conjectures have to be made, we shall determine by demonstrative reason the degree of probability which can be drawn from the data. We shall also know how the given circumstances must be represented by ratios and be stated like an account of receipts and expenses, so that we can decide in favor of what is most in agreement with reason. Though we may sometimes fail in this procedure—just as happens to masters in the game of dice, in which there is an admixture of reason—we shall nevertheless be acting rationally, and for the most part attain what we wish; it is the same with good gamblers and makers of their own good luck—those who, as a proverb says, are sought out by dice and the like. We judge, moreover, that this procedure is not only more likely to succeed, but also more secure, and we shall be prepared, if necessary, to purchase the hope of this success at the price of some risk. Nothing better can be expected from human reason. Therefore I am particularly interested in that part of logic, hitherto hardly touched, which investigates the estimation of degrees of probability and the weight of proofs, suppositions, conjectures, and criteria. I am also able to show that, in general calculus no less than in the numerical, tests or criteria of truth can be invented,
which correspond to casting out nines and other similar proofs; indeed, I have already carried this proof from the common numbers to algebra.

... All human reasoning uses certain signs or characters. Neither the things themselves nor the ideas of the things can always be distinctly present to the mind, nor is this necessary. For the sake of abridgment, signs are therefore substituted for them. For if the geometrician, whenever he refers in his demonstrations to hyperbolas, spirals, or quadratrices, were always forced to have before his mind the exact definitions and constructions of these curves and again the definitions of the terms used therein, he would be very much delayed in new discoveries. And if the arithmetician should, amidst his calculations, be continually thinking of the value of all the signs and symbols he writes down and of the multitude of units represented, he would never be able to complete long calculations—any more than he could handle as many little stones. Even a lawyer, thinking of claims or exceptions or legal privileges, is often unable to run through all their details and essential requirements mentally, nor is it necessary to do so. As a consequence, names have been assigned to contracts, figures, and various other kinds of things, signs to numbers in arithmetic, to magnitudes in algebra. Thus, whatever has been discovered about those objects through experience or reasoning can also receive a sign, which can thereafter be firmly conjoined with the sign standing for the object. Under the term sign I comprehend words, letters; chemical, astronomical, and Chinese figures; hieroglyphs; musical, cryptographic, arithmetic, algebraic notations; and all other symbols which in our thoughts we use for the signified things. When the signs are written, drawn, or carved, they are called characters. They are the more useful, the more they express the concept of the signified thing, so that they can serve not only for representation, but also for reasoning.

The natural languages are of very great value in reasoning, but full of innumerable equivocations and unable to function in a calculus: for if they were able to do this, errors in reasoning could be uncovered from the very form and construction of the words, namely, as solecisms and barbarisms. Hitherto only the arithmetical and the algebraic notations have offered this admirable advantage. For in these fields all reasoning consists in the use of characters, and a mental error and an error of calculation are identical.

Having pondered this matter more deeply, it became clear to me long ago that all human ideas (cognitiones) can be resolved into a few as their primitives (primitivas). If characters were assigned to these primitives, char-
acters for derivative notions could be formed therefrom, and from these it would always be possible to discover the primitive notions (notiones primitivae) which are necessary ingredients; in short, it would be possible to find correct definitions and values and, hence, also the properties which are demonstrably implied in the definitions. Once this is achieved, anyone who in his reasoning and writing is using characters of this kind, will either never fall into error or, if he does, he will always discover his errors himself by the simplest examinations, as anybody else will; and, moreover, he will find the truth which is implied in the available data.

This characteristic art, of which I conceived the idea, would contain the true organon of a general science of everything that is subject matter for human reasoning, but would be endowed throughout with the demonstrations of an evident calculus. It will therefore be necessary to present our characteristic art itself, that is, the art of using signs in a kind of rigorous calculus, as generally as possible. Since no definition result has yet been reached as to the way these signs must be formed, we shall meanwhile follow the example of mathematics for their future formation, and use the letters of the alphabet, or any other arbitrary notation which in the course of our progress will suggest itself as most convenient. Thus, too, the order of the sciences to be treated with the characteristic method will become clear; and it will be evident that elementary arithmetic precedes, and is simpler than, the elements of the logical calculus dealing with the figures and modes of reasoning.

• • •

MONADOLOGY

1. The object of this discourse, the monad, is nothing else than a simple substance, which enters into the composites; simple meaning, which has no parts.

2. And there must be simple substances, since there are composites; for the composite is nothing else than an accumulation or aggregate of the simples.

3. But where there are no parts, neither extension, nor figure, nor divisibility is possible. Thus, these monads are the veritable atoms of nature, and, in one word, the elements of all things.

4. Hence no dissolution is to be feared for them, and a simple substance cannot perish naturally in any conceivable manner.

5. For the same reason, no simple substance can come into being naturally, since it cannot be formed by composition.
6. Thus it may be maintained that monads cannot begin or end otherwise than instantaneously, that is, they can begin only by creation, and end only by annihilation; while what is complete begins and ends through and in its parts.

7. It is impossible also to explain how a monad can be altered, that is, internally changed, by any other creature. For there is nothing in it which might be transposed, nor can there be conceived in it any internal movement which could be excited, directed, or diminished. In composites this is possible, since the parts can interchange place. The monads have no windows through which anything could come in or go out.

8. Nevertheless, the monads must have some qualities, otherwise they would not even be beings. And if the simple substances did not differ through their qualities, there would be no means at all of perceiving any change in things. For what is in the composites can come only from the ingredient simples. So the monads, if they were without qualities, would be indistinguishable the one from the other, since they do not differ in quantity either. The plenum being presupposed, no space, consequently, could ever receive through movement anything but the equivalent of what has been in it, and one state of things would be indiscernible from another.

9. Each monad must even be different from every other. For in nature there are never two beings which are perfectly like one another, and between which it would not be possible to find an internal difference, that is, a difference founded on an intrinsic denomination.

10. I take it also for granted that all created beings, consequently the created monads as well, are subject to change, and that this change is even continual in each one.

11. In consequence of what has been said, the natural changes of the monads must result from an internal principle, since no external cause could influence their interior.

12. But besides the principle of change, there must be a particular trait of what is changing, which produces, so to speak, the specification and variety of the simple substances.

13. This particular must comprehend a multiplicity in the unity, that is, in the simple. For since all natural change proceeds by degrees, something changes and something remains. Consequently, there must be in the simple substance a plurality of affections and relations, though it has no parts.

14. The passing state which comprehends and represents a multiplicity in the unity or simple substance is nothing but what is called perception; it must be clearly distinguished from apperception or consciousness, as will become clear later on. On this point the Cartesian doctrine has been very
defective, since it has entirely neglected those perceptions which are not apperceived; the same failure to distinguish has made the Cartesians believe that only spirits are monads, and that there are neither animal souls nor other entelechies. Therefore, they, like the unlearned, have confused a long swoon with death, strictly speaking, and yielded to the scholastic prejudice that there are entirely separated souls. The same error has even confirmed unsound minds in the opinion that souls are mortal.

15. The action of the internal principle which produces change, that is, the passage from one perception to another, may be called appetition. It is true that appetition may not always entirely attain the whole perception toward which it tends, but it always obtains something and arrives at new perceptions.

16. We ourselves experience a multiplicity in the simple substance, when we observe that the least thought which we apperceive in ourselves comprehends a variety in its object. Thus, all those who recognize that the soul is a simple substance must recognize this multiplicity in the monad. . . .

17. Moreover, it must be avowed that perception and what depends upon it cannot possibly be explained by mechanical reasons, that is, by figure and movement. Suppose that there be a machine, the structure of which produces thinking, feeling, and perceiving; imagine this machine enlarged but preserving the same proportions, so that you could enter it as if it were a mill. This being supposed, you might visit its inside; but what would you observe there? Nothing but parts which push and move each other, and never anything that could explain perception. This explanation must therefore be sought in the simple substance, not in the composite, that is, in the machine. However, there is nothing else to be found in the simple substance but perceptions and their changes. In this alone can consist all the internal actions of simple substances.

18. The name entelechies would fit all the simple substances or created monads. For they have in themselves a certain perfection . . . [echousi to enteles], and they are endowed with a self-sufficiency . . . [autarkeia] which makes them the sources of their own actions and, so to speak, incorporeal automata.

19. If we want to call soul all that has perception and appetition, in the general sense explained above, we might give the name soul to all simple substances or created monads. But since sensation is something more than a simple perception, I agree that the general name monad or entelechy may suffice for those simple substances which have nothing but perception and appetition; the name souls may then be reserved for those having perception that is more distinct and is accompanied by memory.
20. Indeed, we experience in ourselves a state in which we remember nothing and have no distinct perception at all, e.g., when we faint or are overcome by a deep and dreamless sleep. In this state the soul is not noticeably different from a simple monad. However, since this state does not last, the soul being able to pull itself out of it, the soul is more than a simple monad.

21. Besides, it does not follow at all that in such a state the simple substance entirely lacks perception. For the reasons propounded a while ago, this lack is not possible; for the monad cannot perish, nor can it subsist without some affection, which is nothing but its perception. But when there is a great multitude of minute perceptions lacking distinctness, one becomes dizzy: for example, when you turn around several consecutive times, you get a vertigo which may make you faint and leave you without any distinct perception. Death may throw animals into such a state for a time.

22. The present state of a simple substance is the natural result of its precedent state, so much so that the present is pregnant with the future.

23. Therefore, since on awakening from such a swoon, you apperceive your perceptions, it follows that you must have had some perceptions immediately before, though you did not apperceive them. For a perception cannot come naturally except from another perception, just as movement cannot come naturally except from another movement.

24. Hence it is evident that if in our perceptions there were nothing distinct nor anything, so to speak, in relief and of a more marked taste, we would always be in a swoon. And that is the state of the mere naked monads.

25. We see indeed that nature has given distinct perceptions to the animals, for care has been taken to provide them with organs which collect several light rays or several air waves, to unite them and thereby give them greater effect. Something similar occurs in scent, taste, and touch, and perhaps in many other senses unknown to us. I shall explain soon how what occurs in the soul represents what occurs in the sense organs.

26. Memory provides the souls with a sort of consistency which imitates reason but has to be distinguished from it. For we see that animals, perceiving something which impresses them and of which they have previously had a resembling perception, are brought by the representation of their memory to expect what has been associated with this perception in the past and are moved to feelings similar to those they had then. If you show a stick to a dog, for instance, it remembers the pain caused by it and howls or runs away.

27. The vividness of the imagination which strikes and moves animals comes from either the strength or the frequency of preceding perceptions.
For often one strong impression produces at once the effect of a long habit or of many reiterated impressions of minor strength.

28. Men act like animals in so far as the succession of their perceptions is brought about by the principle of memory. In this they resemble medical empiricists whose practice is not backed by theory. In fact, we are mere empiricists in three quarters of all our actions. If you expect, for instance, that the sun will rise tomorrow because up to now it has always happened, you act as an empiricist. The astronomer alone judges by reason.

29. Knowledge of necessary and eternal truths, however, distinguishes us from mere animals and grants us reason and the sciences, elevating us to the knowledge of ourselves and of God. This possession is what is called our reasonable soul or spirit.

30. By this knowledge of necessary truths and by the abstractions made possible through them, we also are raised to acts of reflection which enable us to think of the so-called self and to consider this or that to be in us. Thinking thus about ourselves, we think of being, substance, the simple and the composite, the immaterial, and even of God, conceiving what is limited in us as without limit in him. These acts of reflection furnish the principal objects of our reasoning.

31. Our reasoning is founded on two great principles: The first is the principle of contradiction, by virtue of which we consider as false what implies a contradiction and as true what is the opposite of the contradictory or false.

32. The second is the principle of sufficient reason, by virtue of which we hold that no fact can be true or existing and no statement truthful without a sufficient reason for its being so and not different; albeit these reasons most frequently must remain unknown to us.

33. There are also two kinds of truths: those of reason, which are necessary and of which the opposite is impossible, and those of fact, which are contingent and of which the opposite is possible. When a truth is necessary, the reasons for it can be found through analysis, that is, by resolving it into simpler ideas and truths until one comes to primitives.

34. Thus the mathematicians, using the analytical method, reduce the speculative theorems and the practical canons to definitions, axioms, and postulates.

35. In the end, there are simple ideas of which no definition can be given. Moreover, there are axioms and postulates, in short, primitive principles, which cannot be demonstrated and do not need demonstration. They are identical propositions, the opposite of which contains an express contradiction.
36. A sufficient reason, however, must also exist for contingent truths or truths of fact, that is, for the series of things comprehended in the universe of creatures. Here the resolution into particular reasons could be continued without limit; for the variety of natural things is immense, and bodies are infinitely divided. There is an infinity of figures and movements, past and present, which contribute to the efficient cause of my presently writing this. And there is an infinity of minute inclinations and dispositions of my soul, which contribute to the final cause of my writing.

37. Now, all of this detail implies previous or more particular contingents, each of which again stands in need of a similar analysis to be accounted for, so that nothing is gained by such an analysis. The sufficient or ultimate reason must therefore exist outside the succession or series of contingent particulars, infinite though this series may be.

38. Consequently, the ultimate reason of all things must subsist in a necessary substance, in which all particular changes may exist only virtually as in its source: this substance is what we call God.

39. Now, this substance is the sufficient reason for all this particular existence which is, moreover, interconnected throughout. Hence, there is but on God, and this God suffices.

40. This Supreme Substance is unique, universal, and necessary. There is nothing existing apart from it which would be independent of it, and the existence of this being is a simple consequence of its possibility. It follows that this substance does not admit of any limitation and must contain as much reality as possible.

41. God, therefore, is absolutely perfect, perfection meaning the quantity of positive reality. In things which have limits, that is, in finite things, this perfection has to be strictly interpreted, namely as the quantity of positive reality within their given limits. But where there are no limits, namely in God, perfection is absolutely infinite.

42. It follows that creatures owe their perfection to the divine influence, but their imperfections to their proper nature, which is incapable of being without limits. For it is in this that they are distinguished from God. The created things’ original imperfection manifests itself through the natural inertia of all bodies.

43. Moreover, it is true that in God is the source not only of all existence, but also of all essence endowed with reality, that is, the source of what is real in the possibles. For the divine understanding is the region of the eternal truths and of the ideas on which they depend, and without him there would
not be anything real in the possibles; that is, without him there would not only be nothing existing, but even nothing possible.

44. Indeed, if there is to be any reality in the essences or possibles, that is, in the necessary truths, this reality must be founded on the existence of the necessary being whose essence implies its existence, that is, to which it suffices to be possible in order to be actual.

45. Thus God alone (or the necessary being) has the privilege of existing necessarily, provided only he be possible. Now, since nothing can hinder the possibility of the substance which contains no limits, no negation, and hence no contradiction, this provides a sufficient reason for the knowledge a priori of God’s existence. Besides, we have proved it by the reality of the eternal truths. In addition, we also have proved this existence a posteriori by the existence of contingent beings. For the sufficient and ultimate reason of these can lie only in the necessary being which has in itself the reason of its existence.

46. It must not be imagined, however, as certain authors have imagined, that since the eternal truths depend upon God, they are arbitrary and depend upon his will. Descartes seems to have thought so . . . This is true only of the contingent truths which are based on the principle of fitness, that is, the choice of the best possible; while the necessary truths depend only on his understanding, of which they are the internal object.

47. Thus God is the only primitive unit or the only original simple substance, of which all the created or derivative monads are the products, born, so to speak, every moment by continual fulgurations from the divinity, and limited by the capacities of creatures, to which limitation is essential.

48. In God, there are his power which is the source of everything, his knowledge which contains the particulars of the ideas, and finally his will which is the source of change or production and acts according to the principle of the best possible. Corresponding to these divine attributes, there is in the created monads the subject or basis, namely, the faculty of perception and the faculty of appetition. In God, however, these attributes are absolutely infinite and perfect, whereas in the created monads or entelechies . . . these attributes are only likenesses, possessed by the monads in proportion to their perfections.

49. Creatures are said to act outwardly in so far as they have perfection, and to suffer from other creatures in so far as they are imperfect. Thus activity has to be attributed to the monad in so far as it has distinct perceptions, and passivity in so far as it has confused perceptions.
50. One creature is more perfect than another, in so far as there is found in the former a reason to account a priori for what is happening in the latter; this is why one says that the former acts upon the latter.

51. But in the simple substances this influence of one monad upon the other is but ideal and can take effect only through the intervention of God; in the ideas of God, indeed, any monad reasonably requires that in his ruling of all others, God, from the beginning, take that monad into consideration. For since no created monad can exercise a physical influence upon the interior of any other, this is the only means by which the one can depend upon the other.

52. By this means actions and passions among creatures are mutual. For when God compares two simple substances, he finds in either one reasons which oblige him to adjust the other to it. What appears as active in certain respects, consequently appears as passive from another point of view: it appears as active in so far as what is distinctly known in one monad serves to account for what happens in another; it appears as passive in so far as the reason for what happens in it is to be found in what is distinctly known in another.

53. Now, since in the divine ideas there is an infinity of possible universes of which only one can exist, the choice made by God must have a sufficient reason which determines him to the one rather than to another.

54. This reason can be found only in fitness, that is, in the degree of perfection contained in these worlds. For each possible has a right to claim existence in proportion to the perfection it involves. Thus nothing is entirely arbitrary.

55. This is the cause for the existence of the best, which is disclosed to him by his wisdom, determines his choice by his goodness, and is produced by his power.

56. This connection of all created things with every single one of them and their adaptation to every single one, as well as the connection and adaptation of every single thing to all others, has the result that every single substance stands in relations which express all the others. Whence every single substance is a perpetual living mirror of the universe.

57. Just as the same city regarded from different sides offers quite different aspects, and thus appears multiplied by the perspective, so it also happens that the infinite multitude of simple substances creates the appearance of as many different universes. Yet they are but perspectives of a single universe, varied according to the points of view, which differ in each monad.
58. This is the means of obtaining the greatest possible variety, together with the greatest possible order; in other words, it is the means of obtaining as much perfection as possible.

59. Only by this hypothesis (which I dare to call demonstrated) can the greatness of God be exalted as it ought to be. . . . In that passage he was inclined to believe that I attributed to God too much, and even more than is possible. But he was unable to adduce any reason why this universal harmony, due to which every substance exactly expresses all the others through the relations it has with them, should be impossible.

60. In what I have just stated, there can also be discerned reasons a priori why things could not be different. For God, legislating the whole, has considered every part and particularly every monad. And since the nature of every monad is representative, there is nothing which could limit it to representing only a part of all things. It is true, however, that this representation is but confused concerning the particulars of the whole universe and can be distinct concerning only a small part of all things, namely those which are either the nearest or the largest in respect to each of the monads. For otherwise every monad would be a deity. It is not in the objects of their knowledge, but in the modes of this knowledge of the infinite, that is, of the whole; but they are limited and distinguished by the degrees of distinct perception.

61. The composite substances are in this respect symbols of the simples. For since all is a plenum, all matter is connected and all movement in the plenum produces some effect on the distant bodies, in proportion to the distance. Hence every body is affected not only by those with which it is in contact, and thus feels in some way everything that happens to them; but through them it also feels those that touch the ones with which it is in immediate contact. Hence it follows that this communication extends over any distance whatever. Consequently, every body experiences everything that goes on in the universe, so much so that he who sees everything might read in any body what is happening anywhere, and even what has happened or will happen. He would be able to observe in the present what is remote in both time and space: . . . [sumpnoia panta], as Hippocrates stated. A soul, however, can read in itself only what is distinctively represented in it; it is unable to unfold all at once all its folds; for these go on into infinity.

62. Thus, every created monad represents the whole universe; nevertheless, it represents more distinctly the body which is particularly attached to it and of which it is the entelechy. And since this body expresses the whole universe through the interconnection of all the matter in the plenum, the soul,
too, represents the whole universe by representing this body which in a particular manner belongs to it.

63. The body belonging to a monad which is its entelechy or its soul constitutes, together with this entelechy, what may be called a living unit, and together with this soul what may be called an animal. This body of a living being or of an animal is always an organism. For since every monad is, in its way, a mirror of the universe, and since the universe is ruled in a perfect order, there must also be an order in the representing, that is, in the perceptions of the soul, and consequently the body. The representation of the universe in the body evinces this order.

64. Thus every body of a living being is a sort of divine machine or natural automaton, which infinitely surpasses all artificial automata. For a machine made by human art is not a machine in all its parts. The cog on a brass wheel, for instance, has parts or fragments which for us are no longer artificial things, and are no longer proper to the machine with respect to the purpose for which the wheel was designed. The machines of nature (namely, the living bodies) are, on the contrary, machines even in their smallest parts without any limit. Herein lies the difference between nature and art, that is, between divine and human art.

65. The author of nature, indeed, has been able to practice this divine and infinitely marvelous art because any portion of matter is not only infinitely divisible, as the ancients recognized, but also actually subdivided ad infinitum: every part having parts each of which has its own particular movement. For otherwise it would be impossible for every portion of matter to express the whole universe.

66. Hence it can be seen that in the smallest portion of matter there is a world of creatures, living beings, animals, entelechies, and souls.

67. Thus every portion of matter can be conceived as a garden full of plants or as a pond full of fish. But every branch of the plant, every limb of the animal, every drop of its humors, is again such a garden or such a pond.

68. And though the soil and the air in the intervals between the plants of the garden is not a plant, nor the water between the fishes a fish, yet these intervals contain again plants or fishes. But these living beings most frequently are so minute that they remain imperceptible to us.

69. Thus there is nothing uncultured, sterile or dead in the universe, no chaos, no disorder, though this may be what appears. It would be about the same time with a pond seen from a distance: you would perceive a confused movement, a squirming of fishes, if I may say so, without discerning the single fish.
70. Hence it becomes clear that every living body has a dominant entelechy which in an animal is its soul. But the limbs of this living body are full of other living beings, plants or animals, each of which again has its entelechy or its dominant soul.

71. But you must not imagine—like some authors who have misinterpreted my thought—that each soul has a mass or portion of matter forever belonging or attached to it and that, consequently, it owns other living, though inferior, beings forever destined to serve it. For all bodies are, like rivers, in a perpetual flux; small parts enter and leave them continually.

72. Thus the soul changes its body bit by bit, and by degrees, so that it never is deprived all at once of all its organs; in animals there is frequently metamorphosis. Never, however, is there metempsychosis nor transmigration of souls. Nor are there any totally separate souls, nor genii without body. God alone is entirely bodiless.

73. This also proves that, strictly speaking, there never is either complete generation or perfect death, which would consist in the separation of the soul. What we call generation consists in developments and growths, just as what we call death consists in involutions and diminutions.

74. Philosophers formerly have been very perplexed concerning the origin of forms, entelechies, or souls. Today, however, it has been discovered through precise observations made on plants, insects, and animals that the organized bodies of nature are never produced out of chaos or putrefaction, but always out of seeds, in which doubtless there has been some preformation. Hence it has been concluded, not only that the organized body was already in the seed before conception, but also that there was a soul in this body, and, in short, the animal itself. Through the conception, furthermore, the animal has only been disposed to a great transformation, namely to become an animal of a different species. Something similar can even be observed outside generation, as, for instance, when worms become flies, or caterpillars butterflies.

75. Those animals among which some are elevated by means of the conception to the grade of larger animals, may be called spermatic; while those among them which remain within their species, that is, the majority, are born, multiply, and are destroyed like the large animals. Only a small number of elect pass on to a greater stage.

76. This, so far, has been but half the truth. Therefore I have concluded that if it be true that the animal never begins naturally, it will not end naturally either, and that consequently there will be, strictly speaking, neither generation nor entire destruction, that is, death. These arguments made a pos-
teriori and drawn from experience agree perfectly with my principles deduced a priori a while ago.

77. Thus it may be said that not only the soul (mirror of an indestructible universe) is indestructible, but also that the animal itself is indestructible, albeit its machine often partly perishes, and casts off or takes on organic accretions.

78. These principles have enabled me to propose a natural explanation for the union or conformity of the soul and the organized body. The soul follows its own laws, and so does the body. They meet by virtue of the pre-established harmony prevailing among all substances, since they all are representations of one and the same universe.

79. The souls act according to the laws of the final causes, through appetitions, ends, and means. The bodies act according to the laws of efficient causes, that is, of motion. And the two realms, that of efficient causes and that of final causes, are in mutual harmony.

80. Descartes has recognized that souls cannot impart force to bodies, because there is always the same quantity of force in matter. He believed, however, that the soul was able to change the directions of bodies. For at his time it was unknown yet that there is a law of nature according to which the total direction of matter is equally conserved. If he had been aware of this, he would have hit upon my system of pre-established harmony.

81. This system maintains that bodies act as though there were no souls (assuming the impossible); and that souls act as though there were no bodies; and that both act as though the one influenced the other.

82. As to spirits or reasonable souls, I find that essentially all the living beings and animals have the same nature, as I have said before, namely that the animal and the soul begin with the world and end no more than the world. Nevertheless, the reasonable souls have this in particular, that their little spermatic animals have only ordinary or sensitive souls, as long as they remain undeveloped. As soon, however, as those who, so to speak, are elected attain human nature through an actual conception, their sensitive souls are promoted to the rank of human nature and to the prerogative of spirits.

83. Among other differences existing between ordinary souls and spirits, some of which I have already pointed out, there is also this one, that souls in general are living mirrors or images of the created universe, while the spirits are in addition the images of the Deity itself or of the author of nature himself. They are capable of knowing the system of the universe and of imitat-
ing some of it by architectonic specimens, each spirit being like a small deity in his field.

84. This is the reason why the spirits are capable of entering a kind of society with God, and why with respect to them he is not only as an inventor is to his machine (this being the relation of God to the other creatures), but also as a prince to his subjects and even as a father to his children.

85. Hence it may easily be concluded that the assemblage of all the spirits must compose the City of God, that is, the most perfect city possible, under the most perfect monarch possible.

86. This City of God, this truly universal monarchy, is a moral world within the natural world; it is among the works of God the most exalted and the most divine. In it consists veritably the glory of God: for he would be without glory unless his greatness and goodness were recognized and admired by the spirits. Properly speaking, his goodness is directed toward this divine City, while his wisdom and power manifest themselves everywhere.

87. We have established above the perfect harmony between two natural realms, that of efficient causes and the other of final causes. To this we must add here still another harmony, namely, between the physical realm of nature and the moral realm of grace, that is, between God considered as the architect of the machine of the universe, and God considered as the monarch of the divine city of the spirits.

88. This harmony has the result that events lead to grace through the very processes of nature, and that our globe, for instance, must be destroyed and repaired through natural processes at the moments when the government of the spirits so demands, to chastise some and to reward others.

89. One may add that God as the architect satisfies in all respects God as the legislator. Thus sin must entail punishment according to the order of nature and as the very result of the mechanical structure of the universe; and, analogously, good actions will attract their rewards through machinelike corporeal processes. Of course, these results cannot be and ought not always to be obtained as an immediate consequence.

90. Finally, under this perfect government, no good action will remain without its reward, no evil action without its punishment. All events in this city conspire to the advantage of the good people, that is, of those who are not discontented in this great State; who, once they have fulfilled their duties, trust in providence and duly love and imitate the author of all good; who enjoy the contemplation of his perfections as required by the nature of the true pure love, which consists in taking pleasure in the felicity of the beloved. This pure love makes the wise and virtuous people work at everything that