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SOURCES

LOGIC AND MATHEMATICS IN THE LIBRARY OF CASIMIR LEWY

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Introduction. Casimir Lewy was born in Warsaw in 1919. An early contact with Thadeus Kotarbiński stimulated Lewy's interest in philosophy and logic. This interest in philosophy, combined with a desire to learn English, took him to Cambridge University. In the Summer of 1939, he took First Class Honours. The outbreak of World War II ensured that he would remain in England most of the rest of his life.

Upon earning his Ph.D., Lewy began his teaching career at Cambridge. Except for a brief stint in Liverpool beginning in 1945, he remained at Cambridge, obtaining election to a Fellowship at Trinity College in 1959 and a Readership in 1972, thus becoming the successor to the noted Cambridge philosophers George Edward Moore (1873 – 1958) and Charlie Dunbar Broad (1887 – 1971). In 1980, he was elected to a Fellowship in the British Academy. He belonged to the analytic tradition that Moore and Broad helped shape, and his contributions the preparation for posthumous publication of Broad's *Ethics* (1985) and papers of Moore, as well as publication of several of his own papers on Moore, including one discussing Moore's editorship of the journal *Mind* (1976), and one on Wittgenstein's *Tractatus Logico-philosophicus* (1967). He also contributed an essay to the collection *G.E. Moore – Essays in Retrospect* (1970) edited by Alice Ambrose and Morris Lazerowitz. His primary focus was in philosophy of language and theory of meaning. This lead to publication by Cambridge University Press in 1985 under the title *Exercises in Analysis* of a collection, edited by Ian Hacking, of essays by his students, including Hacking and philosopher of mathematics Crispin Wright. His interest in logic centered upon non-classical logics, especially modal logic. A major publication of Lewy in this area was his *Meaning and Modality* by Cambridge University Press in 1967.

The latter years of Lewy's life were beset by ill-health, and this led to his early retirement. He died in Cambridge in 1991.

Lewy's library, sold to Thoemmes Antiquarian Books of Bristol, England and being in turn sold one item at a time by Thoemmes, included works in the history and literature of Lewy's native Poland, and 420 philosophy titles, many of which are of particular interest to logicians and historians of logic. The logic and mathematics holdings of Lewy's library, as purchased by Thoemmes, are listed and briefly described. A detailed physical description is also given of those items from Lewy's library which were purchased from Thoemmes by Modern Logic Publishing, followed by a discussion of the efforts undertaken by Modern Logic Publishing to preserve these documents.

Teacher of Logic. The range of logic textbooks in Lewy's library show strong interest in mathematical logic. The oldest logic texts to be found in Lewy's library are John Neville Keynes, *Studies and Exercises in Formal Logic – Including a Generalisation of Logical Processes* (4th edition, 1906), William Stanley Jevons, *The Principles of Science. A Treatise on Logic and Scientific Method* (Macmillan, 1907) and a reprint of the ninth (1908) edition of Richard Whately's *Elements of Logic* by Longmans, Green. Typical of the textbooks in his library representing traditional logic are the three-volume *Logic – In Three Parts* of William Ernest Johnson (1921-1924), S.H. Mellone's *Elements of Modern Logic. University Tutorial* (1934) W.A. Sinclair's *The Traditional Formal Logic – Short Account for Students* (1937), and C.A. Campbell's *Philosophical Lecture-Notes (For the Use of Studies in the Logic Ordinary Class at Glasgow University)* (1945).

Textbooks such as Clarence Irving Lewis and Cooper Harald Langford, *Symbolic Logic* (1932), the first (1934) edition of Morris Raphael Cohen and Ernest Nagel, *An Introduction to Logic and Scientific Method*, Susan K. Langer's *An Introduction to Symbolic Logic* (1937), H.W.B. Joseph's *An Introduction to Logic* (1946), A.A. Bennett and C.A. Baylis, *Formal Logic – A Modern Introduction* (1946), Max Black's *Critical Thinking – An Introduction to Logic and Scientific Method* (1946), Alice Ambrose and Morris Lazerowitz's *Fundamentals of Symbolic Logic* (1948), P.H. Nidditch's *Propositional Calculus* (1952), Hughes Leblanc's *An Introduction to Deductive Logic* (1955), E.J. Lemmon's *Beginning Logic* (1965), Benson Mates, *Elementary Logic* (1965), and Roger C. Lyndon's *Notes on Logic* (1967), represent the typical modern introductory logic course. The first (1954) edition of Irving M. Copi's *Symbolic Logic*, and Arthur N. Prior's *Formal Logic* (1955), and Patrick Suppes's *Introduction to Logic* (1957) represent the typical philosophy department course textbook in symbolic logic. The copy of Lewis and Langford's *Symbolic Logic* is the first edition cloth-bound copy that was previously owned by L. Susan Stebbing. It has occasional marginal pencil marks, and the edges and corners are worn.

The first English edition of Alfred Tarski's *Introduction to Logic, and to the Methodology of Deductive Sciences* (1941), translated by Olaf Helmer, the first edition of Alonzo Church's *Introduction to Mathematical Logic, Part I* (1944), Paul Rosenbloom's *The Elements of Mathematical Logic* (1950), Willard Van Orman Quine's *Mathematical Logic* (2nd ed., 1951), John Barkley Rosser's *Logic for Mathematicians* (1953), R.L. Goodstein's *Mathematical Logic* (1957), Elliott Mendelson's *Introduction to Mathematical Logic* (1964),

Quine's *Set Theory and Its Logic* (1963), and Herbert Enderton's *A Mathematical Introduction to Logic* (1972) represent advanced textbooks intended to prepare one for more specialized study in logic and mathematics. In Lewy's case, they opened the way to a mathematical treatment of modal logic and supported a serious interest, if not expertise, in mathematics, with special attention to algebra, geometry, classical analysis, set theory, and probability theory. Three of a series of four lectures by Alonzo Church on "Elementary Topics in Mathematical" at the Galois Institute in 1940-41, and a course on "Logical Calculus" by Paul Bernays at the Institute of Advanced Study in 1935-36 were among Lewy's papers that were purchased by Thoemmes and subsequently purchased from Thoemmes by Modern Logic Publishing.

Other logic texts of particular note in Lewy's library include: R.M. Eaton, *General Logic – An Introductory Survey* (1931), Leon Chwistek, *The Limits of Science – Outline of Logic and of the Methodology of the Exact Sciences* (1948), Hans Hermes and Heinrich Scholz's *Mathematische Logik*, Bd. I.1, Heft 1, Teil 1 of *Enzyklopädie der mathematischen Wissenschaften* (1952), Lewis Carroll, *Symbolic Logic, Part I – Elementary* (1955), Rudolf Carnap, *Introduction to Symbolic Logic and Its Applications* (1958), and Hilbert and Ackermann *Grundzüge der theoretischen Logik* (2nd edition, Dover, 1946).

Advanced Logic Texts and Specialized Studies. Richard C. Jeffrey's *Formal Logic: Its Scope and Limits* (1967) and Raymond M. Smullyan's *First-order Logic* (1968) represent the analytic tableaux method in Lewy's library; the first is an introductory text, the second a graduate text. Another approach is given by Paul Lorenzen's *Einführung in die Operative Logik und Mathematik* (1955).

An introductory survey of specialized topics in logic is given in J.N. Crossley, C.J. Ash, C.J. Brickhill, J.C. Stillwell, and N.H. Williams, *What is Mathematical Logic?* (1972). More specialized studies, some of great historical value today and at the forefront of current research when they appeared and became part of Lewy's library, include Haskell Curry *A Theory of Formal Decidability* (1950), Martin Davis, *Computability and Unsolvability* (1958), *Recherches sur la déduction logique*, which is the 1955 French translation with commentary, by Robert Feys and J. Ladrière, of Gerhard Gentzen's "Untersuchungen über das logische Schließens", B. Meltzer's 1962 translation of Gödel's *On Formally Undecidable Propositions of Principia Mathematica and Related Systems*, Hans Hermes' *Enumerability, Decidability, Computability – An Introduction to the Theory of Recursive Functions* (1965), and Dag Prawitz *Natural Deduction: A Proof-Theoretical Study* (1965). To this we may add Solomon Feferman, et. al. (editors), *The Collected Works of Kurt Gödel. Volume I: Publications 1929–1936* (1986), Quine's *Selected Logic Papers* (1966), von Wright's *Logical Studies* (1957), and Jean van Heijenoort (editor), *From Frege to Gödel: A Source Book in Mathematical Logic, 1879 – 1931* (1967).

E.J. Lemmon's *Introduction to Axiomatic Set Theory* (1969), and Suppes, *Axiomatic Set Theory* (1960) are basic modern textbooks in set theory; the third (1946) edition of A.A. Fraenkel's *Einleitung in die Mengenlehre*, published by Dover, Eric Kamke's *Theory of Sets*, translated by F. Bagemihl for Dover (1950), and the third (1944) edition of Hausdorff's

Mengenlehre, published by Dover, are the more historically interest textbooks on set theory to be found in the library.

Non-classical Logics. The primary focus of Lewy's interest in logic was in non-classical logic. His holdings included such elementary textbooks as R.J. Ackermann's *Introduction to Many Valued Logics* (1967), Brian F. Chellas, *Modal Logic: An Introduction* (1980), Lemmon's *American Philosophical Quarterly Monograph*, in collaboration with Dana Scott and edited by Krister Segerberg *An Introduction to Modal Logic. The "Lemmon Note"* (1977), Nicholas Rescher's *Many-Valued Logic* (1969), and J.B. Rosser and A.R. Turquette's *Many-Valued Logics* (1952). The copy of Rosser and Turquette is an author's presentation copy, as is D.J. Shoesmith and T.J. Smiley's *Multiple-Conclusion Logic* (1978). Advanced studies in the field in Lewy's library included Alan Ross Anderson, Nuel D. Belnap, *et al.*, Volume I: *Entailment – The Logic of Relevance and Necessity* (1975), R. Feys, *Modal Logics, edited with some complements by J. Dopp* (1965), G.E. Hughes and M.J. Cresswell, *An Introduction to Modal Logic* (1968), and the typescript of Lemmon's paper "Strict Lewis Modal Systems". Clarence Irving Lewis and Cooper Harald Langford's *Symbolic Logic* (1932) was also present in Lewy's library. It is an elementary introduction to symbolic logic and an introduction to non-classical logics, and a survey of contemporary work in modal and multiple-valued logics, including some of the first discussions of Łukasiewicz's work. It also presents Lewis's system of entailment or strict implication.

More advanced writings in modal and multiple-valued logic could also be found in Lewy's library. Among these works, we find Hintikka's *Models for Modalities – Selected Essays* (1969), the *Proceedings of a Colloquium on Modal and Many-Valued Logics, Helsinki, August 1962* appearing in *Acta Philosophica Fennica* Fasc. **XIV**, 1963, and Georg Henryk von Wright's *An Essay in Modal Logic* (1951).

Susan Haack's *Deviant Logic – Some Philosophical Issues* (1974) and *Philosophy of Logics* (1978) belong to this category as well, providing a philosophical justification for non-classical logics as well as advanced presentations of such systems.

Deontic logic, epistemic and other special logics are represented in Lewy's collection by such items as S. Halldens' On *the Logic of "Better"* (1957), Hintikka's *Knowledge and Belief – An Introduction to the Logic of the Two Notions* (1962), and Georg Henryk von Wright's *An Essay in Deontic Logic and the General Theory of Action* (1968) and *The Logic of Preference* (1963). The collection *The Logical Way of Doing Things* (1969) edited by Karel Lambert includes articles by Harrah, Belnap, Vickers, Bas van Fraassen, Hintikka, Roderick Chisholm, and Wilfrid Sellars and deals with many non-classical logics as well as some aspects of philosophical logic generally.

Of special historical interest are copies in Lewy's library of three technical reports, in duplicated typescript, by Anderson from the Office of Naval Research, Interaction Laboratory, and Yale University dating from the late 1950's, including in particular the a copy of the 27 pp. report #6, "Completeness Theorems for the Systems E of Entailment and EQ of Entailment with Quantification," and a copy of Belnap's 107 pp. typescript Technical Report #7, "A Formal Analysis of Entailment," from the Office of Naval Research, Interaction Laboratory and Yale University dating from 1960.

History of Logic. Lewy understood that to understand a subject, one must know its history. His special interest in non-classical logics led him to study Aristotle's work on modal syllogisms, and more generally gave him an interest in Aristotelian logic. Thus his library included a copy of J.L. Ackrill's translation of *Aristotle's Categories and De Interpretatione* (1963) and Hintikka's paper 'On the Interpretation of "De Interpretatione", XII–XIII (pp. 1–20),' from *Acta Philosophica Fennica* (Facs. XIV, 1962), as well as J. Lear's study *Aristotle and Logical Theory* (1980), J.W. Miller's *The Structure of Aristotelian Logic* (1938), Łukasiewicz's *Aristotle's Syllogistic from the Standpoint of Modern Formal Logic* (1951) and Storrs McCall's *Aristotle's Modal Syllogisms* (1963). The history of medieval logic was represented by Ph. Boehner's *Medieval Logic: An Outline of Its Development from 1250 to 1400* (1950), Karl Dürr's *The Propositional Logic of Boethius* (1951), and E.A. Moody's *Truth and Consequence in Medieval Logic* (1953) and *The Logic of William of Ockham* (1935).

The only historically significant work in early modern logic owned by Lewy was the English translation, with an introduction by T.S. Baynes, of Arnauld and Nicole's *The Port-Royal Logic* (1850).

Modern logic was represented by a range of historically significant classic works, from Boole to Gödel, as well as lesser works, such as Lewis Carroll's *Symbolic Logic, Part I – Elementary* (1955) already mentioned. The more significant works in Lewy's library included reprints of Boole's *Investigations of the Laws of Thought* (Dover Publication's edition), Boole's *Studies in Logic and Probability* (1952 edition), and the already mentioned William Stanley Jevons' *The Principles of Science: A Treatise on Logic and Scientific Method* (Macmillan, 1907), and the reprint of the ninth (1908) edition of Richard Whately's *Elements of Logic*.

Charles Peirce's writings, represented by Morris Raphael Cohen's edition of *Chance, Logic and Love: Philosophical Essays* (1949), are of only tangential interest to logicians, as are most of the articles in Russell's *Mysticism and Logic* (4th impression, 1921), although parts of both are naturally of varying degrees of interest to philosophers of logic. Frege's writings are represented in translation. Here we have Ludovico Geymonat's translation *Aritmetica e Logica* (1948), Montgomery Furth's translation, *The Basic Laws of Arithmetic: Exposition of the System* (1964), J.L. Austin's translation *The Foundations of Arithmetic* (1950), and Peter T. Geach and Max Black's famous *Translations from the Philosophical Writings of G. Frege* (1952).

Critical and historical studies relating to modern logic include Ernest Nagel and James R. Newman's *Gödel's Proof* (1958) and Hao Wang's *Reflections on Kurt Gödel* (1988), indicating that Lewy had a particular interest in the problems of the consistency and completeness of formal systems, and that the occurrence of such questions may have inspired, if not supported, his special interest in non-classical logics. Other historical surveys of contemporary logic in Lewy's possession include Mostowski's *Thirty Years of Foundational Studies – Lectures on the Development of Mathematical Logic and the Study of the Foundations of Mathematics in 1930–1964* (1966).

Lewy's interest in logic included an interest in set theory and its history, no doubt arising out of the set theoretical paradoxes and a belief that nonclassical logics provided a

means to circumvent, if not solve, the paradoxes. Thus, his library included the Přihonsky translation of Bolzano's *Paradoxes of the Infinite* (1950) as well as Jourdain's translation of Cantor's 1895-97 *Beiträge*, i.e. the Dover Publication edition of Cantor's *Contributions to the Founding of the Theory of Transfinite Numbers*, and the second edition of Edward Vermilye Huntington's *The Continuum, and Other Types of Serial Order – with an Introduction to Cantor's Transfinite Numbers* (published by Dover, 1955, with paper covers, and stapled), as well as historical-philosophical studies such as Hallett's *Cantorian Set Theory and Limitation of Size* (1984) and Copi's *The Theory of Logical Types* (1971).

Heinrich Scholz's *Geschichte der Logik* (Berlin, Junker und Dünnhaupt Verlag, 1931) is one of the few works on general history of logic in Lewy's collection. This book was purchased from Thoemmes by Modern Logic Publishing.

Lewy's *ex libris* consisted simply of "C. Lewy" written in pencil. In his copy of Scholz's history, it is written across the upper left-hand corner of the half-title page. Also on the lower right corner of the half-title page, we find the number "732–" written in pencil; immediately below that, at the extreme edge of the corner, is the number "43", also written in pencil, and encircled. There are minor pencil marks in the margins on many of the pages of the book, and some underlinings in pencil on several pages. 31 pages in all have pencil marks. No other marginal notes occur. Physical damage to the book is very moderate, in view of its age. The lower right-hand corner of p. 37 has been torn off, and there is water damage at the center of the upper margin throughout the book, with a red stain (possibly red ink) beginning at that location from p. 69 to the outside of the back cover.

A note sheet was found between pages 28 and 29. This is a 20 × 25.2 cm. sheet, folded in half horizontally, with notes in black ink. The majority of notes focus on Aristotle and are arranged much like a supplement to the index. Of special interest, however, is the note for section 3, labelled "III, p. 52" by Lewy in his note. The note itself, referring to Leibniz, reads: "(relatively) long exegesis of L_s Char. Univ^l.", with " (see 54) & 55" added in pencil. Underneath this, Lewy, referring to volume I of Whitehead and Russell's *Principia Mathematica*, wrote (again in ink):

> Scholz sees P.M. as working out of L_s great conception
> [Does he mean the Char. Univ^l.?
> " " refer to Frege & Peano?)

"To be reviewed for Mind" is written in pencil at the top left of the outside back cover.

The 22–page pamphlet "A History of the Corruptions of Logic" is Peter Geach's 1968 inaugural lecture at the University of Leeds was also among Lewy's holdings.

Russell's intellectual autobiography, *My Philosophical Development* is present in its first (1959) edition and is both of general philosophical interest and, in parts, especially the earlier chapters, of interest to historians of logic. Volume II of Victor Lowe's biography *Alfred North Whitehead: The Man and His Work*, covering the years 1910–1947, is not in precisely the same category, since the collaboration of Whitehead and Russell on *Principia Mathematica* is dealt with in the final two chapters of volume I, volume I covering the period 1861–1910.

Philosophy of Mathematics and Logic. Philosophical issues in mathematics, including logic, and history of logic and foundations of mathematics were of interest to Lewy, and we find in his library such diverse works as Maurice Cornforth's *Science Versus Idealism: An Examination of "Pure Empiricism" and Modern Logic* (1946), H.B. Curry's *Outlines of a Formalist Philosophy* (1951), Philip E.B. Jourdain's *The Nature of Mathematics* (1919 edition), Jacques Nicod's *Foundations of Geometry and Induction* (1950), Poincaré's *Science and Hypothesis* (1905), Friedrich Waismann's *Introduction to Mathematical Thinking* (1951), Hermann Weyl's *Philosophy of Mathematics and Natural Science* (1949), Raymond Louis Wilder's *Introduction to the Foundations of Mathematics* (1952), Ludwig Wittgenstein's *Philosophische Grammatik, I: Satz, Sinn des Satzes; II: Über Logik und Mathematik* edited by Rush Rhees (1969), two editions of Wittgenstein's *Tractatus Logico-philosophicus* — one with an Italian translation by G.C.M. Colombo, the other with the Pears and McGuinness English translation and Bertrand Russell's introduction (1961), Crispin Wright's *Wittgenstein on the Foundations of Mathematics* (1980), von Wright's Inaugural Lecture "Form and Content in Logic," (1949) and the three volumes of von Wright's *Philosophical Papers* (vol. I on *Practical Reason*, vol. II on *Philosophical Logic*, vol. III on *Truth, Knowledge and Modality*), of which the first and third volumes are presentation copies, O.F. Bergen's typescript compilation of von Wright's "Bibliography of Philosophical Writings, 1938 – 1966," and large number of philosophical studies of Frege's philosophy of logic and language. Thus, we find G.P. Baker and P.M.S. Hacker's *Frege: Logical Excavations* (1984), Michael Dummett's *Frege: Philosophy of Language* (1969), Reinhardt Grossmann's *Reflections on Frege's Philosophy*, Crispin Wright's *Frege's Conception of Numbers as Objects* (1983), and Elmer D. Klemke (editor), *Essays on Frege* (1968). Lewy's philosophical interests in logic tended to be concerned with issues in particular in philosophy of language. These types of writings were exemplified in his library by such items as W. Marciszewski (editor), *Dictionary of Logic, as Applied in the Study of Language: Concepts, Methods, Theories* (1981).

Philosophical issues in logic and mathematics, including in particular philosophical logic as pertains to the method of philosophical analysis and linguistic philosophy also played an important role in Lewy's professional life, and we are therefore not surprised to find such items as Max Black's *Language and Philosophy – Studies in Method* (1949), Stephen Körner's *Conceptual Thinking – A Logical Inquiry* (1955), Saul Kripke's *Naming and Necessity* (1980), Leonard Linsky's *Names and Descriptions* (1977) and Donald Davidson's *Inquiries into Truth and Interpretation*, his own *Meaning and Modality* (1976), Richard M. Martin's *Truth and Denotation – A Study in Semantical Theory* (1958), Quine's *From a Logical Point of View* (2nd edition, 1963), or John Oulton Wisdom's *Interpretation and Analysis in Relation to Bentham's Theory of Definition* (1931) in his library. Analytical and logical treatments of metaphysics include such works as Geach's *Reference and Generality: An Examination of Some Medieval and Modern Theories* (1962) and Nelson Goodman's *The Structure of Appearance* (1951).

Elementary mathematics, from arithmetic to real analysis. Lewy's study of mathematics arose from the goal of providing a mathematical treatment of modal logic.

A survey of elementary mathematics was provided by Courant and Robbins, *What Is Mathematics?* (1956), Felix Klein's two Chicago lectures, *Elementary Mathematics– from an Advanced Standpoint, I. Arithmetic, Algebra, Analysis; II. Geometry* (published as two books by Macmillan and Dover), and J.W. Young, *Lectures on Fundamental Concepts of Algebra and Geometry, edited by W.W. Duncan, and with a note on The Growth of Algebraic Symbolism by U.G. Mitchell* (1939). Modern algebra and algebraic logic were studied from Garrett Birkhoff and Saunders Mac Lane, *A Survey of Modern Algebra* (1949), Garrett Birkhoff, *Lattice Theory* (revised edition, 1948) an P. Dienes, "Logic of Algebra," No. 614 (1938), as well as classic texts of Augustus De Morgan's *Elements of Algebra, Preliminary to the Differential Calculus* (2nd edition, 1837). Indeed, De Morgan's classic textbooks provided a broad background for elementary mathematics, from arithmetic and geometry through the calculus, and Lewy's library included, in addition to De Morgan's *Elements of Algebra,* his *The Elements of Arithmetic* (1846), *Elements of Trigonometry, and Trigonometrical Analysis, Preliminary to the Differential Calculus* (1837), *Trigonometry and Double Algebra* (1849), and *Elementary Illustrations of the Differential and Integral Calculus* (new edition, 1899). There is also the T.J. McCormick translation of Lagrange's *Lecture on Elementary Mathematics* published by Open Court in 1898. A copy of the 1948 Everyman's Library edition of Euclid's *The Elements* completed the geometrical works of historical significance in Lewy's collection.

More modern, technical texts such as Hardy's classic *A Course of Pure Mathematics* (1948), Edmund Landau's *Foundations of Analysis* (1951), and J.E. Littlewood's *The Elements of the Theory of Real Functions* (3rd, 1954, edition) lent contemporary substance to Lewy's understanding of real analysis and may have originated as much from his readings in set theory as from his reading in De Morgan.

Probability, statistics, inductive logic, and game theory. Probability and statistics and their logical foundations, including in particular inductive logic, and their history, provided another strong area of interest in Lewy's library. Works of this nature include Richard von Mises' *Probability, Statistics and Truth* (1939), J.M. Keynes' *A Treatise on Probability* (1943), along with the pamphlet *John Meynard Keynes, 1883 – 1946, Fellow and Bursar, A Memoir* published by King's College Cambridge, William C. Kneale's *Probability and Induction* (1949), Ian Hacking's *The Emergence of Probability – A Philosophical Study of Early Ideas about Probability, Induction, and Statistical Inference* (1975) and *Logic of Statistical Inference* (1965), von Wright's *The Logical Problem of Induction* from *Acta Philosophica Fennica* (1941) its second, revised edition (1957), von Wright's *A Treatise on Induction and Probability* (1951), and Simon Pierre LaPlace's historic *A Philosophical Essay on Probabilities* (1951 Dover edition. Applications of statistics and probability are included as well. Works of this nature in Lewy's collection include L.R. Conner, *Statistics in Theory and Practice* (1932), R.A. Fisher, *Statistical Methods for Research Workers*, and the statistical study *Inquiries into Human Faculty and Its Development* (ca. 1920) by the British pioneer psychologist Francis Galton.

R.B. Braithwaite's *Theory of Games as a Tool for the Moral Philosophy* (1955), an application of game theory to ethics, is the publication of Braithwaite's December 1954 Cambridge University inaugural address.

History of mathematics and recreational mathematics. History of mathematics is represented by Eric Temple Bell's somewhat disreputable *The Development of Mathematics* (1945), and mathematical entertainment by W.W. Rouse Ball's classic *Mathematical Recreations and Problems, of Past and Present Times* (Macmillan, 1896). G.H. Hardy's *A Mathematician's Apology* (1948) and M.I. Logsdon's long-forgotten *A Mathematician Explains* (1944) are also included.

Manuscripts/typescripts. From the standpoint of the historian of logic, the most valuable and interesting materials in Lewy's collection are the typescripts. We have already mentioned these. They include copies in Lewy's library of three technical reports, in duplicated typescript, by Anderson from the Office of Naval Research, Interaction Laboratory, and Yale University dating from the late 1950's, including in particular the a copy of the 27pp. report #6 "Completeness Theorems for the Systems E of Entailment and EQ of Entailment with Quantification" on A4 ($8^1/_2 \times 11$ inch) paper with cardboard covers, and a copy of Belnap's 107 pp. typescript Technical Report #7, "A Formal Analysis of Entailment," from the Office of Naval Research, Interaction Laboratory and Yale University dating from 1960 on A4 paper, stapled with cardboard covers, and the Wilhelm Britzelmayr Festschrift, *Kontrolliertes Denken – Untersuchungen zum Logikkalkül und zur Logik der Einzelwissenschften*, edited by Menne, Wilhelmy and Angstl and which contains contributions by O. Anderson, Paul Bernays, Alonzo Church, R. Fels, Kornhardt and others, 1951, which is a 122 pp. duplicated typescript on A4 paper, stapled with cardboard covers. Church's two lectures on "Fermat's Last Theorem" and "A Finite Geometry," given at the Galois Institute of Mathematics, Long Island University in the 1930's, are duplicated typescripts on A4 paper, stapled, 9 and 11 pages respectively. The version of Lemmon's paper "Strict Lewis Modal Systems" in Lewy's collection is an undated and unbound carbon copy of a 25-page typescript. Bergen's compilation of von Wright's "Bibliography of Philosophical Writings..." is an 11 page duplicated typescript on A4 paper, stapled, in cardboard covers.

Alonzo Church's four lectures on "Elementary Topics in Mathematical Logic" were given at the Galois Institute of Mathematics, Long Island University in 1940–41. Thoemmes' catalogue erroneously describes them as dating from "the early 1930s." A simple perusal through the bibliographical notes on pp. 100–101 of the typescript of the fourth lecture, referring to publications dating from 1937 and 1941 should have been sufficient to alert the cataloguer to the error. Moreover, the publication of Part II of Bernays' "A System of Axiomatic Set Theory" is mentioned in the text, giving March 1941 as the most specific date available.[1] With other parts of the Bernays series mentioned as soon to appear,[2] the Thoemmes cataloguer could safely have assumed that the lectures were given circa March 1941 or somewhat later, and that the typescripts of the lectures therefore date from the same period. Thoemmes's cataloguer may have assumed that the lectures and their typescripts date from "the early 1930s" because the logo on the title page of the typescripts bears the date 1934. It was common in the 1930s and 1940s, when mathematical logic was still relatively new and

[1] In fact, it appeared in the March 1941 issue of the *Journal of Symbolic Logic* **6**, pp. 1–17.

[2] Part II in fact appeared in the June 1942 issue of the *Journal of Symbolic Logic* **7**, pp. 65–89.

suitable textbooks therefore not widely available, for instructors to distribute to their students copies of lecture notes that they prepared themselves. Indeed, it is a widespread practice mathematics that, especially when subjects are still new and textbooks not yet widely available, that courses in those subjects, in particular at advanced levels, be taught from hand-out lecture notes prepared by instructors rather than from textbooks. We may safely assume that the typescripts of Church's lectures (as well as those of Bernays described below) were examples of this widespread practice.

The series began with a lecture on the algebra of classes. This lecture is represented by a 27-page pamphlet on 16.5 × 23.8 cm. pages, bearing the copyright of H.G. and L.R. Lieber, dated 1959 on page 1, which is the inside front cover. The title page, which is the outside front cover, indicates that the lecture was presented at "The Galois Institute of Mathematics and Art, Brooklyn, N. Y." In the center it bears the drawing of a tower of uncertain design (perhaps a carillon or a light house). The upper right-hand corner has "$^6/_6$" written in pencil, which may have been Lewy's means of cataloguing or identifying the document for filing loose papers (Lewy's copy of the Scholz book, for example, does not bear such a marking; the other two typescripts of the Church lectures in this series also bear such markings, but the Bernays typescript, which is bound, does not). There is no *ex libiris* on the pamphlet.

The second lecture, for which no copy was found in the Lewy library — or at any rate listed in the Thommes catalogue — was on the algebra of propositions and dealt with truth-functional logic and the relationship between propositional logic and the logic of classes.

The third and fourth lectures were on set theory, and gave an axiomatic presentation, without specifying which axiomatic system was used. Although on p. 79 he follows the "method of Zermelo," i.e. employing Zermelo's Axiom [schema] of Foundation (Axiome der Fundierung), in the effort to avoid the Russell paradox, it is evident that he intended his lectures to be an elementary and incomplete introduction to **GNB**, on pp. 100–101 referring his auditors to the series of papers on set theory of Paul Bernays on "A System of Axiomatic Set Theory," being published at that time in the *Journal of Symbolic Logic*, as a complete presentation of axiomatic set theory. He also made some general statements comparing his usage with that of Bernays. There are exercises included, some of which are worked out, others left to the audience or readers to complete. Typographical errors on pp. 54, 59, 73 are corrected in pencil; they are among the errata enumerated on p. 102 of the typescript.

A review of these lecture notes is given by Morton G. White in the *Journal of Symbolic Logic* 7 (1942), 91–92. It was also reviewed by Heinrich Scholz in *Zentralblatt für Mathematik und Ihre Grenzgebiete* **27** (1943), p. 148, who said of systems such as **GNB** that they "are desirable" (*"daß solche Systeme erstrebenswert sind"*). On p. 92 of his review, White reports on an error on typescript p. 90, communicated to him by Church, that was not recorded by Church in the original list of errata on p. 102 of the typescript. The unnumbered p. 103 of the Lewy copy, called "Additional Erratum," contains the text of the communication from Church to White reported in White's review.

The mimeographed typescripts are on A4 paper, the third being bound by two staples along the left-hand margin, the fourth by six staples. Pages 75 and 76 were loosely bound to each other by two small narrow strips of brown tape. The title page of the third lecture

reads: "ELEMENTARY TOPICS IN MATHEMATICAL LOGIC, III. Set Theory, by Alonzo Church," followed by the hand-drawn logo $\sum_{1934}^{\infty}$ with two figures shaking hands depicted inside the sigma, the whole surrounded by two concentric circles, underneath which one reads: "A lecture given at the Galois Institute of Mathematics at Long Island University, 300 Pearl Street, Brooklyn, N. Y." The title page of the fourth lecture is exactly the same as the third, except that "III. Set Theory" is replaced by "IV. Set Theory (continued)." Both typescripts bear Lewy's *ex libris* "C.L." written diagonally in pencil in the upper left-hand corner of the back of the last page and on both typescripts the upper right-hand corner has "$^3/_6$" written in pencil. The typescript of lecture three runs pp. 52–76, the fourth lecture, pp. 77–103, although, as noted, p. 103 is unnumbered and contains an erratum.

There is severe physical damage to the typescripts of the third and fourth lectures. The typescript of the third lecture has worm-hole damage to the lower right-hand corner from p. 67 through p. 76, with the hole becoming progressively larger towards the later pages, and pp. 75 and 76 are beginning to disintegrate and are becoming detached. The typescript of the fourth lecture has severe worm-hole damage to the lower right corner throughout, the worst being to the front cover, with the least amount of damage from pp. 90–100. The last page (the unnumbered p. 103) is detached, and p. 102 is partially detached. There is some faded type on each page from p. 78 to p. 85, as well as at pp. 91, 94–95, and the fading is especially pronounced at pp. 78–85.

The brief bibliographical notes at the end of p. 100 and p. 101, where it is mentioned that Part I of Paul Bernays's "A System of Axiomatic Set Theory" was published in the *Journal of Symbolic Logic* in June 1937, Part II in March 1941, and other parts were soon to appear, provide the primary, if not the only, distinguishing or interesting feature of these typescript notes of Church's lectures for the historian of logic.

The pamphlet and two typescripts surviving in Lewy's library were sold by Thoemmes as a package to Modern Logic Publishing. They arrived bundled together in a plastic library folder to which a white label was affixed bearing the legend "CHURCH/ELEM TOPICS/3 PARTS/726–".

Of the materials purchased from Thoemmes by Modern Logic Publishing, the most significant is the typescript of Paul Bernays' 1935–36 Institute of Advanced Study course on "Logical Calculus." The lectures were known to Jean van Heijenoort, who at footnote 103 on p. 561 in the selection from Herbrand's "Investigations in Proof Theory" in *From Frege to Gödel*, cites Bernays' "Remark 1" from typescript pp. 115–166 regarding the role of Herbrand's Fundamental Theorem in simplifying the proof of the consistency of geometry as an example of how Herbrand's Fundamental Theorem simplified proofs of the consistency of theories. The typescript is also cited by Goldfarb, for example at pp. 18–19 in his "Introduction" to his English edition of Herbrand's *Logical Writings* (1971), specifically in connection with Bernays' derivation, in these lectures for the first time, of the First and Second ε–theorems, from which he then, again, for the first time, derives various analogs of Herbrand's Fundamental Theorem, including an expansion result of the Fundamental Theorem for prenex formulæ from the Extended First ε–Theorem.

Bernays' "Logical Calculus" is a 125-page duplicated (mimeographed) typescript on A4 paper between cardboard covers, with three staples and tape binding. The top left corner of the inside of the front cover bears Lewy's pencilled *ex libris* "C. Lewy." Below and to the right of the *ex libris* "Trinity" is pencilled in. Below and to the left of that, roughly flush with the ex libris, "L.S. Stebbing" was written in ink and was subsequently crossed out by diagonal slashes in pencil, suggesting that the typescript had originally belong to L. Susan Stebbing. Approximately one inch (2.54 cm.) from the right edge of the title page and approximately $4^1/_2$ inches (11 cm.) from the bottom edge, "738–" is written in pencil diagonally, from lower left to upper right; and at the lower right-hand corner of the title page, "43"is written in pencil and encircled, at 1 inch from the right-hand margin and approximately 1.125 inches (2.85 cm.) from the bottom margin. The significance of these markings is unclear, but since we noted similar markings on the title page of Lewy's copy of Scholz and, in part, on the plastic folder containing the Church lectures, it is reasonable to suggest that these most likely are part of Lewy's cataloguing classification numbers.

There are four corrections of typographical errors, one each on pp. 4, 16, 52, and 66, presumably by Lewy as these were done in pencil. Apart from fading text on each of pp. 36–46 and p. 76, especially of handwritten formulæ, browning along all four of the edges of the pages, and very minor tears in the middle of the gutter edges of pp. 124–125, there is no physical damage to this typescript. In one instance, fading is particularly severe: on p. 53, where the ten axioms of propositional calculus and the two additional ones for first-order quantification listed (written in pen), two of the ten are completely faded and altogether unreadable, although it should, upon closer examination, be easy to reconstruct them.

This document presents an introduction to the first-order predicate calculus using Gentzen's version of natural deduction, providing enough depth to permit consideration of metatheorems regarding decidability and the consistency of propositional logic, first-order logic, and number theory. It is of special significance because the reader is given a contemporary, state-of-the-art, introduction to logic which provides up-to-the-minute work of Wajsberg on deciding deducibility; on consistency, making reference to unpublished work of Herbrand and Ackermann, followed by Hilbert's axiomatization of geometry by way of example (with Hilbert's system derived from Veblen's axioms for projective geometry with R.L. Moore's metrical axioms adjoined); and on the consistency of number theory, making use of the latest contemporary results of Gödel, Gentzen, Ackermann, von Neumann, Heyting, and Herbrand, and with reference to the newly developed concept of the *general recursive function* that Herbrand, Gödel, and Kleene presented. The typescript is of special importance also insofar as the historian of logic is not only given a snapshot of the most advanced knowledge of mathematical logic at a very particularized temporal locus, but a synopsis of the most advanced research of the day, brought together into a unified presentation in a way that reading separately the publications of the day cannot, while also giving insight into Bernays's concept of *Beweistheorie*. Indeed, as Haskell B. Curry noted on p. 163 in his review of these lecture notes in the *Journal of Symbolic Logic* **3** (1938), 162–163, Bernays uses a method of derivation (for the consistency theorem on p. 98) that had not yet been used even in the first volume of Hilbert and Bernays' *Grundlagen der Mathematik* (Berlin, Springer-Verlag, 1934); the method, says Curry (p. 163) is the "process due to Ackermann

for eliminating bound variables from a proof by use of the Hilbert ε-symbol. This method is not used in the Hilbert-Bernays book above cited; but it appears probable, from an announcement just received, that it will be taken up in the second volume of that work." At p. 87, Bernays referred to this as "the Hilbert device [which] is due to Wilhelm Ackermann. (Not published.)" In fact, it first appeared in published form in volume 2 of Hilbert and Bernays' *Grundlagen der Mathematik* (1939). The notes were prepared "by Prof. Bernays with the assistance of Mr. F. A. Fincken."

Modern Logic Publishing is exploring the possibility of publishing the materials it has acquired, with particular emphasis on the possibility of publishing the Bernays material. I asked Nathan Houser of the Peirce Edition Project (Indiana University, Indianapolis), Kenneth Blackwell of the Bertrand Russell Archives at McMaster University (McMaster University, Hamilton, Ontario), and Frederic F. Burchsted of the Archives of American Mathematics (University of Texas at Austin) for their advice on protection and preservation of these materials.