DISCOURSE, DEMONSTRATION, VERIFICATION, AND JUSTIFICATION

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The history of things and events, the history of ideas and theories, the history of statements, presentations, and communications run separate courses which are ambiguously intermingled in occurrences, meditations, and narrations. They are histories of what has been the case, leading up to, and in the light of, what is now the case; of what men have thought, preparing for, and judged according to, what is now known; and of what men have said and expressed, reconstructed relative to, and interpreted under the influence of, what is now perceived and valued. They are all histories of facts, of concrete existences and occurrences; yet no facts enter the sequences of our histories except known facts and stated facts, and we still recognize, with Parmenides, that what can be said and thought must be. Thoughts and statements are adapted to facts; and facts are discovered, invented, and created in and by thought and statement. Discourse presents sequences in occurrences, in thoughts, and in expressions. It is *discursus,* a running around or a running to and fro; and since it is impossible to separate actual discourses from known discourses or stated discourses, the structures of discourse are sometimes found in things, sometimes in thoughts, sometimes in words, sometimes in actions. Science, poetry, and history are modes of discourse whose structures are similar, as Aristotle observed: poetry is more philosophic (or scientific) and serious than history, for poetry narrates particularized universals rather than historical individuals and singulars. Discourse presents things, thoughts, and symbols, the abstract and the concrete, and relates them in the omni-existent; it presents past, present, and future, the timeless and the timed, and relates them in the omni-present.

From the beginning of speculation on human action and the environing world, the arts of what men know and do have been conceived as arts of discourse. From the first, the arts of discourse

have united saying and doing with what is said and done; and from the beginning, the arts of discourse have been distinguished into arts of words and arts of things, and the verbal and substantive arts have been given meaning in pragmatic interpretations. During the Middle Ages the arts of the Trivium — grammar, rhetoric, and logic or dialectic — were often treated as the arts of words; and the arts of the Quadrivium — arithmetic, geometry, astronomy, and music — as the arts of things. Yet analysis of words or of the *logos* has produced grammars of science, of politics, and of assent, as well as grammars of languages and of Language; and inquiry into things or into the *cosmos* has produced the symbolism of mathematics and has generalized music from the harmonies of sounds to the spheres and to all proportions; astronomy from the motion of the heavens to the planetary orbits of stars and atoms; geometry from two- and three-dimensional figures to mechanics and dynamics of motion; and arithmetic, even in antiquity, included logistic, the art of calculation. The history of poetry and the arts lays the foundation for the history of politics, religion, and science; and in the sequences of each, ideas and connections are borrowed from the other histories. The arts of words and of things — grammar, rhetoric, logic, dialectic, and mathematics — are not set apart by definite dividing lines but borrow methods and subject matters from each other. Any one of them may be, and each of them has been, shown to contain the basic statement of the principles of all knowledge; and the relations among them, on analysis, contain all the problems of philosophy and science.

The problems of philosophy and their resolution, the relations among philosophic positions and the evolution of philosophic interests and perspectives, when they are not determined by chance and fortune, are produced and discovered by philosophic arts. The arts applied in philosophic inquiry are employed in the resolution of problems and the establishment of unambiguous, coherent, and fruitful truths. The same arts applied in philosophic semantics are employed in the interpretation of statements of problems and resolutions which are ambiguous in their common statement in two or more philosophies and often contradictory in their proper significances. The philosophic arts applied in the con-

tinuities of the history of philosophy and of the debates to the present, trace or guide the common themes of philosophic discussion through concrete precisions and ordered consistencies, productive ambiguities and suggestive inconsistencies, from the topics or commonplaces of discussion to philosophic innovations and discoveries. The problems of demonstration, verification, and justification are problems for the philosophic arts. In philosophic inquiry they assume fixed meanings and functions. Examination of other philosophies reveals their ambiguities in the different methods by which the different ends of different philosophies are achieved. Yet they have a character as arts which provides the common problems of philosophic inquiry and the connecting links for philosophic discussion; and they isolate topics which start new turns of themes, initiate new perspectives and new ambiguities for discussion, and set new problems for inquiry.

The ambiguities of «demonstration», «verification», and «justification» are apparent in the philosophic semantics of ordinary and technical usage. Demonstration is a process of proof from immediate or axiomatic premises in logic, mathematics, or science; it is a manifestation of feelings and convictions by an individual or a group; it is an exhibition, portrayal, or presentation of what is the case and what are the noteworthy characteristics of a situation, occurrence, or object; it is verification or justification by verbalization or activization. Verification is the communication to another of the reasons for crediting conclusions from experience or knowledge; it is an investigation of grounds in fact, probability, or scientific law for descriptions or explanations; it is an analysis of the relations of consistency, relevance, and appropriateness of statements in exposition, narration, or inference; it is demonstration or justification by establishment of applications in things and convictions in minds. Justification is a defence or condonation of oneself, one's attitudes, or opinions; it is a proof of theses, hypotheses, or positions questioned or rejected or a refutation of arguments against them; it is an adjustment or arrangement of things or parts of things in coherent, well-proportioned wholes; it is demonstration or justification by presentation or performance. There are arts of demonstration, verification, and justification in each of these senses as well as in the many senses which emerge from

merging two or more of them and from further differentiating among them.

The ambiguities of philosophic semantics provide the materials of controversy in philosophic inquiry. From the standpoint of the meanings given to demonstration, verification, and justification in any one philosophic position, the processes followed and the results alleged in other philosophies use badly organized and unreliable methods to arrive at meaningless results in resolution of misconceived problems. The ambiguities and the controversies are the materials which are woven into themes by the philosophic arts, and the adjustments and borrowings of the philosophic arts therefore provide insights essential to an understanding of demonstration, verification, and justification. Any account of the origin and development of the philosophic arts, even brief accounts prefixed to new inquiries into science, logic, phenomena, experience, existence, or language, attest to their versatility as methods and their heterogeneous adaptability as devices.

The beginnings of the philosophic arts in the West are encased in a massive ambiguity. We have learned their names, their basic distinctions, and their methods from Aristotle. Moreover, Aristotle claims or implies immodestly that he originated all or most of them and that he worked at best on the lisping anticipations of his predecessors: he first distinguished the causes systematically and completely and, since we know when we have discovered the cause, it follows that he originated scientific method; he first analysed and formulated the parts, the structures, and the objectives of logic; he concentrated attention on the essential part of rhetoric, arguments or persuasions, which were omitted by his predecessors. He was convinced that each science has its own peculiar subject-matter, method, and principles. In many of his scientific treatises he therefore first examines previous theories dialectically; then he makes a new beginning and methodically investigates the problems of the science and verifies his conclusions; finally, he makes use of causes to adjust what has been shown to be the case and the properties and functions of things to the broader context of the problems of adjacent sciences and of the cosmos. This conception of the philosophic arts contains the reasons for Aristotle's criticism of his predecessors: the dialectical

definitions of Plato reduced all things to thoughts or ideas; the physical definitions of Democritus reduced all processes, including thinking, to things and motions of things; the eristic of the Sophists reduced all thoughts and things to connections and interpretations of words. Once the results of inquiry have been established by the methods of the sciences — theoretic, practical, or productive — they can be reformulated, organized, and tested by the universal analytics of logic. Aristotle also distinguished and laid down the procedures of two other universal arts, which did not apply to the particular subject matters or problems of the sciences: dialectic or the method of treating the opinions of men to establish one opinion and to refute opposed opinions; and rhetoric or the method of treating the convictions, interests, and feelings of men to move and persuade particular audiences.

Despite its clarity and its crucial position in the history of thought in the West, Aristotle's conception of demonstration, verification, and justification does not throw much direct light on the history of the development of these arts employed to achieve them in their various senses, because the influence of his distinctions was slight, and his arguments and arts were adjusted and interpreted to support the methods and conclusions he opposed. Historians of philosophy from the first have been amused or offended by his *hubris*: they found the beginnings of science in the Presocratics, Pythagoras, Plato, or Democritus; they found the distinctions and devices of logic in the Eleatics, the Pythagoreans, the Sophists, and the Socratics; they adjusted Aristotle's rhetoric to that of Isocrates with little attention to argument or persuasion. His commentators practised the universal arts, not the particular methods of the Aristotelian sciences: from the time of the Greek commentators, who were Neoplatonists, to the time of Brandis, Jaeger, Burnet, Taylor, Ross, and Cherniss, who saw Aristotle as a Platonist, they have been dialecticians; during the Renaissance when Medievalism was invented and discovered, and when philosophy and culture were refurbished, the task was done by rhetoricians who gave rhetorical force to their interpretation by the thesis that Aristotle had enslaved men's minds for two thousand years; with the coming of modern science and the impact of scientific method on philosophers, Aristotle's critics have been

physical scientists or philosophers of science who continue the dialogues of Galileo against the restated errors of Aristotelian science.

Since the theme of the development of the philosophic arts has evolved in the reinterpreted terms and the rediscussed distinctions of Aristotle, the influence of Aristotle on the meaning and methods of demonstration, verification, and justification can be seen more clearly from beginnings in his treatment of methods in the universal arts than in methods of the sciences. One of the paradoxes in the evolution of the themes of philosophic discussion is that the universal arts which were distinguished by their differences from the scientific methods, have repeatedly been transformed into methods of scientific discovery and proof; and scientific questions have taken on new meanings relative to new subject matters by transforming moral ends in action into scientific objectives in inquiry and proof or into esthetic insights in statement and communication. The ambiguities of methods in interpretation are a source of fruitfulness in their adaptations as well as of stagnation in their repetitious uses. Since the methods of rhetoric were not adapted to characteristics of subject-matter treated, Aristotle distinguished them according to the audiences addressed. Political rhetoric is addressed to assemblies or individuals faced with problems of policy or mode of life; it employs devices of exhortation and dissuasion to determine the expedient or useful and the harmful in future behavior. Forensic rhetoric is addressed to judges and juries in accusation and defense to determine the just or right and the unjust in past actions. Epideictic rhetoric is addressed to a general public in praise or blame to mark the honorable or good and the disgraceful in present records of accomplishments and of recognized values. By the time that Cicero reformulated these distinctions, they had acquired three names — deliberative, judicial, and demonstrative — which became fixed as three universal methods in the developing art or science of discourse, the *ratio disserendi*. The commonplaces of the themes of these methods grow out of consideration of deliberation (or decision-making), judgment (or criticism), and demonstration (or exhibiting) as methods of applying reason to the problems of science, art, and action.

Deliberation takes its meanings in a context of choice and decision. It treats of means, not of ends which are determined by wishes, with the possible influence of prudence and wisdom. Its subject matter is utilities — moral, political, and social — in matters whose issue is indeterminate or uncertain. When deliberation becomes a universal method, it is not restricted to the subject matter of practical action but determines all subject matters. All questions are matters for deliberation and decision, and all matters are uncertain and indeterminate. Probability takes the place of necessity and certainty. Deliberation extends to ends as well as means and to the issues of science as well as those of policy. Deliberation is a kind of weighing; it is disputation, which is a kind of calculating. When subject matters are determined by communication and discourse, ends are found in the opinions and feelings of those who enter the disputation, and the method of deliberation is to discover means to realize those ends. Deliberation is involved in the future of planned actions or predicted outcomes. The better course of action or the truth is set forth as some one's conception or conviction, and the scientist establishes his truth as the moralist or statesman establishes his policy or morality, by exhortation and dissuasion consisting of statements of what is the case and predictions of what will be the outcome if events are left to themselves and if other sources and influences are brought into play. Deliberation has become a universal method of science, art, and action.

Judgment takes its meanings in a context of definition and opposition. It is an estimation of persons in the light of their actions and accomplishments and of things in the light of their qualities and effects, with the possible influence of sensibility and taste. The judge or the critic pronounces on things done and things made in matters which affect the interests and pleasures of others. When judgment becomes a universal method, it is not restricted to subject-matters under the jurisdiction of courts of law or under the scrutiny of aesthetic criticism but determines all subject matters. Judgment becomes the synonym of proposition, and any statement about any subject is a judgment. A thing or event is what it is judged to be until the judgment is invalidated. The judgment of common opinion and of experts extends to manners and morals,

to persons and values, to facts and truths. Judgment is a kind of pronouncement or sentence for or against, and the methods of securing judgment are methods of attack and defense. Oppositions of judgment are oppositions of controversy, a kind of turning against, which are resolved by securing agreement on one of the opposed judgments. When subject matters are determined by communication and discourse, what is just and right extends its meaning from the determinations and judgments of law, to custom and accepted determinations of what is and what should be. The laws of nature are likewise judgments, and the history of science is a series of controversies resolved by successive judgments of scientists. Judgment is involved in the past of actually formulated views and hypotheses of facts judged relevant. The method of the philosopher, the scientist, the politician, the critic, and the molder of common opinion or received doctrine is to invalidate opposed judgments and to test his own judgment by considering all attacks by which it might conceivably be falsified. Judgment by the tests of falsifiability has become a universal method of science, art, and action.

Demonstration takes its meanings in a context of inquiry and presentation, of principles and consequences. It seeks to set up principles which are unquestionable and to derive inferences that follow necessarily from them. The proofs of mathematics and physics have long provided the models of demonstration. The subject-matter of demonstration is knowledge well enough established to be set down in formal proof. *Mathemata* meant whatever is learned, in Greek educational theory, before the mathematical sciences were separated from other learning to provide the model structure of learning. When demonstration becomes a universal method, it is not restricted to the subject-matter of quantity or of mathematics but extends to and establishes all subject matters. Learning begins in experience as well as in postulates and axioms, and all structures, including those of mathematics, can be exhibited by ordering as well as be constructed by deduction. Demonstration is a kind of discussion, a breaking asunder or distinguishing by analysis and synthesis. When subject matters are determined by communication and discourse, structures and sets are found in any organized wholes encountered in statement. De-

monstration is involved in the present formulations of what is and has been and will be, and in present formulations of values brought to bear in ordering these structures. It is the method of forming lawlike statements and of applying them to actual states of occurrence and circumstance; it is the establishment of what is thought to be the case, relative to what is conceived to be value. Demonstration by exhibition of facts and values has become a universal method of science, art, and action.

Discourse takes its being and its meanings in a context of deliberation, judgment, and demonstration. When they are universalized as methods of science, art, and action, discourse is their embodiment. It constitutes or constructs their media of communication and expression; it discovers or creates their subject matter; it sets or expresses their objectives; and it establishes or applies the criteria of their success. The intelligible structure of the universe and the objective structure of thought have been transformed into the consequential structure of discourse. The sequences and consequences of things, thoughts, actions, and statements are inseparable, and they establish connections between fact and theory, fact and value, fact and fiction, fact and non-existent, which in turn make the connections of sequences in discourse possible and intelligible. There is no pre-established priority of being, cause, or rule among things, thoughts, actions, and statements; each in turn may be made fundamental in deliberation or judgment or demonstration. Speculation concerning discourse must avoid the fixities of categories, doctrines, methods, and assumptions which discourse assumes in any one form of philosophy or inquiry, if it is to include all the forms which discourse takes in philosophy and in inquiry, action, and production. This is possible because the variety of categories or elements is approached in discourse by way of common topics or «commonplaces»; the variety of facts or statements of what is the case by way of common hypotheses; the variety of arts or methods of treating problems by way of common themes; and the variety of assumptions or principles by way of common theses. In what follows, the nature of demonstration, verification, and justification will be sought, first, by examining some of the commonplaces or structures of meaning which underlie and connect the particular positions taken with respect to

common ambiguous problems, and which make discussion and continuity of discussion possible; and, second, by tracing the perspectives in which common questions take on particular forms in the lines of discourse when theses are accepted and are employed as principles with consequences in thought, action, and statement and therefore in occurrence.

One of the functions of commonplaces is to determine what discourse is about, what the subject matter of inquiry, discussion, and controversy is. When Aristotle tried to fix the subject matter of the theoretic sciences by listing four scientific questions, the distinctions he made were broadened to provide commonplaces for all subjects, processes, and functions. Whether a thing or occurrence is ? what it is ? how it is characterized ? and what its cause is ? became the basic questions about the nature of things in medieval metaphysics and science, and the basic issues of decision and debate in Roman rhetoric and law. Their remnants are in modern speech: we still use «quiddity» in answer to the question, what ? and «quality» (a linguistic innovation of Cicero) to answer the question, of what sort ?; and one medieval philosophy invented «anity» to name the answer to the question, is it ? and «curity» to name the answer to the question, why is it ? In legal rhetoric the questions become the stages of establishing a case or a «cause» rather than the steps in discovering an essence or in grounding a scientific demonstration in a «cause». The «conjectural» issue is a question of fact, did the occurrence take place and was the accused present ?; it is followed by the «definitive» issue, what is its name ?, the «general» or «qualitative» issue, what is its genus or characterizing quality ?, and «translative» issue, under what law or before what court shall it be judged ? that is, who is competent to determine the case. The structure of things and the structure of thought are assimilated to the structure of discourse and of presentation, and the four questions are transformed in their continuous but ambiguous history from questions adapted to subject-matters to questions for the resolution of any problem or for the accomplishment of any purpose, including the total and integrative relation of all problems and all experience. The transformation may even seem to be a substantive philosophic innovation for the questions are no longer questions of

essence and cause but questions of process and structure in which essence and cause survive as anachronisms or figures of speech. Discourse is not about actual, potential, or imaginary things, nor about being or becoming, nor about necessary, probable, chance, or impossible occurrences: the subject of discourse is the possible, and the realm of universal discourse is the omni-possible.

Since discourse is not differentiated into kinds by its subject-matters, the second function of commonplaces is to distinguish the purposes which discourse serves and the means by which it achieves the values to which it is addressed. When Aristotle separated the methods of the universal art of rhetoric from the characteristics of particular subject-matters and related them to audiences, the distinction of three ends of persuasion which he made was broadened in later discussion and speculation to provide commonplaces for all values and for all activities in pursuit of values. The end of political rhetoric was the expedient or the useful and the inexpedient; the end of forensic rhetoric was the just or right and the unjust; the end of epideictic rhetoric was the honorable or the good and the disgraceful. When rhetoric is distinguished from ethics and politics, as it was by Aristotle, questions concerning what is desired as useful, what is accepted as just, and what is praised as honorable can be distinguished from what is desirable, what is just by nature, and what is good in itself. But when the method of rhetoric becomes the universal art of discourse, one deliberates not only about means but also about ends; one judges not only according to what is accepted but also according to what is acceptable because it is a source of pleasure; and one demonstrates or exhibits not only what is praised but also what is praiseworthy and good in itself. The «useful» (*utilia*) and the «good» (*honesta*) not only provided the matrix for Kant's treatment of moral imperatives, and the commonplaces for the opposition between utilitarianism and the morals of synthetic *a priori* categorical imperatives, but also, with the «right» and «pleasure» of judicial rhetoric, a structure of commonplaces for the whole of moral and political philosophy and for the relations of theoretic and practical philosophy. We still treat questions of the good and the right, of the good and the useful, of disinterested and interested pleasures, of values and existence; and questions of the useful and

pleasure, the right and good are transformed in their continuous history from limited or arbitrary ends to the ruling purpose of any process and of all experience. The transformation again seems substantive, for the question of fact is separated from the question of value, and the question, what is it ? is balanced, not by the question, why is it ? but by the questions, what should be and why should it be ? The ends of discourse are not superimposed *a priori*, or by tradition, or authoritative revelation: the inclusive objective of discourse is the desirable, and the realm of the ends of discourse is the omni-desirable.

The determination of subject-matter and the ends of discourse, of the what and the why, raise questions of fact and existence, of the what sort and the whether. The third and the fourth function of commonplaces is to find general qualifications of facts when facts are universalized and all-inclusive, and to formulate the marks and tests of existence among all existences. Beginning from Aristotle's rhetoric, rather than from his metaphysics, deliberation is concerned with what is useful in policy for the future, and deliberative proof is not distinct from exhortation and dissuasion; judgment is concerned with what is just in punishment and reward for past actions, and judicial proof is not distinct from rectification and differentiation; demonstration is concerned with what is honorable for praise and criticism of present agents and personalities, and demonstrative proof is not distinct from securing agreement and esteem. When deliberation becomes a universal method, planning and prediction as a method of determining what should be is transformed into definition and prediction as a method of determining the nature of existent things and processes. When judgment becomes a universal method, refutation and defence as a method of determining how past actions should be rewarded or punished is transformed into falsification and defense as a method of determining whether formulated statements should be credited or discredited. When demonstration becomes a universal method, devaluation and estimation as a method of establishing what is honorable or dishonorable in the accomplishments and character of present agents is transformed into alienation and estimation as a method of achieving more goods for more people. The facts of the future, past, and present are known in example and predic-

tion, in argumentation and falsification, and in maximization and estimation. We still differentiate past determinancies and future contingents, but we make them both relevant to present processes. The change seems substantive, for the perspective of the present enters not only into the determination of simultaneity, priority, and posteriority of observed past, present, and future facts, that is, into when they are, but also into the determination of what they are, how they are qualified, and why. The facts of inclusive discourse are seen and presented as present facts, and the realm in which they evolve and take form is the omni-present.

A fourth function of commonplaces is essential, once discourse has supplanted metaphysics and epistemology as architectonic methods, for when facts of existence take the place of principles of being and indubitable truths, they take on the characteristics of being and truth, and become at once inclusive and the basis of discrimination. Marks and tests of existence are needed to move and think and communicate within the totality of all existences. No questions arise unless there is an answer to the question, is it ? Whether it is or is not, the methods of examining «it» are not unlike the methods of metaphysics and epistemology, for they continue the same commonplaces. The transcendentals of the Middle Ages were predicated convertibly of each other: whatever is is a thing, a something, a unity, a true, and a good. So too, to run through the commonplaces of discourse which we have examined, whatever is alleged to be fact may be analyzed to determine what it is, how it is qualified, and why the results of these analyses may be presented as warranted. Whatever is is desirable, if only because whatever is came to be and continues within structures judged to be right, and what is provides the beginning point and grounds for modifications and innovations in the structure of what is and of what is right. Whatever is is a connecting link between what was and what will be. Discourse as an inclusive whole provides the system within which facts and values are stated and determined. An initial immediate experience is a confused whole from which selections and simplifications are made in perspectives determined by attention and interest. They are stated in particular propositions and generalized in universal propositions. They fit into a compendent whole or are isolated into irrelevancies; they

are ordered in inferential sequences or are opposed in contrarieties or contradictions. Neither existence nor experience is *ab initio* an ordered whole of constituted facts or of spaced or sequential events. Occurrences, observations, errors, illusions, and fictions are all facts; and errors are sometimes as illuminative of experience as controlled, well-grounded experimental observations. A coherent system of relations may cease to apply to relevant facts, and an incoherent, opaque system of variables may be reinterpreted to become relevant and fruitful. The change seems substantive since we have abandoned the revealed verities of theology and the self-evident truths of metaphysics and have sought models in the new authoritative paradoxes of mathematics and of relativity physics and quantum mechanics; but we have learned to be comfortable with the paradoxes of facts and the coincidence of contradictories in experience without building the inclusive structures of facts which explain and justify the contradictions. The facts of inclusive discourse are existential facts, and the realm in which are ordered in lines and hierarchies of influence and reaction, dependency and rule is the omni-existent.

The commonplaces provide the linkages of communication and the sources of innovation. Discussion and inquiry are possible only when questions are ambiguous, for no problem (except problems of fact) is posed by questions which have a single interpretation and simple univocal answers. An ambiguous question may be interpreted in different ways to constitute different questions about the same concrete but general experience; and those different unambiguous questions are relevant to different aspects of the experience, constitute different facts, and provide different data to be explored and used by different arts and methods. The lines of discourse are continuities of a sequence and consequence bound by coherency and directed to novelty. Since the questions of communication and discovery are ambiguous, the arts of discourse and inquiry, which disclose and organize facts, explore orders and connections in which they return one on another, and the themes which they develop borrow matter and method from different disciplines and find their continuity in common ambiguous questions faced in thought, action, and art. The arts, thus, are formative and creative; they have natural bases and ordered natural

contents; they embody and express values and achieve purposes; they raise problems and have consequences. Again, the emotions presented and produced by poetry are in turn subject of inquiry and use in psychology, ethics, and rhetoric, and each of these arts has borrowed nomenclature, description and analysis from the others. Philosophy is a systematic ordering of lines of discourse into perspectives.

Philosophic analysis of discourse may take its perspective from discourse itself. The intelligible structure of discourse is at once a structure of symbols related and transposed, of actions performed or projected, and of things signified and ordered. The frameworks of things, thoughts, actions, and symbols are assimilated in the common framework of discourse. When dialectic was the method of metaphysics or epistemology, the assimilation was to being or ideas, but the dialectic of discourse is an assimilation to concrete facts and contextual statements structured in processes rather than in essences or concepts. Facts have their meaning and existence in structured wholes of which they are interpreted parts. Statements have their references and consequences in structured discourses of which they are constituent parts. Facts reflect or approximate the ordering principles which give them form; they are orderings in a manifold, and they are adjusted to the environing circumstances and conditions in which they develop and evolve. They are formulated in lawlike statements and described in narrative statements. Statements of fact reflect the interests and information of the agent or formulator and the values and opinions of his culture; and scientific, historical, and mythical statements of fact supplement and reinforce each other. Discourse is a structure of systematization, argumentation, proof, and discovery, and each of the four structures take many forms because the arts by which they are developed are commonplaces. To examine the interrelations and interplays of the modes of discourses is to assimilate them into discourse and to treat discourse in the perspective of systematization.

Philosophic analysis of discourse may take its perspective from the known and from conditioning circumstances. Facts are known facts; and since known facts present problems which vary with circumstances, they orient inquiry to the unknown. The scope

and significance of problems expands as problems are solved and as the body of stated and known things increases and is ordered. The perspective of discourse is determined by the structure of emerging problems and hypotheses for their resolution. When logic was a method of definition and demonstration, of terms and rules by which to relate them, the resolution of problems was an ordering of variable and constant terms, but the logic of discourse is a resolution of problems of communication in which the definition and structure of symbols, the nature and functions of things, the character and intentions of agents, and the available knowledge of facts and relations are all structures of fact and statement, and in which consequences are established in historical narration, creative imagination, and purposive action as well as in symbolic implication. Facts are encountered and stated; and the adequacy of their statement is tested by comparing the consequences anticipated in statement with the consequences observed in occurrence. The method of deliberation is generalized from planning policies of action to predicting continuities of process and function. It includes the anticipations prepared in literature, music, and the arts, the expectations established in experimentation and theory, and the inferences and porisms grounded in logic and mathematics as well as the outcomes forecast or projected in practical action. Discourse is a sequence of assumptions and consequences, of observations and expectations. To treat discourse in the perspective of known facts and conditioning circumstances is to treat it by the method of deliberation and verification.

Philosophic analysis of discourse may take its perspective from the knowable and the underlying nature of things. Facts are the data of experience and the evidence for the structure of elements, which in turn provide the grounds and explanations of facts and their relations. Proof is a synthesis of elements of discourse, and it is a synthetis of elements of the subject-matter of discourse. The verification of proof depends on the double movement by which conclusions are related to the elements or principles on which they depend, and elements are related to the facts of experience from which they are derived. The Greeks used a single word, *stoicheion*, for the letters of the alphabet, the elements of physical nature, and the fundamental principles of mathematics and proof. When

grammar was a linguistic method of constructing and analyzing statements and discourses, the constructions of things, of attitudes, and of proofs were ordered and examined by different grammars analogically related to the grammar of the discourse in which they were expressed; but the grammar of discourse is a vocabulary and syntax in which the construction of character and thought, of occurrences and sequences, of responses and style are inseparable from the construction of periods and the literature of communication. The method of judgment is generalized from the debates of law and the interpretations of criticism to include all analytic judgments of appropriate elements and all synthetic judgments of plausible consequences. Judgments of science, art, and action are based on analyses of facts and syntheses of elements, judged basic to the facts, into conclusions judged consequential on the elements. The element of debate which is prominent in judgments in law continues in the expansion of judgment to all discourse, for the test of a judgment is by placing it in the context of alternative judgments and by trying all means of refuting and falsifying both the opposed judgment and one's own. Discourse is an organized series of judgments set forth to secure credit concerning what is judged and consensus in the judgment expressed. It is justification of purposes and attitudes, of appreciations and interpretations, of facts and conditions as well as of statements of fact and of regularities of occurence. To treat discourse in the perspective of the knowable and of nature and human nature is to treat it by the method of judgment and justification.

Philosophic analysis of discourse may take its perspective from the agent or knower or speaker. Facts are discoveries or inventions or innovations to be demonstrated or shown to others. The intelligible structure of the universe or of discourse, the known and the objects of inquiry, the unknown and the objects of experience are all facts discovered and made, or to be discovered and to be made. When rhetoric was a method of speaking to arouse passions and create attitudes, the art of invention was an art of forming arguments, but the commonplaces and topics of rhetoric have been extended in the rhetoric of discourse to the discovery of things and of arts as well as of words and ideas. Commonplaces have provided patterns, structures, and matrices subject

to heuristic interpretation and application. The method of demonstration is generalized from the deductions of scientific proof and the manifestations of display oratory to include the exhibition of any structure particularized to any constants — the exhibitions of poetry and propaganda, of power and protest, of skepticism and proof. Demonstration as establishment of conclusions and certification of facts, demonstration as manifestation of convictions and advocacy of actions, and demonstration as stimulation of pleasure and inducement to adherence have modified and supplemented each other in the demonstrations of discourse since structures, things, and objectives are all projections and inventions in the perspective of the agent. The demonstrations of discourse are discussions which supervene in and transform the disputations of deliberation and the controversies of judgment. Discourse orders all experience into a series of manifestations which are the facts and meanings and values of communication. It is demonstration as designation, definition, and proof; as acquaintance, appreciation, and criticism; as reaction, connection, and integration. To treat discourse in the perspective of the agent or knower is to treat it by the method of demonstration.

There are sequences and consequences in things, thoughts, language, and action. At times in the history of the West they have been treated, in the dominant interests and in the philosophy of the times, as structures of communication; In Rome the structure of legal rhetoric provided commonplaces and methods which were extended to all problems. In the Renaissance the structure of a rhetoric of criticism of art and culture provided methods of innovation and demonstration that moved from the fine arts to the problems of science, society and religion. Today the structure of the rhetoric of communication and decision-making is in process of constructing universal arts of life and knowledge. Law and the fine arts become universal arts of discourse and communication, and we have recognized that universalizing tendency by seeking our art not in the practical or the poetic but in the scientific, by making a science of art, a *logos* of *techne,* and naming it ambiguously «technology». When discourse is a universal art, it is a matrix from which an indefinite number of patterns may be derived, and those patterns may be viewed from the point of view

of the audience, the subject matter, or the agent of communication. Each perspective isolates a form of discourse, which is distinct from the others in methods and history, and which none the less may dominate and transform the others and assume their functions. The use of discourse as an inclusive structure, therefore, introduces flexibility while retaining methodological precision; it opens up dangers, repetitions, rigidities and wandering ambiguities. Deliberation is verification, not only in the sense of establishing propositions as true of what is the case and of what will happen, but also of planning action and policy, of communicating reasons for conclusions and evaluations, and of establishing satisfactions and enjoyments. Judgment is justification, not only in the sense of establishing the right or wrong of an action, but also of defending a position and belief, of extending and applying an interpretation, or of adjusting a thing to a context. Demonstration, finally, as manifestation, exhibition, or portrayal, has become an architectonic art, an art of arts. We verify and justify by demonstrating, and in so doing we exhibit the structures and unity of discourse. We move commonplaces from one mode of discourse or discipline to another, and we trace the lines of discourse according to the perspective selected; but the assimilation and discrimination are both achieved by demonstration, for they are achieved from the perspective of the agent who makes them.

University of Chicago Richard McKeon

R. McKeon

Since my communication has been printed and distributed, I shall not go over what it contains. Instead I shall try to expound the structure of its argument. This will permit me to achieve two interrelated purposes, suited to a mixed audience which has before it material evidence of what is being said: (1) I shall assume that some of you have already read the paper, more or less recently and with varying degrees of interest and attention, and I shall therefore not repeat what has already been said, and (2) I shall also assume that some few of you are looking at the paper for the first time, and I shall therefore

call your attention to statements and places in the paper in order that you may be able to ask questions and enter into discussion of the issues that are raised without detailed knowledge of the arguments by which they are raised and treated.

When I first read the three words which announce the subject of our conference — demonstration, verification, justification — they seemed to me clearly to be the three dimensions of discourse. Discourse consists of words; it is about things; it expresses thoughts. Demonstration proceeds deductively from stated principles or assumptions to inferred conclusions; verification is confirmation of statements by observation of facts; justification is communication to secure agreement concerning ideas expressed. This initial distinction was quickly shown to be inadequate, however, since in ordinary usage and in technical analysis each of the three words takes on the functions that I had assigned to the others. The ambiguous merging, moreover, is as important as the definite distinction. Therefore, I show how "demonstration", "verification", and "justification" have proper meanings and how they are broadened to universal meanings which assimilate all functions of meaning, reference, and communication, by increasing the scope of the methods of discourse distinguished in the initial definitions. Each of the three successive sentences in which this amplification is analyzed (p. 39) is made up of four parts: in the first clause a proper significance is given for the term; in the second and third clauses that meaning is broadened to apply to the subjects proper to the other two terms; in the fourth clause the manner in which those subjects are assimilated to the functions which define it is stated. Thus, in the case of justification, I first define it as "a defence or condonation of oneself, one's attitudes, or opinions"; second, I give the meaning of justification which approximates that of demonstration: "it is a proof of theses, hypotheses, or positions questioned or rejected or a refutation of arguments against them"; third, I go on to the meaning of 'justification' approximating verification in that it is applied to things rather than to ideas or statements (a meaning which we tend to forget in thinking about justification), the justification of lines of type in printing, or the justification of the moving parts of a machine: "it is an adjustment or arrangement or things or parts of things in coherent well-proportioned wholes"; fourth, the adaptation of the methods of justification to these assimilated functions is re-

marked: "it is demonstration or verification by presentation or performance".

The three words refer to distinct functions of discourse or language. Each of these universal functions has assumed a universality of application which includes the matters treated under the other functions. Since the changing meanings and applications of these terms of art are themselves instances of discursive or linguistic phenomena related to those treated by the methods which they name, the examination of demonstration, verification, and justification begins properly with the problems of their ambiguity and definition. I therefore examined the methods by which such problems are treated, I distinguished four methods and chose one of them. I called the study of the different meanings which have been given to "demonstration", "verification", and "justification" and of the different organizations, functions, and devices assigned to them in those meanings, "philosophic semantics". The examination of demonstration, verification, and justification univocally in one meaning chosen among those that have been used or are possible uses, the choice of one of the processes as fundamental and explanatory of the others, and the investigation of problems and applications within one set of meanings fixed by that selection, I called "philosophic topics". The development of an inclusive theory to bring demonstration, justification, and verification together and to relate them to the problems of philosophy, I assigned to "philosophic inquiry" or "philosophic systematization". Finally, examination of the practices, arguments, and myths associated with the three processes, which interact and influence each other in discussion and history, I classified as "philosophic arts".

Semantic discussion of what men have said is opaque and puzzling if unfamiliar meanings are not clarified and applied by the philosophic arts; *topical* discussion of particular questions and subjects and of common assumptions and beliefs are unclear and indistinct if unspecified issues are not stated and examined by the philosophic arts; systematic *inquiry* builds rigid theoretic dogmas if the possibility of other principles and methods is not revealed by the philosophic arts. The philosophic *arts* are instrumental and propaedeutic to topics, semantics, and inquiry, and they provide critiques of unexamined priorities and fixities, empty formal abstractions, and accepted sectarian certainties. I therefore decided to examine the arts by which demonstration, verifi-

cation, and justification are practiced, that is, to study the ways in which they acquire ambiguous interconnections, in common practice, and influence each other, in particular meanings given to them, in contemporary discussion and in the history of their development. The theme of the development and interrelations of the philosophic arts provides the context and delimitations which define demonstration, verification, and justification. The theme as I trace it through its variations, in historical development and in contemporary controversy, is embodied in accounts or instances of the intertwining of particular methods (adapted to particular subject matters and to particular objectives) and universal arts. Aristotle distinguished the methods of the theoretic, practical, and productive sciences from the universal arts of logic, dialectic, and analytic. His analysis provided a vocabulary for later discussion of the sciences and arts but did not fix the organization of sciences and arts, for the methods of the sciences were generaliezd to provide a "scientific method", and the universal arts were particulariezd to provide methods of discovery, proof, prediction, and system. We are still involved in a characteristic variation on the theme of methods and arts: thirty years ago we argued for a logic without commitment to ontology or metaphysics; now we use our ingenuity to construct logics of the concrete or the existent, of the experienced, logics of concrete facts without formal or universal structures. Metaphysics is still out, but discourse and culture have assumed the structuralizing functions of metaphysics. In recognition of this organizing function, I have added "discourse" to demonstration, verification, and justification, and I treat the art of "systematization" with the other three arts.

Aristotle had distinguished three forms in the universal art of rhetoric: political, forensic, and epideictic rhetoric. The three kinds of rhetoric became the particular "methods" of deliberation, judgment, and demonstration, while retaining their character as universal arts. I trace the differences and interpenetrations of demonstration, verification, and justification from these arts (pp. 42-46). Deliberation (or decision-making) is *verification*: deliberation took its beginning as a universal art of choice and decision among future moral, political, and social utilities, and became a universal method applicable to all subject matters, transforming all questions into questions of probability, subject to *disputation* or weighing, and transforming all general state-

ments of law into predictions to be tested by the occurrence or non-occurrence of consequences sought or anticipated. Judgment (or criticism) is *justification.* Professor Klibansky pointed out, this morning, the derivation of justification from the law courts. It has a parallel derivation from literary criticism: in antiquity the κριτάι were "judges" or "critics" not only of crimes and civil processes, but also of literary productions and works of art. Judgment or justification took its beginning as a universal art of passing on opposed views of past actions and of produced objects, and became a universal method of judging debatable issues in all subject matters, transforming all questions into debates, subject to resolution by *controversy* or turning against, and transforming all statements into true or false statements, statements of what is or is not the case to be tested for approval or condemnation by examining possible falsifications. We sit in judgment upon our own statements and those of others: we refute statements or allegations which we oppose, and we test our own statements by constructing arguments in opposition to them. Demonstrations have retained the name *demonstration,* but the transition of demonstration from universal art to universal method is exhibited, or demonstrated, by the meanings of that word, for to demonstrate is to manifest, to show, to point out: in the universal arts of analytic and rhetoric it is to show by arguments or to prove a conclusion for knowledge or conviction, and it became a universal method of manifesting anything — an attitude, a need, a conviction, a policy — for approbation or disapproval, in all fields, transforming all questions into subjects for *discussion* or shaking loose.

I have added discourse to demonstration, verification, and justification, because discourse itself is a universal art, and it relates the other universal arts which function as universal methods to each other and to the universal subject matter of experience and existence which these methods set up and share. Discourse is a method of ordering in all dimensions. It is an analysis of systems as structures of process and formulation. It is an art and method of *systematization* conceived and used, not as an organization or tabulation of defined data and established facts but as a *ratio disserendi,* an ordering of possible accounts from conceivable beginnings and materials to necessary or possible consequences and conclusions, structured by principles of organization not only of the verbal form of scientific theories and imaginative

formulations but also of sequences and relations of occurrences and actions, sequences and relations of sense, imagination, and emotion, as well as of reason, adaptable to all matters of inquiry and information, transforming all questions into the flow of *dialogue,* systems analysis, or cybernetics.

The methods of discourse have broadened with the broadening of demonstration, verification, and justification. Demonstration means today not merely logical demonstration but any mode of manifestation and ostentation — theoretic, emotional, or sensational — and the broadening meaning of demonstration affects the devices and varieties of logics. The methods of rhetoric have once again been adapted to logical categories, statements, and argumentation. Verification means today not merely confirmation of statements of empirical experience by statements of what has been ascertained in fact to be the case but any account or narration which sets forth a sequence of occurrences, thoughts, or feelings with conviction and authenticity. The methods mythological and artistic authentification have once again been adapted to logical categories, statements, and argumentation. Justification means today not merely judgment of issues to be resolved or of objects to be evaluated, but any presentation of an alleged fact or a proposed value and any form of language used to make such presentations. The methods of speculative and universal grammar have once again been adapted to logical categories, statements and argumentation. Professor Klibansky referred to universal grammar as it was conceived in the Middle Ages and remarked that we would blush today to think of a universal grammar. That was true until recently when Noam Chomsky and his associates have sought to supplement inadequate particular, structural grammars by constructing a universal grammar and a lexicon of language. The old universal grammar tended to adapt the syntax of Greek and Latin to other languages; the new universal grammar sets up the structure of any language.

I proceed in my analysis (p. 45) to bring the schematisms of demonstration, verification, and justification under the organizing principles of "systematization". To emphasize the different processes I give fixed technical meanings to four terms proper to the four functions: "topics" or "commonplaces" to order and relate the variety of categories or elements; "hypotheses" to order and relate the variety of facts or statements of fact; "themes" to relate the variety of arts or

methods of treating problems; "theses" to order and relate the variety of assumptions or principles.

Having made these distinctions, I undertake to examine the nature of demonstration, verification, and justification by using two of the four schematisms (pp. 45-46): (1) "commonplaces" or elements of meaning (pp. 46-50), and (2) "theses" or principles of organization. (pp. 51-54). The method which I used is adapted to the ambiguity which I early remarked in the definition and use of the three terms under discussion. I set up a matrix to establish the distinctions of possible meanings. It is a four-quadrant matrix, and the fourhold distinctions are therefore ordering principles of possible meanings of terms defined by four variables — things, thoughts, actions, and words — and are not to be attributed to the nature of being, of thought, of action, or of language independently or objectively. The argument of the two inquiries runs through the same four quadrants in opposite directions, first from topics or elements to wholes, then from theses or ordering principles to parts.

The inquiry concerning the topics or elements of demonstration, verification, and justification (pp. 46-50) is an investigation into what they are about. Discourse is not dfferentiated into kinds by pre-existent subject matters to which it is adapted: subject matters are constituted in the discourse in which they are stated. The universal arts which were transmuted into universal methods of discourse lay out the scope of discourse to cover whatever is experienceable, dividing the data of experience according to the three tenses of verbs and times, united as the total data of experienced existence. In order to describe these data, I followed the example of the Stoics, who coined the term "omni-present" to signify the universal scope of the present of discourse, and I have coined three similarly constructed universal terms. The "omni-present" is the tense of statements in which we speak of the past, present, and future in present discourse, and the «omni-present» achieves universality with respect to the "omni-possible", the "omni-desirable", and the "omni-existent". (1) Discourse is not about data once experienced, now experienced or about to be experienced; it is about omni-present data which are used to answer the question, is it ? (2) Discourse does not describe facts that have already occurred or have already been constituted; it is about omni-possible facts which are used to answer the ques-

tion, what is it ? (3) The values stated or to be achieved in discourse are not values which will be established as values or will eventuate in fact in the future; they are omni-desirable ends and objectives used to answer the question, of what sort is it ? (4) The interrelations of experienced data, existent facts, and purposive arts and methods are not determined by structures of being or schemata of thought; they are the omni-present principles of positions establishing orders of discursive systems used to answer the question, why ?

The inquiry into the theses or ordering principles of demonstration, verification, and justification (pp. 51-54) is an investigation into the perspectives or orientations which distinguish them. There are four perspectives of discourse, and I treat them on the matrix used to distinguish the elements of discourse, but in reverse order, from the wholes to the parts of discourse. Philosophy is a systematic ordering of lines of discourse into perspectives. It may be ordered from any of the four elements of discourse. (1) Philosophic analysis of discourse may take its perspective from discourse itself. The intelligible structure of discourse is a structure of symbols, actions, thoughts, and things. When the frameworks of things, thoughts, actions, and symbols were assimilated by dialectic, the assimilation employed a metaphysics of being or an epistemology of thought, but the dialectic of discourse is an assimilation to concrete facts and contextual statements structured in processes and formulations rather than in essences or concepts. To examine the interrelations and interplays of the modes of discourse is to assimilate them into discourse and to treat discourse in the perspective of inquiry and systematization. (2) Philosophic analysis of discourse may take its perspective from known facts and conditioning circumstances. The logic of discourse is a resolution of the problems of communication in the light of consequences of symbols, actions, intentions, and things .To treat discourse in the perspective of known facts and conditioning circumstances is to treat it by the method of deliberation and verification. (3) Philosophic analysis of discourse may take its perspective from knowable matters and the underlying nature of things. The grammar of discourse is a vocabulary and a syntax which reflects the characteristics of subject matters, thinkers, agents, and languages. To treat discourse in the perspective of the knowable and of nature and human nature is to treat it by the method of judgment and justification. (4) Philosophic analysis of

discourse may take its perspective from the agent or knower or speaker. The rhetoric of discourse is an art of invention or discovery of structures and laws of things, of arts and arguments, of facts and truths, and of words and elementary data. To treat discourse in the perspective of the agent or knower is to treat it by the method of manifestation or demonstration.

The central place of discourse — of the arts of communication and decision making — in the treatment of problems today gives it the force of a new architectonic art which transforms the methods of inquiry and discussion in all fields. The philosophic analysis of discourse may contribute to this process and clarify the problem of philosophy and culture, by transforming the traditional processes of discussion, controversy, disputation, and dialogue, giving them a positive function in increasing understanding among divergent approaches, rather than advancing the claims of one point of reference, and opening up an ongoing inquiry into new problems, rather than pointing inquiry to establishing the unique truth of one set of doctrines and conclusions.

A. Joja

Avant de présenter quelques suggestions au rapport de M. McKeon, permettez-moi de me reporter au discours de M. le Professeur Philippe Devaux. Il se félicitait qu'après le Congrès de Logique, de Méthodologie et de Philosophie des Sciences qui a eu lieu à Amsterdam, on ait convoqué ici un séminaire philosophique. Je crois à ce propos rappeler qu'en logique c'est un peu comme dans l'art: les différentes visions qui se succèdent au cours des temps n'annulent pas les visions précédentes, la vision par exemple de Shakespeare ou de Baudelaire n'annule pas la vision de Sophocle ou d'Homère. La vision de Sophocle ou d'Homère reste entièrement valable. Si la même chose se produit en logique, je crois que les différentes visions de la logique qui se sont produites au cours des temps restent valables parce qu'elles reflètent un point de vue de la pensée humaine. J'apprécie hautement la logique symbolique, mais je pense qu'à côté de la logique symbolique il y a place pour la logique aristotélicienne, pour la logique stoïcienne et pour la logique médiévale parce que chacune de ces logiques reflète

un aspect de la multiplicité de la pensée humaine. Je crois que la logique aristotélicienne est même la *logica perennis*, car elle fournit le fondement de toutes les logiques. Pas possible de faire de la logique, même de la logique symbolique sans présupposer la logique d'Aristote. En sorte que je suis très heureux de participer à ce séminaire consacré à la logique philosophique.

En passant maintenant au rapport du Professeur McKeon, je dois dire que je suis un interlocuteur improvisé parce que j'ai reçu l'invitation du Congrès deux ou trois jours avant la clôture du Congrès d'Amsterdam et comme mon pays, la Roumanie, a eu l'honneur d'être choisie comme le siège futur du 4e Congrès de logique, de Méthodologie et de Philosophie des Sciences, il va de soi que je n'ai pas eu le temps nécessaire de mettre de l'ordre dans mes pensées. Cependant M. McKeon me permettra de formuler quelques suggestions que m'a inspirées son rapport qui est très riche en suggestions, qui a touché à beaucoup de plans. Je ne prendrai que quelques aspects du problème. M. McKeon traite du discours, du λόγος. C'est le λόγος qui chez les Grecs signifie à la fois parole et pensée et qui même chez les Grecs, surtout chez les présocratiques signifie quelque chose de plus, signifie la constitution interne, la loi des phénomènes. C'est dans ce sens qu'un des présocratiques les plus illustres dit γενόμένων πάντων κατὰ τὸν λόγον τὸν δὲ car toutes choses arrivent suivant cette raison, suivant cette loi. Le discours a des manières différentes de s'exprimer, si j'ose ainsi dire, c'est la démonstration, c'est la vérification, c'est la justification, et même M. le professeur McKeon traite de la rhétorique et de l'art poétique. Il rappelle à ce propos un passage d'Aristote dans la *Poétique* où il dit que la poésie est plus philosophique φιλοσοφώτερον que l'histoire. Pourquoi ? Parce que tandis que l'histoire raconte des choses singulières, des choses qui sont réellement arrivées, τὰ γενόμενα, la poésie raconte des choses universelles, des choses sous leur aspect typique, des choses qui auraient pu arriver (ὗραὰν γένοιντο). Il m'est impossible de m'arrêter sur tous les points, mais je crois qu'il y a une ressemblance entre les différentes façons de produire la certitude dans la démonstration, la vérification, et la justification, bien qu'elles touchent à des points différents. En effet, qu'y a-t-il de ressemblant entre ces aspects, entre ces arts du discours ? C'est que tous procèdent d'un point pour aboutir à un autre, mais diffèrent profondément. Je dirais même qu'il faut faire une distinction entre démonstration et preuve.

Je crois que le Vocabulaire de Lalande l'a déjà fait. La preuve n'est pas la démonstration. Par exemple, je passe dans la rue, un accident survient, j'ai un appareil photographique, je prends une photo. C'est évidemment une preuve, mais ce n'est pas une démonstration. Je puis aussi produire, d'une manière rhétorique la conviction dans l'âme de mon auditeur. C'est évidemment une conviction, mais ce n'est pas une démonstration parce que *c'est* un syllogisme, un raisonnement rhétorique. Je puis aussi par une série d'expériences personnelles arriver à une certaine conclusion. Je puis accéder à une certaine intuition moi-même. Ce n'est pas une démonstration, c'est une expérience personnelle, intime, qui a des points de ressemblance avec la démonstration au sens strict; mais ce n'est pas une démonstration. Je pense qu'on peut bien souligner les ressemblances entre les différentes sortes de discours, mais ce qui est très important, c'est de souligner surtout leurs différences spécifiques. Ce sont toutes des espèces du genre λόγος, mais elles sont différentes. La démonstration telle qu'elle a été définie par Aristote (et le professeur McKeon s'est heureusement beaucoup rapporté à Aristote, car Aristote reste notre source commune et notre source universelle). C'est le discours qui nous fait connaître par la cause. Aristote dit dans les *Analytiques* — Aristote n'emploie jamais le mot logique qu'en un sens péjoratif, spéculatif, abstrait au mauvais sens du mot — que savoir ἐπιώτάσθαι, c'est connaître par les causes, c'est connaître les causes, c'est connaître que la chose est telle qu'elle est et qu'elle ne peut pas être autrement qu'elle n'est, c'est-à-dire qu'elle est nécessaire. Comme vous le savez tous mieux que moi, c'est l'universel et l'essentiel qui est la marque de la science. *Scientia est universalis et per necessaria*; la science est universelle et elle s'exprime par des propositions nécessaires. Naturellement, c'est là l'idéal de la sience, en ce sens que la démonstration est coextensive à la science et toute science est démonstration. Naturellement, Aristote admet aussi la démonstration *ut plurimum,* la démonstration de ce qui arrive le plus souvent, mais il n'admet pas de connaissance selon l'accident. La démonstration doit donc s'effectuer par le syllogisme scientifique ἐπιστημονικὸς συλλογιμός, le syllogisme qui produit la science parce que toute démonstration est science, parce que toute démonstration est syllogisme, mais tout syllogisme n'est pas science. Je dis qu'il faut faire une distinction très nette, il faut souligner les aspects ressemblants de la démonstration, de la vérification et du syllogisme, mais je crois

qu'il faut surtout, et c'est cela l'essentiel, distinguer nettement les sens du mot démonstration. La démonstration agit par les causes et par les raisons. La démonstration est l'instrument de la vérité, la démonstration s'effectue par la connaissance des causes, du nécessaire et de l'universel, tandis que la justification n'agit pas de même. En effet, dans l'*Éthique à Nicomaque,* Aristote dit que les observations portant sur des points singuliers sont plus importantes que les observations générales. C'est le point de vue du moraliste. C'est aussi le point de vue du naturaliste. En éthique, ce qui importe, c'est surtout la saisie singulière des valeurs, et je pense que la justification porte sur les valeurs. C'est une espèce de démonstration, mais il ne faut jamais la confondre avec la démonstration au sens strict du mot, c'est-à-dire avec le processus dont parle le professeur McKeon, le *Discursus a quo, ad quem,* qui, de prémisses *falis exprimis* aboutit enfin à une conclusion nécessaire. Quant à la vérification, elle est absolument nécessaire, mais il faut dire que la vraie science, c'est la science déductive, la science analytique, mais que cela suppose la science assurée, que nous avons besoin d'expérience pour pouvoir vérifier nos prévisions. En sorte que je suis d'accord, au fond, avec le professeur McKeon que les arts du discours sont différents, qu'il y a des différences entre l'art du logicien, entre la science du logicien et l'art de l'historien ou du politique, entre l'art du moraliste, mais que tous ont certaines ressemblances. Mais je pense que ce qui est le plus intéressant c'est de noter les dissemblances. Je crois que Aristote, dans le *De Sophisticis Elenchis,* recommande d'observer toujours dans les choses ce qui est identique et ce qui est différent, de contempler ensemble l'identique et le différent, comme il le dit en grec συνορᾶν (voir ensemble) τὸ ταυτὸν καὶ τὸ ἕτερον (voir ensemble l'identique et le différent). Si l'on n'observe pas cette règle méthodologique, on risque de commettre des pétitions de principe. C'est une règle extrêmement importante. C'est le système idéal, mais la science moderne a rendu possible la construction en mathématique ou bien en logique symbolique ou bien en physique de systèmes hypothético-déductifs, systèmes dont on déduit la validité par la vérification des conséquences. C'est une grande conquête de la science moderne mais cela ne change pas les choses: c'est la science catégorico-déductive qui est l'idéal de notre savoir, mais aujourd'hui, parce que nous avons la possibilité de faire des expériences, de vérifier nos hypothèses, nous employons aussi et surtout le système hypo-

thético-déductif. J'ai voulu seulement remarquer que ce problème est extrêmement intéressant mais que ce problème comporte à la fois dissemblances et ressemblances et que, suivant les consignes d'Aristote, il faut συνοραν τὸ ταυτὸν καὶ τὸ ἕτερον, voir ensemble, voir à la fois l'identique et le différent.

R. McKeon

I want to thank Professor Joja for his reflections on my paper. I followed with great interest his exposition of the basic distinctions made by Aristotle concerning demonstration, verification, and justification; and I agree with everything that he said in exposition of the position of Aristotle. The purpose which I set myself, however, was not to present and develop a "thesis" — the thesis of Aristotle or of any other philosopher or even a thesis of my own — but to follow the evolution of "themes" in which theses influence and transform each other. The advantage of considering the themes within which "demonstration," "verification," and "justification" acquire a variety of meanings is that interpretation is not limited to one aspect of discourse, and alternative uses of "argument" which do not fit one's thesis are not marked off automatically as erroneous or defective.

There is a difference, Professor Joja points out, between demonstration and proof. A photograph is a proof of an occurrence; it is not a demonstration. But both "demonstration" and "proof" are ambiguous words: "demonstration" is not limited to deductive inference from universal certain principles, and "proof" is not limited to empirical evidence of particular contingent occurrences. A demonstration is a manifestation, including a deductive theoretical manifestation; a proof is a testing, including an empirical phenomenal testing. Marks on a photographic plate are used for demonstration and for proof in quantum mechanics. The relation between demonstration and proof in the history of thought and of representation cannot be reduced to any one of the theses that have-been advanced about them: demonstration and proof are not mutually exclusive contraries; each may be treated as a species of the other, but they are not univocally related as genus and species; they are not overlapping species of a higher genus;

they are aspects or functions of discourse disclosed variously by discourse as it is employed under that aspect in exercise of that function. Each of these perspectives is set forth in the thesis which fixes that perspective, and in each perspective (or philosophical orientation) the theses of other perspectives are restated and rejudged.

Opposed theses are aligned against each other in the controversies of philosophy. Professor Joja reminds us that science is necessary. But the discoveries and laws of science are only probable, not necessary, according to opposed interpretations of science. Both theses are intelligible, defensible, and useful; and they must be given a place in the theme of the development of science and the philosophy of science. Professor Joja says that science is knowledge of causes. But "cause" is also an ambiguous word: it means the reason for a thing or a process, but it also means, in Greek, Latin and many modern languages, an issue under dispute. When I plead a cause in a law court, I present one side of an issue. "Cause" undergoes an alteration as theme from "reason" to "case."

Professor Joja limits "justification" to the consideration of values. I have used it to apply to the consideration of matters treated in demonstration and in science. A similar ambiguity weaves the theme of demonstration and justification, for scientific demonstraton is a manifestation of truths, and truth is a value judged by evaluative justification. Finally, Professor Joja expounds demonstration in terms of the demonstrative syllogism of formal logic, whereas I use deduction as only one variety of demonstration. Cicero influenced the West profoundly when he named what Aristotle called "epideictic" rhetoric, "demonstrative" rhetoric. One manifestation of this change in the Roman Empire was the Second Sophistic, a flamboyant movement in which the method of philosophy and of science as well as the method of literature and of oratory was derived from the Sophists rather than from the philosophers who refuted the Sophists. But the second century A.D., the century of Ptolemy and Galen, was also a time of advance in empirical sciences. In the continuing history of demonstration the meanings and the methods of demonstration have been derived no less from rhetoric than from logic, and we are still involved in the ambiguities and controversies of that relation. Fundamentally there is no conflict between two cultures such as has

been reported from Cambridge, England; two modes of demonstration were merged a long time ago and a long series of battles of the books has resulted from the opposition of theses propounded to secure sovereignty over the combined domain. Science is an art, and art states scientific truths in the general theme of the development of art and science.

J. THEODORAKOPOULOS

I should like to make some remarks concerning the notion of indication or indicative *logos*. It is necessary, I believe, to distinguish between different kinds of *logos*. Demonstration, about which we are discussing, is a kind of logos, a system of logos. The Ancient Greeks distinguish three kinds of logos: the first one is ἀποδεικτικός logos i.e. demonstration. The second kind of logos is the ἐνδεικτικός logos; we would say indicative or something similar. There is also a third kind of logos the ἐπιδεικτικός logos, or, as we may say, the rhetorical logos. The only kind of logos which uses demonstration is, I think, only the ἀποδεικτικός logos. The other two kinds are *logoi* also but they don't have what we call demonstration; they only try to explain or to present different things. The problem, in my opinion, is now to explain where we find the logos ἀποδεικτικός. I think, we do find it in science, only in science, that means in mathematics and mathematical physics. Only in these sciences we have demonstration. On the contrary there is no demonstration in history. In history we can try to explain facts but we cannot demonstrate facts. There is, I think, the second kind of logos which we call indicative, in history. But what happens in philosophy ? Because here also we are speaking about demonstration, but I don't think we have demonstration in philosophical logos. In philosophical logos we have another kind of logos, the dialecticos logos or the dialectics. Here we have a series of thoughts, a system of statements, but we cannot demonstrate the way we do in science. So, I think, it is necessary to distinguish all these kinds of logos, ἀποδεικτικός ἐνδεικτικός, ἐπιδεικτικός and dialecticos logos which is exclusive of philosophy.

J. HYPPOLYTE

C'est en écoutant M. Joja qu'une objection m'est venue à l'esprit. Vous avez assimilé les notions de démonstration, de nécessité et de vérité. Et vous nous avez dit ensuite que dans le monde moderne nous avions affaire à un système hypothético-déductif beaucoup plus qu'à un système catégorico-déductif, mais que l'idéal de la science n'avait pas changé pour cela, il était catégorico-déductif. A mon avis, il y a quand même une rupture profonde entre l'impossibilité d'édifier un système catégorico-déductif et cet idéal aristotélicien dont vous avez parlé, et il me semble que ça modifie la notion même de démonstration, la technique d'une démonstration, pour lequel le mot démonstration n'a peut-être plus le sens imagé qu'il possède dans le mot français «démonstration»; je crois que vous avez assimilé un peu vite la démonstration technique moderne et la démonstration aristotélicienne, parce que vous avez pensé que l'idéal de la science était le même, ce dont pour ma part je ne suis par sûr.

A. JOJA

Je n'ai jamais trouvé une autre définition valable de l'idéal de la science que celui édicté par Aristote et qui vient d'ailleurs en droite ligne de Platon et la saisie de l'universel parce que même l'universel n'est qu'un aspect de la nécessité et de l'essentiel. Une chose est nécessaire parce qu'elle est essentielle et puisqu'elle est essentielle, elle est universelle, mais je reconnais franchement qu'il y a une différence essentielle entre le système catégorico-déductif et le système hypothético-déductif, mais je crois que l'idéal d'universalité est resté l'idéal de la science et je crois que la science ne peut pas se dispenser de cet idéal.

A. J. AYER

Well, not for the first time at these meetings I find myself a little bit lost. I don't really quite know what we are discussing, outside the field of Aristotelian scholarship, where I certainly wouldn't dare to venture in this, or in almost any other company. I think there is

perhaps a danger, in Professor McKeon's paper, of generalizing on too broad a scale, as in supposing there is something *"le discours"*, of which one can say that its subject matter is the possible, or that it aims at the desirable, or even more mysteriously at the only desirable. It is possible that I am misunderstanding McKeon, who may only be following out different themes, as in a musical tone poem, but, if one looks at the facts, one surely finds that people talk for all sorts of reasons, and about all sorts of things. They sometimes talk about what is possible, quite often about what is impossible. People often contradict themselves, sometimes they engage in reductio ad absurdum arguments, sometimes they tell fairy stories, where not too much attention is paid to possibility, even logical possibility, let alone factual. People make jokes, they talk to annoy other people, they talk because they like to hear the sound of their voices, they talk because they get tired of listening to other people talking. There are all sorts of reasons for talking which are very difficult to summarize in this sort of way. And even when it comes down to a special kind of discourse, the kind that mostly interests philosophers, narrative discourse, or meta-narrative discourse, that is to say talking about facts, or talking about what Peirce called the arrangements of facts, even then we tend to generalize much too quickly. For example, I think somebody has said "science aims at the universal". Well, this is true of physics, I suppose, at an advanced stage, but not necessarily true of geology. A geologist spends a lot of time, just minutely describing different stone structures. It is not true of anthropology. Since Frazer, anybody who ventures on a generalization gets kicked out of the club. Eventually perhaps, they hope to get at a generalization of some sort. One thinks that the interest of science must be to extrapolate. But taking physics as the model, I believe, often leads us astray. I think, generally, in philosophy, we are led astray by a kind of "deformation professionnelle". We want to fit everything into a neat framework: to say, for example, of science that just this is its object. Perhaps it is Aristotle who has given us the taste for this kind of essentialism. But ought we not at least to begin by looking at the facts ? How do these people talk ? What are their standards of proof ? What do they actually accept as proof ? The answers will not necessarily be the same, even for all scientists, let alone for scientists, historians, lawyers and logicians.

E. POZNANSKI

I think that one of the objectives of this discussion is to delimit the different provinces of the three terms we are discussing, demonstration, verification and justification. It has been pointed out that all these terms are ambiguous, close to each other, and stand in different relations. To give just an example: in a mathematical reasoning I am using a lemma. What is the *justification* for using it ? Because it is true. How I know that it is true ? Because there is a procedure of *verification* and I apply it. What is this procedure ? By *demonstration,* by showing that my lemma deductively follows from other already accepted axioms or theorems.

I would like to propose some delimitation of the different provinces to which these three terms can be applied, and I limit myself to logic. I would suggest that we use the term 'demonstration' as something which has to do with inference, with something following from something else. It may be deductive following — entailment, or inductive, like probable inference. As long as we speak about entailment or probable inference we do not deal with truth. We only show the validity of demonstration by recalling certain approved rules of inference. This is the first aspect.

The second aspect is verification. We are interested not only in the relationship between statements but would like to know whether they are *true.* There are, of course, different methods of verification, not only by demonstration, (i.e. the conclusion is true because the premisses are true), but also by evidence, perhaps by intuition, or by other approved methods. Verification deals with truth.

Now we come to justification. It does not deal either with inference or with truth. It deals with the validity of the rules and procedures which we apply. We speak, e.g., about the justification of induction, and ask what are the reasons for applying inductive procedures. We justify complicated deductive rules by going back to modus ponens or some other basic rule. We behave in a similar way outside logic, e.g. by looking for a justification of certain rules of moral or legal behaviour. We do not say about the rule that it is true or false, but that it is valid (or invalid), effective (or not effective), i.e. that there is some good reason for using (or not using) it.

If we are ready to accept the tripartite division of logical discourse

into syntax, semantics and pragmatics, I would say that demonstration is mainly a syntactical, verification — a semantical, and justification — a pragmatic concept.

M. BUNGE

I would like to remark that all three procedures — those of proof, verification, and justification — take place in scientific research. Thus certain theoretical statements, the theorems, are supposed to be both proved by rigorous logico-mathematical reasoning and verified, or rather supported, by experience. As to the axioms, although they cannot be proved they must be verified through their testable consequences. Furthermore, they must be justified as well: we must be able to show that they are not idle but necessary for some goal, that they are more suitable in certain respects than other possible axioms, that they cohere reasonably well with what is known, and even that they somehow agree with the dominant world view. Even in mathematics is such a justification called for.

T. KOTARBINSKI

Le rapport de Monsieur Mac Keon est extrêmement riche en contenu logique, et ce qui m'a frappé le plus c'est la déduction historique des notions de justification, de démonstration et de vérification. Et bien, puisque nous n'évitons pas un rappel de l'histoire dans la discussion et dans les rapports, je prends la liberté de rappeler la proposition de systématiser l'usage de ces mots faite par Łukasiewicz. Elle me semble être très simple: elle prend pour point de départ la relation logique de la conséquence logique.

Supposons qu'on cherche une conséquence logique d'une raison logique bien définie. Qu'est-ce qu'on fait alors ? On tire la conclusion tout simplement; mais, si on cherche la conclusion qui serait connue comme vraie, pour une raison logique donnée, qu'est-ce qu'on fait alors ? L'on parvient au résultat: on a trouvé une conséquence vraie d'une raison logique. Or, on a vérifié cette raison. C'est la vérification de la raison logique.

Qu'est-ce qu'on fait au cas où l'on cherche une raison logique vraie pour une conséquence donnée ? On démontre alors la conséquence. Nous avons ici la démonstration. Enfin, dans le cas où on cherche une raison logique quelconque pour une conséquence qu'on connaît comme vraie, alors on explique cette conséquence. Nous avons alors les expressions suivantes: démontrer, vérifier, tirer les conséquences et expliquer. Nous n'avons pas parlé de la justification. Łukasiewicz n'emploie pas cette expression, mais je crois qu'on pourrait l'utiliser en disant qu'on justifie la conclusion qu'on tire. C'est la première fonction qu'on a mentionnée. Si l'on tire la conclusion d'une raison connue comme vraie, on justifie cette conclusion.

J. HOROVITZ

I share Mr. Poznanski's opinion that our discussion would greatly benefit by concentrating upon generally accepted meanings of the basic terms. I second his proposal to consider demonstration as involving inference, and verification as primarily concerning the truth of an empirical statement. But I don't think justification should be construed as especially related to validity. As I see it, justification always has a mental attitude for its proper object. We justify, e.g., optimism, apprehension, a judgment, a resolution. True, we also speak of justifying a system or a hypothesis; but this is an elliptical way of speaking about justifying the acceptance of, or the adherence to, a system, a hypothesis, or the like.

The suggested assignment of demonstration, verification and justification to syntax, semantics and pragmatics, respectively, seems to me to require qualification. Each of the three processes has a pragmatical aspect as well as a logical one (I am using 'logical' for 'syntactical and/or semantical'). Though there may indeed be no semantical aspect in a demonstration, all three aspects are normally present in a verification or in a justification.

E. POZNANSKI

A few words to answer the remarks of Mr. Horovitz. First of all, I said at the beginning that I shall limit myself to the realm of logic.

Of course, one justifies one's behaviour, optimism etc. by giving reasons. But I am not certain whether we can speak about justification of behaviour etc. as a *logical* procedure except by stretching the concept of logic very far.

Secondly, it is well known that in demonstration or verification all three dimensions of a logical discourse are involved. If somebody demonstrates he *does* something, and in doing something a pragmatical aspect is involved. By the way, at the Amsterdam Congress a question has been formulated, but unfortunately not discussed, namely whether this tripartite division into syntax, semantics and pragmatics — while useful in many contexts — is perhaps not overstressed and in consequence some important problems are blurred or neglected. But it does not mean that for the sake of differentiating and delimiting our three concepts of demonstration, verification and justification, the parallelism with the three dimensions of logical discourses is misleading.

Let me give another characterization of our three concepts, by referring to their subject matter. I would say that demonstration has to do with *sentences* (sentences being considered as purely linguistic entities, neither true nor false). Verification deals with *statements*, which being meaningful are either true or false. Finally, justification deals with *rules* which like sentences — but for a different reason — are neither true nor false. They are valid or invalid. In justifying certain logical procedures we ask whether they are valid and what is the source of their validity. Justifying logical procedures is just one instance of the much broader concept of justification as used by Mr. Horovitz.

CH. PERELMAN

L'exposé de M. McKeon nous a frappés à la fois par sa richesse et sa difficulté. D'où vient cette difficulté ? Probablement de ce que les notions qui lui servent à élucider celles de démonstration, de vérification et de justification, telles que *existence, possibilité, désirabilité,* ne sont pas les moins ambiguës. Si on devait les repenser et les analyser à leur tour, on se lancerait dans une entreprise qui n'aurait pas de fin, mais, puisqu'il faut bien s'arrêter, c'est que les notions explicatives et qui ne sont pas expliquées doivent être acceptées d'un façon,

pour ainsi dire, intuitive, ce qui ne va pas sans un certain malaise intellectuel. Comment sortir de cette difficulté, qui nous plonge dans une perplexité méthodologique ?

Il me semble que la seule proposition raisonnable, après nous avoir familiarisés avec les diverses traditions philosophiques au sein desquelles ces notions ont été élaborées — ce qui nous rend conscients du fait qu'en philosophie les choses ne sont jamais aussi simples qu'on le croyait, dès qu'on les éclaire de plus d'un point de vue — serait de nous interroger sur les buts que nous poursuivons, dans notre propre effort philosophique, en reprenant ces notions à notre compte. C'est alors uniquement, tout en étant conscients de ce que nous adoptons une perspective particulière, que nous pourrions nous mettre d'accord sur le sens de ces notions qui correspond le mieux à la finalité de notre entreprise, et auquel nous devons nous tenir pour rendre notre discours intelligible.

J'ai d'autre part été fort intéressé par ce que nous a dit M. Joja de l'idéal d'une science catégorico-déductive. Mais une telle science, dont les points de départ et les techniques de déduction ne sont pas mis en doute recourt constamment, pour son fondement, à la notion d'*évidence*. C'est pourquoi sans doute, nous ne pouvons qu'être loin de cet idéal aristotélicien de la science, car tous nos problèmes et toutes nos perspectives philosophiques sont justement liés à l'abandon du critère de l'évidence: et c'est dans la mesure où l'entreprise philosophique ne peut pas se développer sous la garantie de l'évidence, que l'idée de justification devient importante dans la méthodologie de la philosophie.

Cette conclusion me conduit à la controverse qui a opposé MM. Horovitz et Poznanski à propos de la notion de justification.

Si les thèses philosophiques sont des thèses que l'on ne peut ni démontrer ni vérifier, faut-il leur dénier toute rationalité, ou peut-on, au contraire, montrer que la rationalité de l'entreprise philosophique est liée à la justification que nous sommes à même de fournir de l'adhésion à ces thèses philosophiques ?

En fait, comme l'a bien montré M. Poznanski, pour toute démonstration, il faut appliquer certains principes et certaines règles, mais dans la mesure où ils ne s'imposent pas à cause de leur évidence, il faut fournir des raisons pour les accepter: on arrive ainsi à la justification, comme à un préalable philosophique de la démonstration.

Trop longtemps les problèmes de la justification ont été traités comme ceux d'une démonstration ou d'une vérification imparfaite, indigne de la confiance du philosophe, ce qui a conduit au scepticisme ou à l'irrationalisme en philosophie.

Mais la justification ne concerne pas des propositions théoriques, ni leur vérité, mais des choix, des décisions, des actions ou une disposition à l'action. En traitant la justification, non comme un problème théorique, mais comme un problème pratique, on arrive au primat, en philosophie, d'une philosophie de l'action. Dans quelle mesure une philosophie de l'action peut-elle déboucher, grâce à une théorie élaborée de la justification sur une conception de la raison pratique, dans quel sens peut-on parler de la rationalité d'une justification ? Voilà, me semble-t-il, le thème fondamental par lequel nos Entretiens, partant des préoccupations classiques d'un congrès de logique et de méthodologie des sciences, à savoir la nature de la démonstration et de la vérification, abordent nécessairement le problème fondamental des rapports de la pensée et de l'action.

A. MERCIER

Ma première remarque concerne la controverse qui a eu lieu entre M. Joja et M. Hippolyte.

Comme l'a dit M. Hyppolite, nous ne pouvons plus considérer la science comme catégorico-déductive, mais M. Joja a raison, la seule définition possible de la science est celle qu'il a donnée.

C'est Einstein qui a éprouvé ce dilemme à notre époque de la façon la plus profonde et la plus constante puisque jusqu'à la fin de sa vie il a essayé de réaliser le rêve d'une théorie unitaire qui aurait inclu tous les phénomènes de la nature dans une seule formule gigantesque et qu'il est probablement mort avec le sentiment que la réalisation de ce rêve est impossible. S'il y était arrivé, il aurait, je pense, dû tirer la conséquence qui était pour lui une sorte d'espoir caché, qu'il avait donné une preuve cosmologique de l'existence de Dieu.

Ma seconde question s'adresse à M. Mac Keon parce que c'est lui seul qui a envisagé le problème de notre colloque dans tout son ensemble, alors que les autres orateurs s'attachent plus à des points particuliers. Dans son livre sur les mathématiques et la réalité, Gonseth a

expliqué que les mathématiques sont sorties de la réalité et qu'elles ont été abstraites du concret. Mais, il arrive assez vite que la mathématique tout entière, y compris, si vous le voulez bien, la logique, acquière une autonomie qui lui donne le caractère exceptionnel d'être ce que j'appellerai «la puissance pure». La mathématique est une puissance, elle est même la puissance pure par excellence.

Je poserai alors à M. Mac Keon une double question: comment se peut-il que la mathématique acquière cette autonomie et cette puissance pure, qui est plus puissante et plus pure que la puissance de n'importe lequel des tyrans de l'histoire et comment expliquer que, par là même, la mathématique possède cette vertu démonstrative contre laquelle personne n'oserait s'insurger ?

R. McKeon

Professor Theodoracopoulos analyzed "indication" as an element in my analysis of demonstration. He pointed out that "discourse" is "logos" in Greek, and he differentiated three kinds of "logoi" which are characterized in their modes of "showing" by adjectives formed from "deiktikos" (able to show, or to indicate, or manifest): "apodeictic logoi" or demonstrations, "endeictic logoi" or indications, and "epideictic logoi" or rhetorical displays. He argues that apodeictic demonstrations are used only in science, in mathematics and mathematical physics. History makes use of endeictic but not apodeictic logoi. Epideictic logoi are used in rhetoric. Professor Theodoracopoulos adds a fourth kind of logoi which are not "deictic" or indications, for philosophy uses arguments which are not apodeictic, endeictic, or epideictic but dialectical. These are extremely enlightening distinctions, but they cannot be made into rigid oppositions: even Aristotle calls rhetorical enthymemes "apodeictic logoi", and Plato explores complex relations between philosophical logoi and historical mythoi. The history of scientific proof runs through all four logoi. Professor Theodoracopoulos' excellent distinctions may therefore be used to clarify what I mean by a theme by "showing" the theme of the development of the relations among the four logoi in the interpretation of Aristotelian logic and therefore in their bearing on "demonstration" as scientific proof.

The distinction of the kinds of arguments or logoi entered into the tradition of discussion in Western Europe late. During the early portion of the Christian period, logical theory was based primarily on Aristotle's *Categories* and *On Interpretation,* which were given a dialectical coloring and development under the influence of Porphyry's *Introduction* and Boethius's account of the "topics" of Cicero and Themistius. Aristotle's *Prior Analytics, Posterior Analytics, Topics,* and *On Sophistical Refutations* (the four books of the *logica nova*) were translated in the twelfth century. The principles of scientific proof were not sought, after Aristotle's treatises on demonstrative, dialectical, and sophistical principles were available, in the "demonstrative" arguments treated in the *Posterior Analytics* but in the "dialectical" arguments of the *Topics* (as in the case of Abailard) or in the "indicative" arguments of the *Sophisms* (as in the case of Adam of Balsham). During the thirteenth century the "demonstrative," "necessary," "certain" principles of scientific proof were expounded in commentaires of the *Posterior Analytics* by the proponents of the *logica antiqua,* while "dialectical," "probable," "contingent" principles and "indicative," "referential," "sophistical" (paradoxical) principles took their place in the *logica moderna* of the dominant terministic logics and also of the speculative grammars. One of the subjects treated among sophisms was "motion". The treatises *De Motu* devised mathematical-descriptive methods with denominative or indicative principles which are continued and modified in the transition from logical discussions of hypothetical physical problems to the beginnings of substantive kinematic physical theory. Scientific principles were sought in dialectical analysis of the probabilities of common opinions and common experiences and in sophistical analysis of the paradoxes of immediate experience and the conflict of impressions rather than in demonstrative deductions from certainties. Scientific "demonstration" was based not on universal certainties of nature and being, but on topical probabilities of occurrences and individual references to concrete facts.

This is the *theme* of "demonstration". Professor Theodoracopoulos has set forth the *theses* which are distinguished and then merged in the development of that theme, even in its early stages, and more complexly and ambiguously in its later stages. The mergings should

be examined not only as errors (as they are in the controversial phases of the history) but also as sources of new ideas, new interpretations, new discoveries, and new sciences.

M. Hyppolite reproaches me for hasty assimilation and generalization. He points out that the categorico-deductive demonstration of Aristotelian logic cannot be assimilated to the hypothetico-deductive demonstration of modern science and logic. I did not assimilate the two senses of demonstration; I distinguished them and raised the question of the application of "demonstration," in these and other senses, to a single problem. Two people, treating a genuine, identifiable problem, and even a scientific problem, may apply different methods and come to conclusions which may in turn be subject to discussion. The common *theme* enters the discussion because of the common subject matter treated, despite ambiguities resulting from the different approaches to it. This is, once more, the difference between a theme and a thesis. I argue that if we could manage more frequently to talk about the subject or the problem before us, instead of talking about the presuppositions or assumptions of those who hold other positions or assert other theses about it, if we could direct our argument to analyzing the subject matter rather than to converting an opponent to our philosophy or to imputing to him an error which follows from our assumptions but not necessarily from his, we would engage in discussion rather than controversy. I do not seek to assimilate the two kinds of demonstration; I seek to focus them on common problems.

Professor Ayer expressed wonder and confusion at the discussion of "discourse" which I have undertaken, and he then made use of my distinctions of situations, orientations, and questions in discourse to demolish "discourse" and its themes, theses, methods, and topics. This is an instance of the exchange of courtesies which Professor Ayer and I go through constantly under the guise of philosophical discourse. Our difficulties and achievements in communication may therefore be used as an example of "discourse". Almost every time Mr. Ayer stands on his feet and discourses, I say to myself "that's false" (he usually says of my discourse "that's nonsense"). Then I go on, to myself, "but that is probably not what he meant"; and then, "possibly this is what he meant"; and then, "if, by any chance, it is what he meant, it is interesting; but he didn't follow through its implications." This is the model of my discourse with myself about

Mr. Ayer's discourse. As philosophic discourse goes, I find the sequence stimulating.

Mr. Ayer's objection to my discourse about discourse is that talk about anything like discourse is an excursion into vague generalities. This would be true of I had tried to examine discourse *per se* as an entity. It would be true if I had developed a thesis about the nature of discourse. What I did, however, was to explore discourse as a theme, in which people come together and develop different positions in different ways. If I may borrow Professor Ayer's formulation of a "project" — what we ought to do — this is what I think we ought to do in discussing demonstration, verification, and justification: we ought to examine them as forms of discourse, as ways in which different people talk about different matters in different circumstances to different audiences. We ought to listen to Professor Ayer, in spite of the nonsense that he sometimes talks, not to discover a model of discourse set in the skies, but to improve our own discourse in the light of insights and truths that would not have occurred to us without the impact of his approach and his discourse.

Mr. Poznanski suggests that we limit our discussion to specified meanings of the three terms we are examining and to specified provinces (in particular, to parts of logic in a specified orientation) to which they apply. Once more, let me recall to mind the differences which underlie the opposition between the pursuit of precision and the examination of ambiguity. The only possibility for discussion arises in ambiguity, and the only purposes served by discussion are either to remove the ambiguity by agreeing on a univocal statement of its solution (in the course of the discussion showing other statements to be false or irrelevant) or to clarify alternative statements of the problem and its solutions and to examine possible mutual influences and enrichments resulting from setting them in relation to each other. Discussion and inquiry flourish on ambiguity. If, at the beginning of our conference, we had agreed to use the three words in the same senses and with the same references, there would be no discussion. Discussion occurs when the same statement is made, and it is discovered to have different meanings; or when the same situation or occurrence is considered, and it is described in different ways; or when the same ideas are propounded in different formulations and

with different applications. Discussion is sometimes fruitless, but it frequently has fruitful results.

Professor Poznanski proposes a differentiation in which demonstration, verification, and justification have distinct logical meanings corresponding to the provinces of syntactics, semantics, and pragmatics. This proposal illustrates the structure of variations on a theme perfectly. The terminology and the distinctions were borrowed by the logical positivists from Peirce. But the meanings of the terms and the uses of the distinctions in Peirce's analysis are almost totally different, apart from a continuity of logical structure, from the meanings and uses of the logical positivists. To note this fact is neither criticism or reproach: the logical positivists have made a fruitful use, in a variation on a theme, of distinctions which had been put to other uses in other meanings. My appeal to consider broad themes has been in the hope that we might increase mutual understanding and put differences to fruitful uses before we settle down to our familiar and comfortable univocities. Apart from the lure of this hope, I have two arguments against making the discussion neater by restricting it to three well defined provinces.

First, one may establish or recognize established usages in grammar, but one cannot legislate uses in philosophy or even in the broad field of philosophical logic. You will remember that at the beginning of my talk I noted three apparently clear meanings of demonstration, verification, and justification that seemed to mark off three dimensions of discourse. They are not unlike the three meanings Professor Poznanski proposes. I abandoned them because I found that they were involved in paradoxes. The paradoxes were not of my invention. When I began to encounter paradoxical meanings and uses, I borrowed a technique practised as a philosophical method at a great English university: I used a dictionary. After I had assembled a variety of meanings, I took the precaution of consulting the Oxford English Dictionary, partly because its citations are richer and more diversified than those in other English dictionaries, and partly because I have suspected that Americans do not appreciate some of the niceties of ordinary English because they are adjusted to the meanings of ordinary American. The themes of changing meanings are in the language, and there is no effective way of saying to speakers of ordinary language, or of different languages, including different philosophical languages, "bear

in mind the differences of syntactics, semantics, and pragmatics when you use or hear 'demonstration,' 'verification,' and 'justification' ".

Second, the history of thought, including the history of the development of the most precise sciences, is full of illustrations of ideas and methods which have jumped the carefully constructed fences designed to contain them. Language provides traces from the themes of the experiences of mankind in the meanings given words; the records of inquiry provide themes of discovery and proof borrowed from unrelated bodies of knowledge and translated to other definitions and transformed to other applications. Discoveries have been made by the heterogeneous application of formulae and by the heteronomous juxtaposition or extension of fields. A formula applied to a problem for which it was not constructed may, on first examination, make nonsense; it may, step by step, turn attention to unconsidered aspects of the problem; it may, finally, break the whole structure of the previous analysis and open up new lines of inquiry. I value precision in statement and communication, but I urge the consideration of ambiguities which may lay the basis for reorientation of inquiry and prepare for precision in the statement of new conclusions.

Professor Bunge showed clearly the fashion in which demonstration, verification, and justification are used, all three, in the natural sciences and the social sciences. The "human sciences" and humanistic "knowledge", in the inclusive sense of poetry and the arts, as well as history and the interpretation of art and culture, might be added to that list. Professor Bunge's interpretation has reopened the flexibility of the processes of discourse, but his restriction of his statement to the field of science carries with it the temptation to narrow "scientific method" to lines fixed by theses concerning what the scientist "actually" does. The ambiguity of the theme serves as a corrective to the rigidity of an imposed thesis. Thus, the one limitation which Professor Bunge acknowledges to the symmetry which he expounds is that the statement of a theory, the postulates of a system of proof, cannot themselves be proved. This is true if the axiomatization is conceived logistically, but when the inquiry or the proof is forumlated dialectically, axioms or postulates may be proved by the same method as is used in deriving conclusions from them as axioms and definitions. In dialectic, demonstration may begin at any point, and to prove a principle, as Hegel remarked long ago, one must make a different

beginning by choosing a different principle, with proper dialectical verification and justification, for the dialectical demonstration. The dialectical method is not frequently taken into account in Anglo-American theories of the philosophy of science, but there are many scientists in the world who use dialectical methods and use "demonstration" in their establishment of principles and theories.

Professor Kotarbinski gives me an opportunity to expand the historical dimension of my analysis. In my exposition I avoided historical derivations of themes to concentrate on theoretical questions and controversies prominent in present-day discussion of demonstration, verification, and justification. They have their origin in earlier theories and distinctions, and issues frequently arise from ambiguities and associations buried in the complex of acquired meanings and half-forgotten uses. The interpretation of the history of thought, however, is not a subject for fruitful discussion in a room which has no books, and therefore I undertook to treat the changing meanings of demonstration, verification, and justification formally by "justifying" the meanings and references by the uses and references of the terms as themes moving from subject to subject rather than by citing authors who use them in the respective senses and applications. Professor Kotarbinski has called to mind Łukasiewicz' treatment of systematization. His use of systematization in differentiating systems of logic and in treating the history of logic may be extended to expand my reasons for introducing "discourse" and "systematization" as a fourth term in the discussion of demonstration, verification, and justification.

I said in my preliminary presentation that I added "discourse" to the three terms of our discussion because I thought it was important to consider the "systematizations" of the three processes of discourse relative to each other if we wished to clarify the processes themselves. Systematizations provide ordering principles in discourse not only for individual terms or words but also for the variety of meanings and references which they assume, not only for the sequences and consequences of implication and inference but also for description, narration, exposition, amplification, and other forms of discursive development, not only for systems of demonstrative and inductive logic but also for the varieties of analytical logics, rhetorical logics, grammatical logics, and dialectical logics.

Professor Kotarbinski "systematized" the uses of demonstration,

verification, and justification by examining the logical relations of logical consequences. The process named by each of the three terms consists in seeking a logical reason for a given logical consequence. In seeking reasons for consequences, one may work back and forth, seeking in turn reasons for demonstration, for verification, for justification, and for systematization, in any sequence. Professor Kotarbinski closed his remarks by observing that when one treats of more flexible relations than those of logical reasons and logical consequences, the same method may be used more flexibly. Łukasiewicz' systematization provided the method of constructing logical systems by providing logical reasons for logical consequences. Even within the field of logical relations it can be used more flexibly if the consequences and relations developed in one mode of logical analysis are set up in juxtaposition with those developed in another mode; examination of them in juxtaposition and relation may lead heuristically to the discovery of other consequences and relations, or to the borrowing and transformation of reasons and methods and to the development of new consequences and interpretations to give new life to structural relations which retain their validity but have been worn bare and sterile by repetition. I have, however, extended the scope and flexibility of systematization further by going beyond logical relations into regions of ambiguity. This wandering from the narrow preserve of logical relations permits me to return to Mr. Ayer's suggestion that if we are talking about discourse, we can talk about anything whatever: the possible and the impossible, sense and nonsense, jests and serious matters. Such latitude is desirable, even when one considers serious matters and logical or scientific relations, for it is not impossible that a jest, in the midst of a serious scientific discussion, may turn our thoughts in a new direction, open up new consequences, and even lead to new systematizations. This is the reason why I argued that discourse, as a theme, includes epics, mathematical systems, physical systems, debates, court decisions, systems of law, conversations on the street, and even that kind of "demonstration," which is resorted to more and more frequently today, in which people manifest their causes by marching, sitting, agitating non-violently on he edge of violence, obstructing, and reiterating.

The private dispute between Mr. Horovitz and Mr. Poznanski is a miniature illustration of the place of ambiguity in discussion. Mr.

Horovitz agreed almost completely with Mr. Poznanski. Like him he wished to banish ambiguities from the discussion by limiting its scope. He agreed with Mr. Poznanski's definition and application of demonstration and verification, but there remained a little ambiguity about justification which extended to a larger ambiguity concerning whether demonstration, verification, and justification could be made equivalent to the processes of syntactics, semantics, and pragmatics. Mr. Poznanski defended his interpretation. It was a proper and illuminating discussion, but they could not have had it if they had been in unambiguous agreement about their terms to begin with. Even within the limited range they set themselves, their discussion was a development of themes.

Professor Perelman complained that the discussion, although rich, is difficult to understand. He raises three questions with respect to this difficulty of understanding my analysis.

Professor Perelman's first question is based on the accusation — perhaps he meant it as a suggestion rather than an accusation — that I am trying to create a philosophic perplexity. He is correct in his accusation. The Greeks thought that philosophy begins in wonder, and perplexity is an avenue to wonder. I have no objection to being detected in the enterprise of arousing perplexity. Professor Perelman suggests that I might (and do) use the same analytical method not only on "demonstration," "verification," and "justification" but also on other concepts, such as "possibility," "existence," "desirability" and indeed on any philosophic concept. This is obviously true, since I have extended the analysis of the three terms to other terms which are used in defining them. The argument of my paper is constructed on a matrix: the terms demonstration, verification, justification, and systematization are first differentiated by means of the four quadrants of the matrix, and the further discussion of each term, and of all the terms used in expounding its meaning, is distributed into sets appropriate to the four quadrants. What is existence ? "Existence" has different meanings as it is used in defining, and as it is in turn warranted by, demonstration, verification, justification, and systematization. Demonstration has acquired a broad sense as "manifestation" of topics in which it is the method of discovering aspects of existence; this phase of the theme of "existence" throws light on the current interest in the logic of discovery. Verification has acquired a broad

sense as "interpretation" of hypotheses in which it is the method of determining true propositions about facts; this phase of the theme of "existence" throws light on the current interest in hermeneutics, on falsifiability as a test for hypotheses and on "objects" and "things". Justification has acquired a broad senses as "delineation" of themes in consequential communication and sequence in which it is the method of constructing structures of coherence and interconnection; this phase of the theme of "existence" throws light on the current interest in inductive logics and in law formulations which map out and predict existences. Systematization has acquired a broad sense as "organization" of positions or theses in which it is the method of taking into account overall co-variation and transformation; this phase of the theme of "existence" throws light on current interest in possibility and in "possible worlds". This last step in the transformation of "existence" brings it to the edge of the related term "possibility," which goes through like variations of meanings. In the light of this transition from existence to possibility, another reason may be added to my arguments for adding "discourse" to the other three terms, since the systematization of demonstration, verification, and justification reorients them readily from existence to possibility.

Professor Perelman goes on to seek reasons for exploring the structure of these changing meanings. A perplexity in a well-defined field is easily understood, but a perplexity which leaves no fixed meanings or references needs to be explained, if its purpose is more than merely to show that things are not as simple as they seem. I thought that I had explained the reason for the analysis I undertook. To put it in more explicit and more general terms, its purpose is to distinguish the task of stating and solving philosophic problems from the task of verifying and falsifying philosophic statements, that is, to separate philosophic inquiry from philosophic semantics. Communication in general, and philosophic communication more specifically and acutely, suffer from the difficulty that statements are based on concrete experiences and are about concrete existences, but they are necessarily selections from a richer diversified immediacy than they can express, and the words used to designate any property take on a variety of meanings and references. It is extremely difficult to consider philosophic problems without being sidetracked into consideration of what people say about

philosophic problems as contrasted with what we say and therefore what they should say. I have argued that philosophic semantics is a propaedeutic to philosophic inquiry. If it is used as a propaedeutic, in any case, it cannot be confused with, or be presented as a substitute for, philosophic inquiry. When I try to present a philosophic problem (as I did in the paper which we are now discussing), only a small part of my audience considers the problem I present; the large part considers the odd things I say. There is a difference between saying, in criticism, that I misused a word or made a category mistake, and saying that I misconceived a problem or made an unpromising approach to it. The difference is present even when the philosophic approach chosen makes the subject matter of philosophy language, for the analysis of language to determine what the problem is is different from the use of language to resolve the problem once it is identified and stated. For this reason I welcome Professor Perelman's three questions, because he does not ask me why I say what I say but why I do what I do, and I can explain the manner of saying that I have chosen by its pertinence to what I want to do.

I tried to introduce a perplexity beyond the well-defined fields of mathematics, logic, and scientific method, because I am convinced that philosophic problems do not remain circumscribed ni limited fields or domains, even though they frequently arise among the problems of the arts and sciences. The question of the uses of perplexity is very close to the question of the nature of philosophic discussion. Why do I engage in philosophic discussion ? What is my purpose ? Is it to achieve understanding and to spread the truth as I see it ? If that were my purpose, philosophic discussion, even in selected and enlightened company, is not a very efficient way of attaining it. Does that mean that I think that my paper has been "misunderstood," "misinterpreted," and made "meaningless" or "nonsensical ?" The two alternatives set by these questions have the rigidity of semantic antitheses, which move discussions from substantive problems of what is and what is to be done to the upper stories of meta-problems of what we say and what we intend. Discussion is neither a chain of understandings nor a chaos of misunderstandings; it is a complex of crossed monologues which occasionally spark, for a period of time or a period of discourse, into dialogue. This is the reason why I engage in discussion and use perplexity as a spark to

melt the crossed monologues of semantic disquisition into a dialogue of philosophic inquiry. Even when I do not succeed in altering the course of the discussion at the meeting, I can take the fused bits of junctions home in memory, and discover what I did not understand, at some stages of the disputation, and get new insight into problems that had been discussed or that should have been discussed. What is the purpose of the International Institute of Philosophy, and why have I come to its meetings so long and so frequently ? I have based my conception of its purpose on the experience that talking with people whose works I have read, frequently without agreeing with what I read, and sometimes disagreeing with it violently, has given me a fuller and more enlightening understanding of what they say, of what they mean, and of what are trying to do, and, secondly, that that understanding has affected what I do. Whether this corresponds to the experience of other members and, therefore, whether this is the purpose of the Institute, I do not know. But this is what I had in mind as the purpose of my paper and of the perplexity that it might cause.

Professor Perelman's second question arose from the categorico-deductive ideal of science invoked by Professor Joja and had to do with the question of evidence. A categorico-deductive science presents principles as a point of departure and deduces consequences from its assumptions, and evidence is afforded by showing the dependence of conclusions on the point of departure. Professor Perelman argues that we have departed from this kind of science and therefore we have abandoned evidence. It will not surprise him to learn that I think that "evidence" is an ambiguous word. What is evidence ? Even in language it has three meanings which can be shown to correspond to demonstration, verification, and justification when they are fitted into the same quadrants of the matrix; and there is a fourth meaning, which is not noticed so frequently, which is connected with the systematizations of discourse. Evidence is the clarity of a perception or an experience: evident experiences are relevant to the new meaning of "demonstration." Evidence is the clarity of a description or a formulation: evident statements and proofs are relevant to "verification." Evidence is the clarity of a communication or an intersubjective transfer of awareness of facts and of sequences from one person to another: evident understanding and persuasion are relevant to "justification." Evidence is an ordering of data, facts, and arguments from all fields

of experience and of knowledge: evident structures are relevant to "systematization" and discourse. I think that reasons for Professor Perelman's conviction that we have abandoned questions of evidence in modern philosophical discussions can be given, if this differentiation of kinds of evidence is applied to the answer that I shall give to his third question.

Professor Perelman connected his third question with the discussion between Mr. Poznanski and Mr. Horovitz, which centered on justification. Mr. Perelman is convinced that philosophic questions are no longer questions of demonstration or verification, but are questions of justification, and that rationality and the use of reason depend on the techniques of justification. I should not want to take a position on justification as the method of philosophy without first examining the ambiguity of "justification" and "method." At the first stage of such an analysis I should probably differentiate the interpretation of the question as it bears on inquiry from its interpretation as it is used in semantics. The answer to the question, "Have philosophers abandoned a method of demonstration and a method of verification, which they once used, to initiate a method of justification ?" is negative: we still make use of demonstration and verification, and justification was used before, but all three have changed their meanings and their relations to each other. This is a semantic question of words and of the meanings of words philosophers use. The answer to the question, "Taking into account semantic changes, are philosophers now engaged on different philosophic problems from those which concerned them fifty years ago and twenty-five years ago ?" is affirmative. This is an inquiry question about the concrete facts of what philosophers have done and now do. The beginnings of modern logic were made by inquiry into problems and structures of *demonstration* and inference. Problems of interpreting and using the new logics turned inquiry to problems of *verification*, confirmation, and rational reconstruction. Problems of diversity of orientations to facts and values turned inquiry to problems of *justification* of rules, conceptions, and actions. I agree with Mr. Perelman that problems of justification are at the center of philosophic concern today. My statement that we need to consider problems of discourse and systematization is an expression of my hope that we may turn

from the paradoxes and massages of justification and communication to inquire into the principles and order of what we say and what we say it about and seek new answers to the question, why ? which may be found in the structures and interrelations of *discourses* and cultures.

Professor Mercier returned to the method of demonstration. Taking his starting point from the controversy between Mr. Hyppolite and Mr. Joja concerning whether science can still be said to be categorico-deductive, he argues for the categorico-deductive and against the hypothetico-deductive interpretation of science. He presents the question as a dilemma of science, in which we are still involved today, giving as evidence Einstein's long search for a unitary theory embracing all natural phenomena in one formula, which would have constituted a cosmological proof or demonstration of the existence of God. There is historical evidence for the long duration of that dilemma in the fact that Newton, in the seventeenth century, closed the third and final book of his *Principia,* which examines "The System of the World," with a "General Scholium" in which he demonstrates the existence of God and argues that "to discourse of [God] from the appearances of things, does certainly belong to Natural Philosophy." Einstein's unitary field theory would have been a different kind of cosmological proof adapted to a different mode of demonstration.

Professor Mercier's second question turns to the general problem of our conference, the question of the nature and relations of demonstration, verification, and justification, which I have tried to discuss under discourse or systematization. He recalls Professor Gonseth's work, "Les Mathématiques et la Réalité," and raises the question of the demonstrative method and value of mathematics, how does it acquire the autonomy and pure power which it exhibits in science ? I should like to make use of the dilemma of mathematics and science and trace some of its steps as a theme which suggests an answer to this question. In the seventeenth century Newton constructed a universal mechanics and Descartes constructed a universal *mathesis.* In the *Preface* to the first edition of the *Principia,* Newton argued that geometry is nothing other than the part of universal mechanics which presents (he uses the word "demonstrates") the art of measuring.

Descartes argued that the laws of motion are a part of the mathematics of extension. In the nineteenth century Clerk transformed the mechanical method to what he called the dynamical method by substituting Faraday's conception of a field for Newton's conception of absolute time and space; while Lorentz identified Maxwell's field with a material medium, the ether. In the twentieth century Poincaré argued that physical phenomena may be expressed and calculated in a variety of conventional mathematical forms; while Einstein set mathematicians to inventing new forms of calculation to treat the consequences and applications of the field equations of the general theory of Relativity. Mathematics has an imperial domain whether it is conceived as a comprehensive set of symbols subject to an endless but inclusive variety of interpretations, or as a neutral set of rules of calculation and measurement capable of endless but definitive applications. I agree with Professor Mercier; it is a fascinating question and one which might be investigated to throw light on the principles and organization of demonstration, verification, and justification.