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# CHANCE, LOVE, AND LOGIC



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# CHANCE, LOVE, AND LOGIC

## Philosophical Essays

by

CHARLES S PEIRCE

Edited with an Introduction by Morris R Cohen

With a Supplementary Essay on the Pragmatism of  
Peirce by John Dewey





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## PREFACE

IN the essays gathered together in this volume we have the most developed and coherent available account of the philosophy of Charles S. Peirce, whom James, Royce, Dewey, and leading thinkers in England, France, Germany and Italy have placed in the forefront of the great seminal minds of recent times. Besides their inherent value as the expression of a highly original and fruitful mind, unusually well trained and informed in the exact sciences, these essays are also important as giving us the sources of a great deal of contemporary American philosophy. Because of this historical importance no omissions or changes have been made in the text beyond the correction of some obvious slips and the recasting of a few expressions in the interest of intelligibility.

In a subject which bristles with suggestions and difficulties the temptation to add notes of explanation or dissent is almost insuperable. But as such notes might easily have doubled the size of this volume I have refrained from all comment on the text except in a few footnotes (indicated, as usual, in brackets). The introduction is intended (and I hope it will) help the reader to concatenate the various lines of thought contained in these essays. I cannot pretend to have adequately indicated their significance. Great minds like those of James and Royce have been nourished by these writings and I am persuaded that they

still offer mines of fruitful suggestion. Prof. Dewey's supplementary essay indicates their value for the fundamental question of metaphysics, viz. the nature of reality.

Grateful acknowledgment is here made to Mrs. Paul Carus and to the Open Court Publishing Co. for permission to reprint the essays of Part II from the *Monist*. The late Paul Carus was one of the very few who not only gave Peirce an opportunity to publish, but publicly recognized the importance of his writings.

I must also acknowledge my obligation to Professor Dewey for kind permission to reprint his essay on the Pragmatism of Peirce from the *Journal of Philosophy*, and to the editors of that Journal, Professors Woodbridge and Bush, for permission to reprint some material of my own. Part V of the Bibliography was compiled by Mr. Irving Smith.

MORRIS R. COHEN

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## INTRODUCTION

MANY and diverse are the minds that form the philosophic community. There are, first and foremost, the great masters, the system builders who rear their stately palaces towering to the moon. These architectonic minds are served by a varied host of followers and auxiliaries. Some provide the furnishings to make these mystic mansions of the mind more commodious, while others are engaged in making their façades more imposing. Some are busy strengthening weak places or building much-needed additions, while many more are engaged in defending these structures against the impetuous army of critics who are ever eager and ready to pounce down upon and destroy all that is new or bears the mortal mark of human imperfection. There are also the philologists, those who are in a more narrow sense scholars, who dig not only for facts or roots, but also for the stones which may serve either for building or as weapons of destruction. Remote from all these, however, are the intellectual rovers who, in their search for new fields, venture into the thick jungle that surrounds the little patch of cultivated science. They are not gregarious creatures, these lonely pioneers; and in their wanderings they often completely lose touch with those who tread the beaten paths. Those that return to the community often speak strangely of strange things; and it is not always that they arouse sufficient faith for others to follow them and change their trails into high roads.

Few nowadays question the great value of these pioneer minds; and it is often claimed that universities are established to facilitate their work, and to prevent it from being lost. But universities, like other well-managed institutions, can find place only for those who work well in harness. The restless, impatient minds, like the socially or conventionally unacceptable, are thus kept out, no matter how fruitful their originality. Charles S. Peirce was certainly one of these restless pioneer souls with the fatal gift of genuine originality. In his early papers, in the *Journal of Speculative Philosophy*, and later, in the *Monist* papers reprinted as Part II of this volume, we get glimpses of a vast philosophic system on which he was working with an unusual wealth of material and apparatus. To a rich imagination and extraordinary learning he added one of the most essential gifts of successful system builders, the power to coin an apt and striking terminology. But the admitted incompleteness of these preliminary sketches of his philosophic system is not altogether due to the inherent difficulty of the task and to external causes such as neglect and poverty. A certain inner instability or lack of self-mastery is reflected in the outer moral or conventional waywardness which, except for a few years at Johns Hopkins, caused him to be excluded from a university career, and thus deprived him of much needed stimulus to ordinary consistency and intelligibility. As the years advanced, bringing little general interest in, or recognition of, the brilliant logical studies of his early years, Peirce became more and more fragmentary, cryptic, and involved; so that James, the intellectual companion of his youth, later found

his lectures on pragmatism, "flashes of brilliant light relieved against Cimmerian darkness" — a statement not to be entirely discounted by the fact that James had no interest in or aptitude for formal logical or mathematical considerations.

Despite these limitations, however, Peirce stands out as one of the great founders of modern scientific logic; and in the realm of general philosophy the development of some of his pregnant ideas has led to the pragmatism and radical empiricism of James, as well as to the mathematical idealism of Royce, and to the anti-nominalism which characterizes the philosophic movement known as Neo-Realism. At any rate, the work of James, Royce, and Russell, as well as that of logicians like Schroeder, brings us of the present generation into a better position to appreciate the significance of Peirce's work, than were his contemporaries.

## I

Peirce was by antecedents, training, and occupation a scientist. He was a son of Benjamin Peirce, the great Harvard mathematician, and his early environment, together with his training in the Lawrence Scientific School, justified his favorite claim that he was brought up in a laboratory. He made important contributions not only in mathematical logic but also in photometric astronomy, geodesy, and psychophysics, as well as in philology. For many years Peirce worked on the problems of geodesy, and his contribution to the subject, his researches on the pendulum, was at once recognized by European investigators in this field. The International Geodetic Congress, to



which he was the first American representative, gave unusual attention to his paper, and men like Cellerier and Plantamour acknowledged their obligations to him.<sup>1</sup>

This and other scientific work involving fine measurement, with the correlative investigations into the theory of probable error, seem to have been a decisive influence in the development of Peirce's philosophy of chance. Philosophers inexperienced in actual scientific measurement may naïvely accept as absolute truth such statements as "every particle of matter attracts every other particle directly as the product of their masses and inversely as the square of the distance," or "when hydrogen and oxygen combine to form water the ratio of their weights is 1:8." But to those who are actually engaged in measuring natural phenomena with instruments of precision, nature shows no such absolute constancy or simplicity. As every laboratory worker knows, no two observers, and no one observer in successive experiments, get absolutely identical results. To the men of the heroic period of science this was no difficulty. They held unquestioningly the Platonic faith that nature was created on simple geometric lines, and all the minute variations were attributable to the fault of the observer or the crudity of his instruments. This heroic faith was, and still is, a most powerful stimulus to scientific research and a protection against the incursions of supernaturalism. But few would defend it to-day in its explicit form, and there is little empirical evidence to show that while the observer and his instruments are always varying, the ob-

<sup>1</sup> See Plantamour's "*Recherches Experimentales sur le mouvement simultané d'un pendule et de ses supports*," Geneva, 1878, pp. 3-4.

jects which he measures never deviate in the slightest from the simple law. Doubtless, as one becomes more expert in the manipulation of physical instruments, there is a noticeable diminution of the range of the personal "error," but no amount of skill and no refinement of our instruments have ever succeeded in eliminating irregular, though small, variations. "Try to verify any law of nature and you will find that the more precise your observations, the more certain they will be to show irregular departure from the law."<sup>2</sup> There is certainly nothing in our empirical information to prevent us from saying that all the so-called constants of nature are merely instances of variation between limits so near each other that their differences may be neglected for certain purposes. Moreover, the approach to constancy is observed only in mass phenomena, when we are dealing with very large numbers of particles; but social statistics also approach constant ratios when the numbers are very large. Hence, without denying discrepancies due solely to errors of observation, Peirce contends that "we must suppose far more minute discrepancies to exist owing to the imperfect cogency of the law itself, to a certain swerving of the facts from any definite formula."<sup>3</sup>

It is usual to associate disbelief in absolute laws of nature with sentimental claims for freedom or theological miracles. It is, therefore, well to insist that Peirce's attack is entirely in the interests of exact logic and a rational account of the physical universe. As a rigorous logician familiar with the actual procedures by which our knowledge

<sup>2</sup> P. 190.

<sup>3</sup> Pp. 162-163.

of the various laws of nature is obtained, he could not admit that experience could prove their claim to absoluteness. All the physical laws actually known, like Boyle's law or the law of gravitation, involve excessive simplification of the phenomenal course of events, and thus a large element of empirical inaccuracy. But a more positive objection against the traditional assumption of absolute or invariable laws of nature, is the fact that such assumption makes the regularities of the universe ultimate, and thus cuts us off from the possibility of ever explaining them or how there comes to be as much regularity in the universe as there is. But in ordinary affairs, the occurrence of any regularity is the very thing to be explained. Moreover, modern statistical mechanics and thermodynamics (theory of gases, entropy, etc.) suggest that the regularity in the universe is a matter of gradual growth; that the whole of physical nature is a growth from a chaos of diversity to a maximum of uniformity or entropy. A leading physicist of the 19th Century, Boltzmann, has suggested that the process of the whole physical universe is like that of a continuous shaking up of a hap-hazard or chance mixture of things, which thus gradually results in a progressively more uniform distribution. Since Duns Scotus, students of logic have known that every real entity has its individual character (its *haecceitas* or *thisness*) which cannot be explained or deduced from that which is uniform. Every explanation, for example, of the moon's path must take particular existences for granted. Such original or unde-rived individuality and diversity is precisely what Peirce means by chance; and from this point of view chance is prior to law.

All that is necessary to visualize this is to suppose that there is an infinitesimal tendency in things to acquire habits, a tendency which is itself an accidental variation grown habitual. We shall then be on the road to explain the evolution and existence of the limited uniformities actually prevailing in the physical world.

A good deal of the foregoing may sound somewhat mythologic. But even if it were so it would have the merit of offering a rational alternative to the mechanical mythology according to which all the atoms in the universe are to-day precisely in the same condition in which they were on the day of creation, a mythology which is forced to regard all the empirical facts of spontaneity and novelty as illusory, or devoid of substantial truth.

The doctrine of the primacy of chance naturally suggests the primacy of mind. Just as law is a chance habit so is matter inert mind. The principal law of mind is that ideas literally spread themselves continuously and become more and more general or inclusive, so that people who form communities of any sort develop general ideas in common. When this continuous reaching-out of feeling becomes nurturing love, such, e.g., which parents have for their offspring or thinkers for their ideas, we have creative evolution.

James and Royce have called attention to the similarity between Peirce's doctrine of tychistic-agapism (chance and love) and the creative evolution of Bergson. But while both philosophies aim to restore life and growth in their account of the nature of things, Peirce's approach seems to me to have marked advantages, owing to its being in closer

touch with modern physics. Bergson's procedure is largely based on the contention that mechanics cannot explain certain empirical facts, such as the supposed identity of the vertebrate eye and the eye of the scallop. But the fact here is merely one of a certain resemblance of pattern, which may well be explained by the mechanical principles of convergent evolution. Peirce's account involves no rejection of the possibility of mechanical explanations. Indeed, by carrying chance into the laws of mechanics he is enabled to elaborate a positive and highly suggestive theory of protoplasm to explain the facts of plasticity and habit.<sup>4</sup> Instead of postulating with Spencer and Bergson a continuous growth of diversity, Peirce allows for growth of habits both in diversity and in uniformity. The Spencerian mechanical philosophy reduces all diversity to mere spatial differences. There can be no substantial novelty; only new forms or combinations can arise in time. The creative evolution of Bergson though intended to support the claims of spontaneity is still like the Spencerian in assuming all evolution as proceeding from the simple to the complex. Peirce allows for diversity and specificity as part of the original character or endowment of things, which in the course of time may increase in some respects and diminish in others. Mind acquires the habit both of taking on, and also of laying aside, habits. Evolution may thus lead to homogeneity or uniformity as well as to greater heterogeneity.

Not only has Peirce a greater regard than even Bergson for the actual diversity and spontaneity of things, but he is in a much better position than any other modern phi-

<sup>4</sup> Pp. 249 ff.

losopher to explain the order and coherence of the world. This he effects by uniting the medieval regard for the reality of universals with the modern scientific use of the concept of continuity. The unfortunate war between the pioneers of modern science and the adherents of the scholastic doctrine of substantial forms, has been one of the great misfortunes of human thought, in that it made absolute atomism and nominalism the professed *creed* of physical science. Now, extreme nominalism, the insistence on the reality of the particular, leaves no room for the genuine reality of law. It leaves, as Hume had the courage to admit, nothing whereby the present can determine the future; so that anything is as likely to happen as not. From such a chaotic world, the *procedure* of modern natural and mathematical science has saved us by the persistent use of the principle of continuity; and no one has indicated this more clearly than Peirce who was uniquely qualified to do so by being a close student both of Duns Scotus and of modern scientific methods.

It is instructive in this respect to contrast the views of Peirce and James. James, who so generously indicated his indebtedness to Peirce for his pragmatism, was also largely indebted to Peirce for his doctrine of radical empiricism.<sup>5</sup> The latter doctrine seeks to rescue the continuity and fluidity of experience from the traditional British empiricism or nominalism, which had resolved everything into a number of mutually exclusive mental states. It is curious, however, that while in his psychology James made extensive use of the principle of continuity, he could not free himself

<sup>5</sup> James, *Pluralistic Universe*, pp. 398-400.

from British nominalism in his philosophy — witness the extreme individualism of his social philosophy or the equally extreme anthropomorphism of his religion. Certain of Peirce's suggestions as to the use of continuity in social philosophy have been developed by Royce in his theory of social consciousness and the nature of the community;<sup>6</sup> but much remains to be worked out and we can but repeat Peirce's own hope: "May some future student go over this ground again and have the leisure to give his results to the world."

It is well to note, however, that after writing the papers included in this volume Peirce continued to be occupied with the issues here raised. This he most significantly indicated in the articles on logical topics contributed to Baldwin's *Dictionary of Philosophy*.<sup>7</sup>

In these articles it is naturally the logical bearing of the principles of tychism (chance), synechism (continuity), and agapism (love) that is stressed. To use the Kantian terminology, almost native to Peirce, the regulative rather than the constitutive aspect of these principles is emphasized. Thus the doctrine of chance is not only what it was for James' radical empiricism, a release from the blind necessity of a "block universe," but also a method of keep-

<sup>6</sup> Royce, *Studies in Good and Evil*, and *The Problem of Christianity*, esp. Vol. 2. Baldwin (*Mental Development*) is heavily indebted to Royce in this respect.

<sup>7</sup> These articles are by-products or fragments of a comprehensive work on *Logic* on which Peirce was engaged for many years. For the writing of this book, Royce declared, no greater mind or greater erudition has appeared in America. Only several chapters seem to have been finished, and will doubtless be included with other hitherto unpublished manuscripts in the complete edition of Peirce's writings that is now being prepared by Harvard University.

ing open a possible explanation of the genesis of the laws of nature and an interpretation of them in accordance with the theorems of probability, so fruitful in physical science as well as in practical life. So the doctrine of love is not only a cosmologic one, showing how chance feeling generates order or rational diversity through the habit of generality or continuity, but it also gives us the meaning of truth in social terms, in showing that the test as to whether any proposition is true postulates an indefinite number of co-operating investigators. On its logical side the doctrine of love (agapism) also recognized the important fact that general ideas have a certain attraction which makes us divine their nature even though we cannot clearly determine their precise meaning before developing their possible consequences.

Of the doctrine of continuity we are told expressly<sup>8</sup> that "synechism is not an ultimate absolute metaphysical doctrine. It is a regulative principle of logic," seeking the thread of identity in diverse cases and avoiding hypotheses that this or that is ultimate and, therefore, inexplicable. (Examples of such hypotheses are: the existence of absolutely accurate or uniform laws of nature, the eternity and absolute likeness of all atoms, etc.) To be sure, the synechist cannot deny that there is an element of the inexplicable or ultimate, since it is directly forced upon him. But he cannot regard it as a source of explanation. The assumption of an inexplicability is a barrier on the road to science. "The form under which alone anything can be understood is the form of generality which is the same thing

<sup>8</sup> Baldwin's *Dictionary*, article Synechism.



as continuity.”<sup>9</sup> This insistence on the generality of intelligible form is perfectly consistent with due emphases on the reality of the individual, which to a Scotist realist connotes an element of will or will-resistance, but in logical procedure means that the test of the truth or falsity of any proposition refers us to particular perceptions.<sup>10</sup> But as no multitude of individuals can exhaust the meaning of a continuum, which includes also organizing relations of order, the full meaning of a concept cannot be in any individual reaction, but is rather to be sought in the manner in which all such reactions contribute to the development of the concrete reasonableness of the whole evolutionary process. In scientific procedure this means that integrity of belief in general is more important than, because it is the condition of, particular true beliefs.

## II

This insistence on the continuity so effectually used as a heuristic principle in natural and mathematical science, distinguishes the pragmatism of Peirce from that of his follower James. Prof. Dewey has developed this point authoritatively in the supplementary essay; but in view of the general ignorance as to the sources of pragmatism which prevails in this incurious age, some remarks on the actual historical origin of pragmatism may be in order.

There can be little doubt that Peirce was led to the formulation of the principle of pragmatism through the influence

<sup>9</sup> *Ib.*

<sup>10</sup> Baldwin's *Dictionary*, art. Individual: "Everything whose identity consists in a continuity of reactions will be a single logical individual."

of Chauncey Wright.<sup>11</sup> Wright who had first hand acquaintance with creative scientific work in mathematics, physics, and botany was led by the study of Mill and Bain to reflect on the characteristics of scientific method. This reflection led him to draw a distinction between the use of popular scientific material, by men like Spencer, to construct a myth or picture of the world, and the scientific use of laws by men like Newton as means for extending our knowledge of phenomena. Gravitation as a general fact had interested metaphysicians long before Newton. What made Newton's contribution scientific was the formulation of a mathematical law which has enabled us to deduce all the then known facts of the solar system and to anticipate or predict many more facts the existence of which would not otherwise be even suspected, e.g., the existence of the planet Neptune. Wright insists, therefore, that the principles of modern mathematical and physical science are the means through which nature is discovered, that scientific

<sup>11</sup> The personal relations between Peirce and Wright were thus described by Peirce in a letter to Mrs. Ladd-Franklin (*Journal of Philosophy* Vol. 13, p. 719): "It must have been about 1857 when I first made the acquaintance of Chauncey Wright, a mind about on the level of J. S. Mill. He was a thorough mathematician. He had a most penetrating intellect.—He and I used to have long and very lively and close disputations lasting two or three hours daily for many years. In the sixties I started a little club called 'The Metaphysical Club.'—Wright was the strongest member and probably I was next.—Then there were Frank Abbott, William James and others." "It was there that the name and the doctrine of pragmatism saw the light." It might be added that Peirce's tychism is indebted to Wright's doctrine of accidents and "cosmic weather," a doctrine which maintained against LaPlace that a mind knowing nature from moment to moment is bound to encounter genuine novelty in phenomena, which no amount of knowledge would enable us to foresee. See Wright's *Philosophical Discussions*—1876, also *Cambridge Hist. of American Literature*, Vol. 3, p. 234.

laws are the finders rather than merely the summaries of factual truths. This conception of the experimental scientist as translating general propositions into prescriptions for attaining new experimental truths, is the starting point of Peirce's pragmatism. The latter is embodied in the principle that the meaning of a concept is to be found in "all the conceivable experimental phenomena which the affirmation or denial of the concept could imply."<sup>12</sup>

In the earlier statement of the pragmatic maxim,<sup>13</sup> Peirce emphasized the consequences for conduct that follow from the acceptance or rejection of an idea; but the stoical maxim that the end of man is action did not appeal to him as much at sixty as it did at thirty.<sup>14</sup> Naturally also Peirce could not follow the development of pragmatism by Wm. James who, like almost all modern psychologists, was a thorough nominalist and always emphasized particular sensible experience.<sup>15</sup> It seemed to Peirce that such em-

<sup>12</sup> *Monist*, Vol. 15, p. 180.

<sup>13</sup> This volume, pp. 43-45.

<sup>14</sup> "To say that we live for the sake of action would be to say that there is no such thing as a rational purport." *Monist*, Vol. XV, p. 175.

<sup>15</sup> The letter to Mrs. Ladd-Franklin quoted before, explains why James, though always loyal to Peirce and anxious to give him credit whenever possible, could not understand the latter's lectures on pragmatism. Peirce's incidental judgments on others is worth quoting here:

"Modern psychologists are so soaked with sensationalism that they cannot understand anything that does not mean that. How can I, to whom nothing seems so thoroughly real as generals, and who regards Truth and Justice as *literally* the most powerful powers in the world, expect to be understood by the thoroughgoing Wundtian? But the curious thing is to see absolute idealists tainted with this disease,—or men who, like John Dewey, hover between Absolute Idealism and Sensationalism. Royce's opinions as developed in his *World and Individualism* are extremely near to mine. His insistence on the elements of purpose in intellectual concepts is essentially the pragmatic position."

phasis on particular experiences endangered the principle of continuity which in the hands of men like Weierstrass had reformed modern mathematics. For this reason he began to call his own doctrine pragmatism, a sufficiently unattractive name, he thought, to save it from kidnappers and from popularity. He never, however, abandoned the principle of pragmatism, that the meaning of an idea is clarified (because constituted) by its conceivable experimental consequences. Indeed, if we want to clarify the meaning of the idea of pragmatism, let us apply the pragmatic test to it. What will be the effect of accepting it? Obviously it will be to develop certain general ideas or habits of looking at things.

Peirce's pragmatism has, therefore, a decidedly intellectual cast. The meaning of an idea or proposition is found not by an intuition of it but by working out its implications. It admits that thought does not constitute reality. Categories can have no concrete being without action or immediate feeling. But thought is none the less an essential ingredient of reality; thought is "the melody running through the succession of our sensations." Pragmatism, according to Peirce, seeks to define the rational purport, not the sensuous quality. It is interested not in the effect of our practical occupations or desires on our ideas, but in the function of ideas as guides of action. Whether a man is to pay damages in a certain lawsuit may depend, in fact, on a term in the Aristotelian logic such as proximate cause.

It is of interest to observe that though Peirce is an ardent admirer of Darwin's method, his scientific caution makes

him refuse to apply the analogy of biologic natural selection to the realm of ideas, in the wholesale and uncritical manner that has lately become fashionable. Natural selection may well favor the triumph of views which directly influence biologic survival. But the pleasure of entertaining congenial illusions may overbalance the inconvenience resulting from their deceptive character. Thus rhetorical appeals may long prevail over scientific evidence.

### III

Peirce preferred to call himself a logician, and his contributions to logic have so far proved his most generally recognized achievement. For a right perspective of these contributions we may well begin with the observation that though few branches of philosophy have been cultivated as continuously as logic, Kant was able to affirm that the science of logic had made no substantial progress since the time of Aristotle. The reason for this is that Aristotle's logic, the logic of classes, was based on his own scientific procedure as a zoologist, and is still in essence a valid method so far as classification is part of all rational procedure. But when we come to describe the mathematical method of physical science, we cannot cast it into the Aristotelian form without involving ourselves in such complicated artificialities as to reduce almost to nil the value of Aristotle's logic as an organon. Aristotle's logic enables us to make a single inference from two premises. But the vast multitude of theorems that modern mathematics has derived from a few premises as to the nature of number, shows the need of formulating a logic or theory of inference

that shall correspond to the modern, more complicated, practice as Aristotle's logic did to simple classificatory zoology. To do this effectively would require the highest constructive logical genius, together with an intimate knowledge of the methods of the great variety of modern sciences. This is in the nature of the case a very rare combination, since great investigators are not as critical in examining their own procedure as they are in examining the subject matter which is their primary scientific interest. Hence, when great investigators like Poincaré come to describe their own work, they fall back on the uncritical assumptions of the traditional logic which they learned in their school days. Moreover, "For the last three centuries thought has been conducted in laboratories, in the field, or otherwise in the face of the facts, while chairs of logic have been filled by men who breathe the air of the seminary."<sup>16</sup> The great Leibnitz had the qualifications, but here, as elsewhere, his worldly occupations left him no opportunity except for very fragmentary contributions. It was not until the middle of the 19th century that two mathematicians, Boole and DeMorgan, laid the foundations for a more generalized logic. Boole developed a general logical algorithm or calculus, while DeMorgan called attention to non-syllogistic inference and especially to the importance of the logic of relations. Peirce's great achievement is to have recognized the possibilities of both and to have generalized and developed them into a general theory of scientific inference. The extent and thoroughness of his achievement has been obscured by his fragmentary way of writing and by a rather

<sup>16</sup> Baldwin's *Dictionary*, art. Method.

unwieldy symbolism. Still, modern mathematical logic, such as that of Russell's *Principles of Mathematics*, is but a development of Peirce's logic of relatives.

This phase of Peirce's work is highly technical and an account of it is out of place here. Such an account will be found in Lewis' *Survey of Symbolic Logic*.<sup>17</sup> I refer to it here only to remind the reader that the *Illustrations of the Logic of the Sciences* (Part I of this volume) have a background of patient detailed work which is still being developed to-day.

Symbolic logic has been held in rather low esteem by the followers of the old classical methods in philosophy. Their stated objection to it has been mainly that it is concerned with the minutiae of an artificial language and is of no value as a guide to the interpretation of reality. Now it should be readily admitted that preoccupation with symbolic logic is rather apt to retard the irresponsible flight of philosophic fancy. Yet this is by no means always an evil. By insisting on an accuracy that is painful to those impatient to obtain sweeping and comforting, though hasty, conclusions, symbolic logic is well calculated to remove the great scandal of traditional philosophy — the claim of absolutely certain results in fields where there is the greatest conflict of opinion. This scandalous situation arises in part from the fact that in popular exposition we do not have to make our premises or assumptions explicit; hence all sorts of dubious prejudices are implicitly appealed to as abso-

<sup>17</sup> "Peirce anticipated the most important procedures of his successors even when he did not work them out himself. Again and again one finds the clue to the most recent developments in the writings of Peirce," Lewis' *Survey of Symbolic Logic*, p. 79.

lutely necessary principles. Also, by the use of popular terms which have a variety of meanings, one easily slides from one meaning to another, so that the most improbable conclusions are thus derived from seeming truisms. By making assumptions and rules explicit, and by using technical terms that do not drag wide penumbras of meaning with them, the method of symbolic logic may cruelly reduce the sweeping pretensions of philosophy. But there is no reason for supposing that pretentiousness rather than humility is the way to philosophic salvation. Man is bound to speculate about the universe beyond the range of his knowledge, but he is not bound to indulge the vanity of setting up such speculations as absolutely certain dogmas.

There is, however, no reason for denying that greater rigor and accuracy of exposition can really help us to discern new truth. Modern mathematics since Gauss and Weierstrass has actually been led to greater fruitfulness by increased rigor which makes such procedure as the old proofs of Taylor's theorem no longer possible. The substitution of rigorous analytic procedures for the old Euclidean proofs based on intuition, has opened up vast fields of geometry. Nor has this been without any effect on philosophy. Where formerly concepts like infinity and continuity were objects of gaping awe or the recurrent occasions for intellectual violence,<sup>18</sup> we are now beginning to use them, thanks to Peirce and Royce, in accurate and definable senses. Consider, for instance, the amount of a priori nonsense which Peirce eliminates by pointing out

<sup>18</sup> Hans Breitmann is symbolic of those who "solved the infinite as one eternal sphere."



that the application of the concept of continuity to a span of consciousness removes the necessity for assuming a first or last moment; so likewise the range of vision on a large unobstructed ground has no line between the visible and the invisible. These considerations will be found utterly destructive of the force of the old arguments (fundamental to Kant and others) as to the necessary infinity of time and space. Similar enlightenment is soon likely to result from the more careful use of terms like relative and absolute, which are bones of contention in philosophy but Ariadne threads of exploration in theoretical physics, because of the definite symbolism of mathematics. Other important truths made clear by symbolic logic is the hypothetical character of universal propositions and the consequent insight that no particulars can be deduced from universals alone, since no number of hypotheses can without given data establish an existing fact.

There is, however, an even more positive direction in which symbolic logic serves the interest of philosophy, and that is in throwing light on the nature of symbols and on the relation of meaning. Philosophers have light-heartedly dismissed questions as to the nature of significant signs as 'merely' (most fatal word!) a matter of language. But Peirce in the paper on Man's Glassy [Shakespearian for Mirror-Like] Essence, endeavors to exhibit man's whole nature as symbolic.<sup>19</sup> This is closely connected with his logical doctrine which regards signs or symbols as one of

<sup>19</sup> See *Journal of Speculative Philosophy*, Vol. 2, pp. 155-157, article on A New List of Categories in the Proceedings of the American Academy of Arts and Sciences, Vol. 7, 287-298 and article on *Sign*, in Baldwin's *Dictionary*.

the fundamental categories or aspects of the universe (Thoughts and things are the other two). Independently of Peirce but in line with his thought another great and neglected thinker, Santayana, has shown that the whole life of man that is bound up with the institutions of civilization, is concerned with symbols.

It is not altogether accidental that, since Boole and DeMorgan, those who have occupied themselves with symbolic logic have felt called upon to deal with the problem of probability. The reason is indicated by Peirce when he formulates the problem of probable inference in such a way as to make the old classic logic of absolutely true or false conclusions, a limiting case (i.e., of values 1 and 0) of the logic of probable inference whose values range all the way between these two limits. This technical device is itself the result of applying the principle of continuity to throw two hitherto distinct types of reasoning into the same class. The result is philosophically significant.

Where the classical logic spoke of major and minor premises without establishing any really important difference between the two, Peirce draws a distinction between the premises and the guiding principle of our argument. All reasoning is from some concrete situation to another. The propositions which represent the first are the premises in the strict sense of the word. But the feeling that certain conclusions follow from these premises is conditioned by an implicit or explicit belief in some guiding principle which connects the premises and the conclusions. When such a leading principle results in true conclusions in all cases of true premises, we have logical deduction of the orthodox

type. If, however, such a principle brings about a true conclusion only in a certain proportion of cases, then we have probability.

This reduction of probability to the relative frequency of true propositions in a class of propositions, was suggested to Peirce by Venn's *Logic of Chance*. Peirce uses it to establish some truths of greatest importance to logic and philosophy.

He eliminates the difficulties of the old conceptualist view, which made probability a measure of our ignorance and yet had to admit that almost all fruitfulness of our practical and scientific reasoning depended on the theorems of probability. How could we safely predict phenomena by measuring our ignorance?

Probability being reduced to a matter of the relative frequency of a class in a larger class or genus, it becomes, strictly speaking, inapplicable to single cases by themselves. A single penny will fall head or it will fall tail every time; to-morrow it will rain, or it will not rain at all. The probability of  $\frac{1}{2}$  or any other fraction means nothing in the single case. It is only because we feel the single event as representative of a class, as something which repeats itself, that we speak elliptically of the probability of a single event. Hence follows the important corollary that reasoning with respect to the probability of this or that arrangement of the universe would be valid only if universes were as plentiful as blackberries.

To be useful at all, theories must be simpler than the complex facts which they seek to explain. Hence, it is often convenient to employ a principle of certainty where

the facts justify only a principle of some degree of probability. In such cases we must be cautious in accepting any extreme consequence of these principles, and also be on guard against apparent refutations based on such extreme consequences.

Finally I should like to emphasize the value of Peirce's theory of inference for a philosophy of civilization. To the old argument that logic is of no importance because people learn to reason, as to walk, by instinct and habit and not by scientific instruction, Peirce admits<sup>20</sup> that "all human knowledge up to the highest flights of science is but the development of our inborn animal instincts." But though logical rules are first felt implicitly, bringing them into explicit consciousness helps the process of analysis and thus makes possible the recognition of old principles in novel situations. This increases our range of adaptability to such an extent as to justify a general distinction between the slave of routine or habit and the freeman who can anticipate and control nature through knowledge of principles. Peirce's analysis of the method of science as a method of attaining stability of beliefs by free inquiry inviting all possible doubt, in contrast with the methods of iteration ("will to believe") and social authority, is one of the best introductions to a theory of liberal or Hellenic civilization, as opposed to those of despotic societies. Authority has its roots in the force of habit, but it cannot prevent new and unorthodox ideas from arising; and in the effort to defend authoritative social views men are apt to be far more ruthless than in defending their own personal convictions.

<sup>20</sup> *Studies in Logic*, p. 181.

## IV

Not only the pragmatism and the radical empiricism of James, but the idealism of Royce and the more recent movement of neo-realism are largely indebted to Peirce.

It may seem strange that the same thinker should be claimed as foster-father of both recent idealism and realism, and some may take it as another sign of his lack of consistency. But this seeming strangeness is really due to the looseness with which the antithesis between realism and idealism has generally been put. If by idealism we denote the nominalistic doctrine of Berkeley, then Peirce is clearly not an idealist; and his work in logic as a study of types of order (in which Royce followed him) is fundamental for a logical realism. But if idealism means the old Platonic doctrine that "ideas," genera, or forms are not merely mental but the real conditions of existence, we need not wonder that Peirce was both idealist and realist.

Royce's indebtedness to Peirce is principally in the use of modern mathematical material, such as the recent development of the concepts of infinity and continuity, to throw light on fundamental questions of philosophy, such as relation of the individual to God or the Universe. At the end of the nineteenth century mathematics had almost disappeared from the repertory of philosophy (cf. Külpe's *Introduction to Philosophy*), and Peirce's essay on the *Law of Mind* opened a new way which Royce followed in his *World and the Individual*, to the great surprise of his idealistic brethren. In his *Problem of Christianity* Royce has also indicated his indebtedness to Peirce for his doc-

trine of social consciousness, the mind of the community, and the process of interpretation. It may be that a great deal of the similarity between the thoughts of these two men is due to common sources, such as the works of Kant and Schelling; but it is well to note that not only in his later writings but also in his lectures and seminars Royce continually referred to Peirce's views.

The ground for the neo-realist movement in American philosophy was largely prepared by the mathematical work of Russell and by the utilization of mathematics to which Royce was led by Peirce. The logic of Mr. Russell is based, as he himself has pointed out, on a combination of the work of Peirce and Peano. In this combination the notation of Peano has proved of greater technical fluency, but all of Peano's results can also be obtained by Peirce's method as developed by Schroeder and Mrs. Ladd-Franklin. But philosophically Peirce's influence is far greater in insisting that logic is not a branch of psychology, that it is not concerned with merely mental processes, but with objective relations. To the view that the laws of logic represent "the necessities of thought," that propositions are true because "we can not help thinking so," he answers: "Exact logic will say that *C*'s following logically from *A* is a state of things which no impotence of thought alone can bring about."<sup>21</sup> "The question of validity is purely one of fact and not of thinking. . . . It is not in the least the question whether, when the premises are accepted by the mind, we feel an impulse to accept the conclusion also.

<sup>21</sup> *Monist*, Vol. 7, p. 27. Cf. *Journal of Speculative Philosophy*, Vol. 2, p. 207; *Popular Science Monthly*, Vol. 58, pp. 305-306.

The true conclusion would remain true if we had no impulse to accept it, and the false one would remain false though we could not resist the tendency to believe in it.”<sup>22</sup>

Since the days of Locke modern philosophy has been almost entirely dominated by the assumption that one must study the process of knowing before one can find out the nature of things known; in other words, that psychology is *the* central philosophic science. The result of this has been an almost complete identification of philosophy with mental science. Nor did the influence of biologic studies of the middle of the nineteenth century shake the belief in that banal dictum of philosophic mediocrity: “The proper study of mankind is man.” The recent renaissance of logical studies, and the remarkable progress of physics in our own day bid fair to remind us that while the Lockian way has brought some gains to philosophy, the more ancient way of philosophy is by no means exhausted of promise. Man cannot lose his interest in the great cosmic play. Those who have faith in the ancient and fruitful approach to philosophy through the doors of mathematics and physics will find the writings of Charles S. Peirce full of suggestions. That such an approach can also throw light on the vexed problem of knowledge needs no assurance to those acquainted with Plato and Aristotle. But I may conclude by referring to Peirce’s doctrine of ideal as opposed to sensible experiment,<sup>23</sup> and to his treatment of the question

<sup>22</sup> This vol., p. 15.

<sup>23</sup> Suggestive for a theory of the metaphysics of fictions is the suggestion (p. 46) “that the question of what would occur under circumstances which do not actually arise, is not a question of fact, but only of the most perspicuous arrangement of them.” This arrangement is, of course, not merely subjective.

how it is that in spite of an infinity of possible hypotheses, mankind has managed to make so many successful inductions.<sup>24</sup> And for the bearing of mathematical studies on the wisdom of life, the following is certainly worth serious reflection: "All human affairs rest upon probabilities. If man were immortal [on earth] he could be perfectly sure of seeing the day when everything in which he had trusted should betray his trust. He would break down, at last, as every great fortune, as every dynasty, as every civilization does. In place of this we have death." The recognition that the death of the individual does not destroy the logical meaning of his utterances, that this meaning involves the ideal of an unlimited community, carries us into the heart of pure religion.

<sup>24</sup> Pp. 128-129, *cf. Monist*, Vol. 7, p. 206, and *Logical Studies*, pp. 175 ff.