

Richard M. Millard, Dean, C.L.A.
Richard S. Bear, Dean, G.R.S.

June 12, 1963

Robert S. Cohen, Chairman, Department of Physics
Annual Report for the Department of Physics, 1962-63

This report is set forth in the following sections:

- I. Progress and Problems
- II. Undergraduate Affairs
- III. Graduate Affairs
- IV. Staff Affairs
- V. Faculty Record

I. Progress and Problems

The general activities of the department during the Summer of 1962 and the academic year 1962-63 were full and satisfactory. Research in several areas of investigation has begun to yield results, both scientifically and educationally. In several areas, the teaching of our courses has been improved, and the organization of our facilities made more efficient. A number of substantial grants for research has been received and a new large grant for educational laboratory facilities has also been received. The number and quality of graduate students has once again improved as compared with previous years, but this has not been matched by comparable improvement among the undergraduate majors. A considerable number of honors have been received by our students and our faculty.

A number of problems remain with us. Unlike every physics department known to our faculty we do not have a well equipped lecture room, suitable for scientific demonstration lectures, well lighted and able to hold 300-350 students in comfort. We now have 10 undergraduate courses, meeting at various hours of the academic year, including evening, which require such a lecture hall. We cannot provide the small preparation room adjacent to room 50 in the Stone Chemistry Building with the full range of demonstration equipment needed for these various courses. That preparation room is too small, most of the needed equipment is also needed in other courses and laboratories, and the time available to prepare demonstrations is severely limited due to the extraordinary number of courses which meet in room 50. Room 50 would be completely used by other departments even if we were to withdraw all of our needs for it. As a result of these circumstances, our undergraduate introductory courses, despite careful lecture preparation and fine text books and associated laboratory work, are the weakest of our curriculum in physics. The overwhelming majority of physics departments, including those in very small and very poor liberal arts colleges, teacher colleges, and junior colleges, have lecture facilities with spacious preparation rooms, which are far superior to ours, and almost always these lecture rooms are conveniently adjacent to the general physics equipment storage rooms. We badly need a lecture room to be constructed at the

Physical Science Center, either as a wing projecting over parking facilities or as a third floor.

As indicated in my last Annual Report, the interest in astronomy and astro-physics continues to grow. Professor Hawkins cannot carry complete needs of graduate students, undergraduate majors in physics and astronomy, and undergraduate non-science majors, and with all this continue to carry out his several research programs. I did recommend the appointment of an additional faculty member in astronomy for 1963-64, and the addition of four semester courses and one graduate course in various topics of astronomy and astro-physics. Unfortunately, the additional Assistant Professorship in Astronomy was not approved although the proposed courses were. This leaves a serious lack in our faculty.

There are certain budgetary problems which should be called to your attention. We are still limited by budgetary problems. We should pay a larger stipend to teaching fellows for we are competing with dozens of similar institutions for a quite limited number of able students. The new raise in stipend to \$2,000 merely placed us at the minimum in the national average for physics appointments.

We are sorely limited by the available funds for research, particularly the lack of any funds for appointing research assistants. We have had excellent response to applications for outside grants but we need further funds, for those projects where grants are unavailable or insufficient, and especially for research projects where immediate construction and activity are urgent. We are also severely limited by the lack of funds for secretarial assistance; here I have barely managed to piece together fractional amounts from various grants and special funds, but these have been stretched to the limit or even beyond. The faculty's research productivity is great and the needs for secretarial assistance are also great. The one secretary provided by CLA simply cannot provide the work for an active faculty of 17 teachers of whom 15 are engaged in research. Surely the more than doubling of the faculty in recent years and the increase in research will have to be accompanied by allotments of secretarial funds by the University.

I wish to support the following remarks written by one of my colleagues. "A standing problem concerns teaching loads. Progress is being made on this, but I think it well to establish that teaching loads of the past year have often been excessive. Research progress in physics, world-wide, is proceeding at a merciless rate. The amount of material that must be organized into any satisfactory physics graduate course grows unceasingly, and this requires long and intense preparation. Meanwhile, demands on one's time and energy as a research worker increase due to two causes: expansion of the research background one must have at one's command;

and competition with more and more people, in institutional laboratories and research institutes, who have no teaching at all to do. Finally, one should state the cause of these phenomena, namely the increasing amounts of world-wide monetary support for pure science; amounts scheduled to receive still another big boost (ouch!) in the next few years due to national space programs."

Some mention must also be made of the Summer Term teaching salaries for, despite the recent increase, they are scandalously low as compared with alternative forms of Summer pay, at least in physics. They are also lower than salaries paid at other Summer Schools, a factor which has taken the present Chairman to another University for the Summer Term 1963.

II. Undergraduate Affairs

Professors Chasan, Edmonds, and Stipe received a grant from the National Science Foundation for support of our advanced laboratories in the amount of \$11,250 to be matched over an 18 month period by University funds. Having devoted most of our resources to elementary laboratories over the last several years, we are now fortunate to have sufficient funds available for creation of a superior advanced laboratory.

Several of our undergraduate seniors have received honors. Nessim Laguardo was awarded a Woodrow Wilson Fellowship. Judith Mueller received Honorable Mention in the Woodrow Wilson competition and received a Graduate Fellowship from Brandeis. Robert Lynch and Judith Mueller were elected to Phi Beta Kappa.

We now have special arrangements to provide physics courses for students in CIT, SAR, SED, and in addition we offer the General Physics course, the introductory course for concentrators, and the general education physical science course through DCE. It is now possible for the physics concentration requirements in physics and mathematics to be taken entirely through DCE.

III. Graduate Affairs

It is appropriate to repeat this year from my last report that once again we saw one of our best students receive the Ph.D. degree with an excellent, even exciting, thesis (Dr. Arvind Marathay). He came to us several years ago with a technical M.Sc. in Optics from the University of London; Marathay is now a well-educated and skilled theoretical physicist. He will stay with us for another year as a research associate of Professor Roman. In addition several M.A. degrees were

awarded of which Mrs. Sumanda Basu's thesis should be especially mentioned.

The following awards were received by our graduate students:

1. NSF Cooperative Graduate Fellowships
Herbert Fox
Richard Picard
2. NSF Summer Fellowships
Sylvia Boyd
Benson Chertok
3. John Hay Whitney Foundation Fellowship
Stephen Hamilton
4. Asia Foundation Grant
Mehrabul Alam
5. Fellowship to attend National Summer School in Theoretical Physics at the University of Colorado
Prakash Chand

The Summer 1962 was noteworthy in several respects. Most of the faculty were actively engaged in research here, and nearly two dozen graduate students were present through most of the Summer session as Teaching Assistants, Research Assistants, and working at their own studies or dissertations. We had a weekly Graduate Colloquium to which faculty and students delivered talks on their current research. It was perhaps the closest continuous community of discussion that we have had, and we hope to offer it, again without credit, during the Summer 1963.

IV. Staff Affairs

I am glad to note that our principal undergraduate assistant, Linda Audette (concentrating in English) received the Phi Beta Kappa Scholarship in May, 1963 for the highest grade point average in the Junior Class; she was the top student in our Physical Science Course the previous year.

Joan Ringelheim, who has been a Research Secretary here for two years, received a Human Relations Center Fellowship for 1962-63.

Jean Dennison, another secretary, received a Teaching Fellowship in Geology for 1963-64.

Mr. Joseph DeSouza has joined the Department as Laboratory Curator. He has been extraordinarily helpful throughout the entire range of teaching programs. Indeed now for the first time the general equipment needs are being met with efficiency and intelligence. I am very grateful for his help.

V. Faculty Affairs

Assistant Professor Michael Rice has resigned to accept a position of Associate Professor at Smith College. Mr. Prenowitz's term as Instructor has terminated. Dr. George Zimmerman will come to us from Yale as Assistant Professor of Physics and will initiate a program of work at low temperatures. Several other appointments are in prospect.

I list below the year's record for individual members of the faculty.

A. Booth, Edward C

1) Publications

"Nuclear Resonance Scattering of Bremsstrahlung," Nuclear Physics, 35(1962).

2) Lectures

Addressed the New York Meeting of the American Physical Society on nuclear resonance fluorescence, January, 1963/

3) Research Activities

Research has involved the supervision of a Thayer student, two graduate students and a faculty member during the Summers of 1962 and 1963. During the academic year 1962-63, he has supervised one full-time thesis student and two students doing research part-time. Research has been done on inelastic electron scattering, photo excitation of nuclear isomers, nuclear resonance fluorescence and nuclear Raman effect. None of this work has been published, but all should be publishable within the next six months. A thorough study of low energy electron and photon scattering by nuclei was made with the help of Dr. Chazan and a research grant applied for.

4) Committee Service

Academic Standards Committee, CLA

B. Chasan, Bernard

1) Lectures

Boston University Physics Colloquium on "Direct Pair Production by 800 Mev Electrons"

2) Committee Service

Department: Colloquium Committee

Student Shop Committee

College: Committee to study college language requirements

3) Research Activities

Investigations into nuclear resonance fluorescence, in collaboration with E.C. Booth.

4) Honors

Elected to Sigma Xi.

C. Cohen, Robert S.

1) Publications

(a) "Science: Open Problems and Uncertain Answers", Boston University Journal of Education, vol. 145, No. 3 (1963), 43-47.

(b) Comments on Adolf Grunbaum's paper "The Falsifiability of Theories: Total or Partial? A Contemporary Evaluation of the Duhem-Quine Thesis", Synthese, Vol. XIV, No. 2/3 (1962), 193-195 and in Boston Studies in the Philosophy of Science. Holland: D. Reidel Publishing Company, 1963.

2) Lectures

July 9-13

Visiting Professor on History and Philosophy of Science, American University, Washington, D.C. (NSF Institute for Science Faculty).

August 30

"The Relevance of the History of Science for the Philosophy of Science", 10th International Congress for the History of Science, Cornell University, Ithaca, New York (Invited Address at the Symposium on the Relations of the History of Science and Philosophy of Science).

Sept. 17-October 27

Visiting Fellow of the Polish Academy of Sciences

Warsaw

"Current Work on Philosophical Foundations of Quantum Mechanics", Seminar in Philosophy of Science, Institute of Philosophy.

"Alternative Interpretations of the History of Science", Institute for the History of Science and Technology.

"Open Questions in Marxist Philosophy", Seminar in Marxism, Institute of Philosophy.

"Some Relations of Logical Empiricism and Dialectical Materialism", Seminar in Logic, Institute of Philosophy

- "Critical Reason Today", Warsaw Philosophical Society,
- "Methodology in Philosophy of Science and Esthetics", Department of Philosophy, Party Higher School.
- "Current Issues in American Philosophy of Science", Department of Philosophy, University of Warsaw.
- Cracow "The Tasks of Philosophy", Philosophical Society of Cracow.
- Gdansk "The Place of Science in Culture", Faculty Seminar, Teacher's University of Gdansk.
- Oct. 29-Nov. 2 Visiting Lecturer, Czechoslovakian Academy of Sciences, Prague, Czechoslovakia
- "Open Questions in Marxist Philosophy"
- "Critical Reason Today"
- "Current Issues in American Philosophy of Science"
- December 5 "Remarks on Physics and Philosophy in Poland and Czechoslovakia", Boston University Physics Colloquium.
- Dec. 13 "Philosophy of Science in Poland Today", Boston Colloquium for the philosophy of Science.
- Dec. 27 "Critical Remarks on the Papers of Grünbaum and Hanson". Invited commentator at Symposium on the Mutual Relevance of Philosophy of Science and History of Science, American Philosophical Association, New York City.
- March 10 "Philosophy and Politics in Contemporary Poland", John Wesley Club of Wesleyan University, Middletown, Connecticut.
- March 20 "Alternative Interpretations of Quantum Mechanics", Physics Colloquium, University of New Hampshire, Durham, New Hampshire.
- "Why are Some Civilizations Scientific?", Joint Colloquium, Departments of Geology, Philosophy and Physics, University of N.H.

- March 25 "Recent Developments in the Interpretation of Quantum Mechanics", Philosophy Colloquium, University of Maryland, College Park, Maryland.
- March 26 "Philosophy of Science in Contemporary Poland", The Delaware Seminar in the Philosophy of Science, The University of Delaware, Newark, Delaware.
- April 27 "Politics, Philosophy, and Physics in Poland", Physics Section, National Catholic Educational Association, Stoneham College, Milton, Mass.
- May 17-June 1 Visiting Professor, Philosophical Society of Bosnia and Hercegovina, Croatian philosophical Society, and the Yugoslav Philosophical Association.
- "Open Questions in Marxist Philosophy", Seminar in Philosophy, University of Sarajevo.
- "Open Questions in Marxist Philosophy", Croatian Philosophical Society of Zagreb.
- "American Philosophy from Jonathan Edwards to the Present", Department of Philosophy, University of Zagreb.
- "Little Known Marxist Influences on American Thought", Department of Philosophy, University of Zagreb.
- "Alternative Philosophical Interpretations of Quantum Mechanics", Joint Colloquium, Departments of Physics and Philosophy, University of Belgrade.
- June 24-28 Visiting Professor on History and Philosophy of Science, American University, Washington, D.C. (NSF Institute for Science Faculty).

3) Committee Service

CLA- Academic Policy Committee
GRS- Research Services Committee
University Library Committee
University Advisory VCommittee for Selection of CIT Dean
University Senate Council, Member-at-Large

4) Noteworthy Students

Norman R. Corwin, Ph.D. in Theological Studies ("The Scientist's Responsibility in the Development of Weapons")

Thomas Leith, Ph.D. in Philosophy("Pepper's Views of Theory Formation compared with the Development of Post-Relativistic Cosmological Models")

Judith Mueller, CLA, Honors Student in Physics(Tutorial in Philosophy of Science).

Joan Bromberg, Ph.D. candidate in History of Science at University of Wisconsin.

5) Extra Curricular Activities

Chairman, Boston Colloquium for the Philosophy of Science

Member, Woodrow Wilson Foundation Regional Selection Committee

Member, Executive Committee, Boston Area Faculty Group on Public Issues

Member, National Council, Emergency Civil Liberties Committee

Advisor on Science and Philosophy, Routledge and Kegan Paul Ltd., London.

D. Edmonds, Dean, Jr.

1) Conferences and Symposium

Served as judge at State Science Fair in Rockwell Cagem MIT, May 4, '63

2) Research Activities

Associated with Professor Wolfgang Franzen on his NSF supported research in Optical Pumping.

F. Franzen, Wolfgang

1) Publications

"Generation of Uniform Magnetic Fields by means of Air-Core Coils,"
Review of Scientific Instruments, 33(1962),933-938.

____ Cochran, L.W. "Pulse Ionization Chambers and Proportional
Counters," Chapter I of Nuclear Instruments and Their Uses .
New York: John Wiley & Sons, Inc., 1962.

"Non-Isothermal Superconducting Bolometer," Journal of the Optical
Society of America(1963), 596-603.

2) Committee Service

Chairman of the Graduate Studies Committee and Chairman of
the Colloquium Committee of the Physics Department

3) Research Activities

Research activities include an experimental study of cross-beam light modulation produced by an optically-pumped vapor of rubidium at a double quantum resonance; a theoretical investigation of magnetic resonance of coupled spins; and an experimental investigation of Mössbauer resonance by nuclei undergoing magnetic resonance. Grantee of the National Science Foundation.

4) Extra-Curricular Activities

Member of the Board of Editors of the Review of Scientific Instruments

Consultant to the Committee on Nuclear Science of the National Science Research Council.

G. Hawkins, Gerald

1) Publications

- _____, S.K. Rosenthal, "The Trajectory of Tektites," SAO Report(1962)
 "Impacts on the Earth and Moon," Research Report No.3, NASA Grant
 and P.W. Mitchell, "Catalogue of Lunar Craters I", Research
 Report No.4(1962), NASA Grant
 and P.W. Mitchell, "Catalogue of Lunar Craters II," Research
 Report No.5(1963), NASA Grant.
 "Final Report Tektite Project," (1959-62, 1962) NASA Grant NSG-21-59.
 ○ "Expansion of the Universe", Nature, 194, No. 4828(1962).
 ○ "A Study of Tektites," Journal of Geophysical Research, 68, No.3(1963).
 ○ "Impacts on the Earth and Moon," Nature, 197, No. 4869(1963).
 "A New Theory of the Universe," Science Digest(1962), 40.
 ○ "The Initial Diameter of Meteor Trails", Smithsonian Contributions
 to Astrophysics, 7, 23(1963).
 ○ "The Harvard Radio Meteor Project," Smithsonian Contributions to
 Astrophysics, 7, 53(1963).
 ○ _____ and D.M. Lazarus. "The Mass of Meteoroids," Smithsonian Con-
 tributions to Astrophysics, 7, 221 (1963).
 _____ R.B. Southworth. "Statistics of Meteor Streams," Smithsonian Contrib-
 utions to Astrophysics, 7, 261(1963).
 _____ and Fred Moore. "The Sun and Its Planets. New York: Holt,
 Rinehart and Winston,(in press).

2) Lectures

Sept. 12, 1962	U.S. Army War College, Carlisle Barracks, Pa.
Oct. 2, 1962	Springfield, Massachusetts
Nov. 1, 1962	Gamma Delta
Nov. 2, 1962	Harvard College Observatory Open Night
Jan 31, 1963	Boston University Club of Boston
Feb. 27, 1963	Boston University of Back Bay
May 14 th 1963	Fels Planetarium, Philadelphia

3) Committee Service

Physics Department Graduate Committee
 CLA- Superior Student Committee
 CLA-Honors Committee
 CLA-Group II Science Requirement Committee
 GRS- Space Science Fellowship Committee, Chairman
 University: Distinguished Lectures Committee
 Advisory Committee on Computer Education
 Boston University Research Committee
 University Affairs Council

4) Research Activities

Lunar Craters (NASA Grant)
Tektites (NASA Grant) (Expired September 1962)
Radio Propagation (AFRCRC)
Radio Meteor Project (NSF, NASA)

5) Noteworthy Students

Mrs. Sunanda Basu, M.A. 1963.

H. O'Neill, Edward L

1) Publications

_____ and A. Walter. "The Question of Phase in Image Formation,"
Optics Acta, Jan(1963).

_____ and W. Brouwer and A. Walter. "Matrix Optics and Eikonal
Theory," Applied Optics, Dec(1963), in press.

Introduction to Statistical Optics. Reading, Mass: Addison-Wesley,
June, 1963.

2) Committee Service

CLA Library Committee
Advisor to Physics Club
Committee on Undergraduate Physics Program
Ad-hoc Committee on NSF Proposal for Superior Student Program.

3) Research Activities

Principal Investigator- U.S. Army Grant on "Statistical Optics"

4) Honors

Named Fellow of the Optical Society of America, Oct., 1962
NSF Visiting Scientist Program
Invited Lecturer at Rochester University Summer Institute of Optics

5) Extra-Curricular Activities

Consulting: Completed the Programming and Machine calculations at the physical
optics wavefront and frequency response functions off-axis for all
wavelengths, focal settings and combinations of third and fifth
order geometrical aberration.

I. Read, John

1) Publications

Metropolitan Science Test, Grades 9-12, Harcourt, Brace, and World.
Read General Science Test, Second Edition, Harcourt, Brace, and World.
Co-author, four books of junior high series in science, plus tests and workbooks, L.W. Singer Co., Syracuse, New York.

2) Committee Service

University Educational Council
By-Laws, Senate Council and Dean's Council
Committee to choose a Dean for CIT

J. Rice, Michael

1) Publications

"A Simple Spring Gun: Experiments; Demonstrations," American Journal of Physics, Vol. 31, No.2(1963), 89-91.

2) Lectures

"Quadrupole Relaxation in Nuclear Magnetic Resonance", Physics Department Colloquias, Smith College, December, 1962.

I have no middle name!

K. Roman, Paul

1) Lectures

Three talks on the "Present Status of Elementary Particle Theory" for the Faculty and Research Students of the Boston University Physics Department, Summer 1962.

"Some Recent Facts and Some Speculations on Elementary Particles", Toronto University, Canada, April, 1963.

"Recent Experimental and Theoretical Discoveries in Elementary Particle Physics," U.S. Naval Research Laboratories, Washington, D.C., April, 1963.

2) Committee Service

Department of Physics: Graduate Committee
Colloquia Committee
Ad hoc Committee on Graduate Curriculum Reform

3) Research Activities

- a. A new approach to higher symmetries of elementary particles (in preparation)
- b. On the connection between analytic behaviour and phase retrieval (In cooperations with A. Marathay; to be written up as joint paper in the near future).
- c. Determination of source-correlations from the observed field-correlations (to be written up in the near future).

1 x

- d. A new treatment of vacuum polarization phenomena (In cooperation with J. Herrera- must be further elaborated on before ready for publication).
- e. The mass of the muon in the framework of the gauge invariant theory of elementary particles (In cooperation with Prakash Chand- much further work has to done on it).

4) Honors

Elected to Sigma Xi Society, May 1963

5) Extra-Curricular Activities

Consultant to Addison-Wesley Publishing Company on undergraduate and advanced Physics textbooks.

Regular reviewer of theoretical physics papers and books for
"Mathematical Reviews"
"Zentralblatt für Mathematik", Germany

L. Sachs, Mendel

1) Publications

- and S.L. Schwebel. "On Covariant Formulations of the Maxwell-Lorentz Theory of Electromagnetism", Journal of Mathematical Physics, 3, 843(1962)
- "The Pauli Exclusion Principle from a Self-Consistent Field Theory of Quantum Electrodynamics," Nuovo Cimento, 27 (1963), 1138.
- and S.L. Schwebel. "Implications of a New Approach to Quantum Electrodynamics in Electron-Proton Scattering," Nuclear Physics, 43 (1963).
- Solid State Theory. New York: McGraw Hill Book Company, June 1963.

2) Lectures

- "Derivation of the Pauli Principle" American Physical Society meeting, New York, 1963 (Bull. Amer. Phys. Soc. Sec. II, 8 No.1, 83(1963))
- "Implications of a New Approach to Quantum Electrodynamics in Electron-Proton Scattering", International Conference on the Structure of Nucleon, Stanford University, June 1963.

3) Research Activities

General relativity
Quantum Electrodynamics

M. Siegel, Armand

1) Publications

"Expansions of the linear Boltzmann Operator," Bulletin of the American Physical Society, Series II, Vol. 8, 30 (1963). (With I. Kohlberg)

"Soluble Case of the Time-Dependent Linear Boltzmann Equation Using the 'CD Expansion.'" Bulletin of the American Physical Society, Series II, Vol. 8, 31 (1963). (With I. Kohlberg).

"Operational Aspects of Hidden-Variable Quantum Theories: With a Postscript on the Impact of Recent Scientific Trends on Art. Synthese 14, 171 (1962).

2) Lectures

a. Hillel Foundation, Boston University: "Is Disarmament Possible" public discussion (with Bernard Rubin of SPRC), Nov. 28, 1962.

b. Temple Isaiah of Lexington: "Who were the Heroes?", Panel Discussant, April 26, 1963.

c. Case Institute of Technology, Cleveland, Ohio. Theoretical Seminar, "Expansion of the Linear Boltzmann Operator," March 12, 1963.

3) Research Activities

Linear Boltzmann Operator; Functional Expansions in Turbulence Theory; Basic Aspects of Entropy.

4) Committee Service

Departmental Library Representative
Committee on Academic Programs and Policies, Graduate School
Telephone Committee, University

N. Stipe, J. Gordon

1) Lectures

Preparing a series of closed circuit Television Lectures for a General Physics course, being handled by Harvard Extension and WGBH, for Harvard Extension courses for the Polaris Submarine crews.

2) Committee and University Service

a. Served as Acting Chairman of Department for two and one-half months in Fall 1962, and three weeks in Spring 1963.

b. Premedical Advisory Committee

c. CIA-SAR Liason Committee

d. Ad hoc Committee on Group II Distribution Requirements for 1962-63.

e. Department Committee on revising undergraduate curriculum for physics majors.

3) Honors

Elected Secretary-Treasurer of the New England Section, American Association of Physics Teachers, 1963-64.

O. Willis, Charles R.

1) Publications

- o "Approach to Equilibrium Quantum Mechanical Gibbsonian Ensembles," Physical Review, 127(1962), 1405.
- o _____ and P.G. Bergmann. "Quantum Mechanical Liouville Equation For a System in Contact with a Reservoir," Physical Review, 128, (1962), 391.
- o "Kubo Formalism for the Conductivity of a Plasma with Random Scatterers," (to be published).
- o "Kubo Formalism for the Conductivity of a Plasma with Random Scatterers," (Abstract) Bulletin of the American Physical Society, 8(1963), 147.

2) Lectures

- a. "Approach to Equilibrium in the Space of Density Matrices," Yeshiva University.
- b. Paper at Plasma Physics Meeting, Atlantic City, New Jersey, Nov, 1962.
- c. "Theory of Irreversibility in Plasmas", presented at the Bureau of Standards, Washington, D.C.
- d. "Correlation Effects in a Plasma," Naval Research Laboratory, Washington, D.C.
- e. "Kubo Formalism for the Conductivity of a Plasma," University of Illinois
- f. "The Theory of Irreversibility," Boston University, Summer 1962.

P. Visiting Lecturers

1) Dr. Bertil-Anders Lindblad, Visiting Lecturer for second semester
1962-63 in Astrophysics, AS 702E.

2) Colloquium

Oct. 3	Dr. Benjamin Lax Lincoln Laboratory	"Magneto-Optical Phenomena in Solids"
Oct. 17	Dr. Y. Aharonov Yeshiva University	"Significance of Electro- magnetic Potentials in Quantum Theory"
Oct. 31	Prof. B. Chasan Boston University	"Direct Pair Production by High Energy Electrons"
Nov. 14	Prof. M. Sachs Boston University	"A New Approach to Quantum Electrodynamics"
Nov. 28	Prof. R.S. Ingarden of University of Wroclaw, Poland	"Irreversible Thermodynamics of Optical Imagery"
Dec. 12	Dr. S. Bennett AVCO Research Lab- oratory	"Energy Spectrum and Positive Excess of Muons in Cosmic Ray Air Showers"
Feb. 13	Prof. G.E. Brown MIT and NORDITA (Copenhagen)	"Recent Developments in the Nuclear Many-Body Problem"
Feb. 27	Prof. M. Goldberger Princeton and MIT	"Regge Poles and High Energy Scattering"
Mar. 13	DR. H. Zapolsky Institute for Space Studies	"White Dwarfs, Rocks and Planets"
Mar. 27	Prof. A. Siegel Boston University	"Functional Expansions in Turbulence Theory"
April 17	Dr. Arthur E. Woodruff Yale University	"William Crookes and the Lessons of the Radiometer"
April 24	Dr. M. Skolnick	"Pion Exchange Currents in Deuteron Photo-Disinteg- ration"
May 1	Sir George Thompson Cambridge University	"The Discovery of the Elec- tron"

office copy

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A number of problems remain with us. Unlike every physics department known to our faculty we do not have a well equipped lecture room, suitable for scientific demonstration lectures, well lighted and able to hold 300-350 students in comfort. We now have 10 undergraduate courses, meeting at various hours of the academic year, including evening, which require such a lecture hall. We cannot provide the small preparation room adjacent to room 50 in the Stone Chemistry Building with the full range of demonstration equipment needed for these various courses. That preparation room is too small, most of the needed equipment is also needed in other courses and laboratories, and the time available to prepare demonstrations is severely limited due to the extraordinary number of courses which meet in room 50. Room 50 would be completely used by other departments even if we were to withdraw all of our needs for it. As a result of these circumstances, our undergraduate introductory courses, despite careful lecture preparation and fine text books and associated laboratory work, are the weakest of our curriculum in physics. The overwhelming majority of physics departments, including those in very small and very poor liberal arts colleges, teacher colleges, and junior colleges, have lecture facilities with spacious preparation rooms, which are far superior to ours, and almost always these lecture rooms are conveniently adjacent to the general physics equipment storage rooms. We badly need a lecture room to be constructed at the

Physical Science Center, either as a wing projecting over parking facilities or as a third floor.

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and competition with more and more people, in institutional laboratories and research institutes, who have no teaching at all to do. Finally, one should state the cause of these phenomena, namely the increasing amounts of world-wide monetary support for pure science; amounts scheduled to receive still another big boost (ouch!) in the next few years due to national space programs."

Some mention must also be made of the Summer Term teaching salaries for, despite the recent increase, they are scandalously low as compared with alternative forms of Summer pay, at least in physics. They are also lower than salaries paid at other Summer Schools, a factor which has taken the present Chairman to another University for the Summer Term 1962-63.

II. Undergraduate Affairs

Professors Chasman, Edmunds, and Stipe received a grant from the National Science Foundation for support of our advanced laboratories in the amount of \$11,250 to be matched over an 18 month period by University funds. Having devoted most of our resources to elementary laboratories over the last several years, we are now fortunate to have sufficient funds available for creation of a superior advanced laboratory.

Several of our undergraduate seniors have received honors. Nassim Lagasid was awarded a Woodrow Wilson Fellowship. Judith Mueller received Honorable Mention in the Woodrow Wilson competition and received a Graduate Fellowship from Brandeis. Robert Lynch and Judith Mueller were elected to Phi Beta Kappa.

We now have special arrangements to provide physics courses for students in CIE, SAR, SED, and in addition we offer the General Physics course, the introductory course for concentrators, and the general education physical science course through DCE. It is now possible for the physics concentration requirements in physics and mathematics to be taken entirely through DCE.

III. Graduate Affairs

It is appropriate to repeat this year from my last report that once again we saw one of our best students receive the Ph.D. degree with an excellent, even exciting, thesis (Dr. Arvind Marathe). He came to us several years ago with a technical M.Sc. in Optics from the University of London; Marathe is now a well-educated and skilled theoretical physicist. He will stay with us for another year as a research associate of Professor Roman. In addition several M.A. degrees were

awarded of which Mrs. Sumania Basu's thesis should be especially mentioned.

The following awards were received by our graduate students:

1. NSF Cooperative Graduate Fellowships
Herbert Fox
Richard Picard
2. NSF Summer Fellowships
Sylvia Boyd
Benson Chertok
3. John Hay Whitney Foundation Fellowship
Stephen Hamilton
4. Asia Foundation Grant
Mahbubul Alam
5. Fellowship to attend National Summer School in Theoretical Physics at the University of Colorado
Prakash Chandra

The Summer 1962 was noteworthy in several respects. Most of the faculty were actively engaged in research here, and nearly two dozen graduate students were present through most of the Summer session as Teaching Assistants, Research Assistants, and working at their own studies or dissertations. We had a weekly Graduate Colloquium to which faculty and students delivered talks on their current research. It was perhaps the closest continuous community of discussion that we have had, and we hope to offer it, again without credit, during the Summer 1963.

IV. Staff Affairs

I am glad to note that our principal undergraduate assistant, Linda Aulette (concentrating in English) received the Phi Beta Kappa Scholarship in May, 1963 for the highest grade point average in the Junior Class; she was the top student in our Physical Science Course the previous year.

Joan Ringelheim, who has been a Research Secretary here for two years, received a Human Relations Center Fellowship for 1962-63.

Jean Dennison, another secretary, received a Teaching Fellowship in Geology for 1963-64.

Mr. Joseph DeSousa has joined the Department as Laboratory Curator. He has been extraordinarily helpful throughout the entire range of teaching programs. Indeed now for the first time the general equipment needs are being met with efficiency and intelligence. I am very grateful for his help.

V. Faculty Affairs

Assistant Professor Michael Rice has resigned to accept a position of Associate Professor at Smith College. Mr. Prenowitz's term as Instructor has terminated. Dr. George Zimmerman will come to us from Yale as Assistant Professor of Physics and will initiate a program of work at low temperatures. Several other appointments are in prospect.

I list below the year's record for individual members of the faculty.

A. Booth, Edward C

1) Publications

"Nuclear Resonance Scattering of Bremsstrahlung," Nuclear Physics, 35(1962).

2) Lectures

Addressed the New York Meeting of the American Physical Society on nuclear resonance fluorescence, January, 1963.

3) Research Activities

Research has involved the supervision of a Thayer student, two graduate students and a faculty member during the Summers of 1962 and 1963. During the academic year 1962-63, he has supervised one full-time thesis student and two students doing research part-time. Research has been done on inelastic electron scattering, photo excitation of nuclear isomers, nuclear resonance fluorescence and nuclear Raman effect. None of this work has been published, but all should be publishable within the next six months. A thorough study of low energy electron and photon scattering by nuclei was made with the help of Dr. Chasan and a research grant applied for.

4) Committee Service

Academic Standards Committee, CLA

Annual Report of the Department of Physics, 1962-63

B. Chasan, Bernard

1) Lectures

Boston University Physics Colloquium on "Direct Pair Production by 800 Mev Electrons"

2) Committee Service

Department: Colloquium Committee

Student Shop Committee

College: Committee to study college language requirements

3) Research Activities

Investigations into nuclear resonance fluorescence, in collaboration with E.C. Booth.

4) Honors

Elected to Sigma Xi.

C. Cohen, Robert S.

1) Publications

(a) "Science: Open Problems and Uncertain Answers", Boston University Journal of Education, vol. 145, No. 3 (1963), 43-47.

(b) Comments on Adolf Grunbaum's paper "The Falsifiability of Theories: Total or Partial? A Contemporary Evaluation of the Duhem-Quine Thesis", Synthese, Vol. XIV, No. 2/3 (1962), 193-195 and in Boston Studies in the Philosophy of Science. Holland: D. Reidel Publishing Company, 1963.

2) Lectures

July 9-13

Visiting Professor on History and Philosophy of Science, American University, Washington, D.C. (NSF Institute for Science Faculty).

August 30

"The Relevance of the History of Science for the Philosophy of Science", 10th International Congress for the History of Science, Cornell University, Ithaca, New York (Invited Address at the Symposium on the Relations of the History of Science and Philosophy of Science).

Sept. 17-October 27

Visiting Fellow of the Polish Academy of Sciences

Warsaw

"Current Work on Philosophical Foundations of Quantum Mechanics", Seminar in Philosophy of Science, Institute of Philosophy.

"Alternative Interpretations of the History of Science", Institute for the History of Science and Technology.

"Open Questions in Marxist Philosophy", Seminar in Marxism, Institute of Philosophy.

"Some Relations of Logical Empiricism and Dialectical Materialism", Seminar in Logic, Institute of Philosophy

- "Critical Reason Today", Warsaw Philosophical Society,
- "Methodology in Philosophy of Science and Esthetics", Department of Philosophy, Party Higher School.
- "Current Issues in American Philosophy of Science", Department of Philosophy, University of Warsaw.
- Cracow "The Tasks of Philosophy", Philosophical Society of Cracow.
- Gdansk "The Place of Science in Culture", Faculty Seminar, Teacher's University of Gdansk.
- Oct. 29-Nov. 2 Visiting Lecturer, Czechoslovakian Academy of Sciences, Prague, Czechoslovakia
- "Open Questions in Marxist Philosophy"
- "Critical Reason Today"
- December 5 "Current Issues in American Philosophy of Science"
- "Remarks on Physics and Philosophy in Poland and Czechoslovakia", Boston University Physics Colloquium.
- Dec. 13 "Philosophy of Science in Poland Today", Boston Colloquium for the Philosophy of Science.
- Dec. 27 "Critical Remarks on the Papers of Grünbaum and Hanson". Invited commentator at Symposium on the Mutual Relevance of Philosophy of Science and History of Science, American Philosophical Association, New York City.
- March 10 "Philosophy and Politics in Contemporary Poland", John Wesley Club of Wesleyan University, Middletown, Connecticut.
- March 20 "Alternative Interpretations of Quantum Mechanics", Physics Colloquium, University of New Hampshire, Durham, New Hampshire.
- "Why are Some Civilizations Scientific?", Joint Colloquium, Departments of Geology, Philosophy and Physics, University of N.H.

March

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- March 25 "Recent Developments in the Interpretations of Quantum Mechanics", Philosophy Colloquium, University of Maryland, College Park, Maryland.
- March 26 "Philosophy of Science in Contemporary Poland", The Delaware Seminar in the Philosophy of Science, The University of Delaware, Newark, Delaware.
- April 27 "Politics, Philosophy, and Physics in Poland", Physics Section, National Catholic Educational Association, Stoneham College, Milton, Mass.
- May 17-June 1 Visiting Professor, Philosophical Society of Bosnia and Hercegovina, Croatian Philosophical Society, and the Yugoslav Philosophical Association.
- "Open Questions in Marxist Philosophy", Seminar in Philosophy, University of Sarajevo.
- "Open Questions in Marxist Philosophy", Croatian Philosophical Society of Zagreb.
- "American Philosophy from Jonathan Edwards to the Present", Department of Philosophy, University of Zagreb.
- "Little Known Marxist Influences on American Thought", Department of Philosophy, University of Zagreb.
- "Alternative Philosophical Interpretations of Quantum Mechanics", Joint Colloquium, Departments of Physics and Philosophy, University of Belgrade.
- June 24-28 Visiting Professor on History and Philosophy of Science, American University, Washington, D.C. (NSF Institute for Science Faculty).

3) Committee Service

CLA- Academic Policy Committee
 GRS- Research Services Committee
 University Library Committee
 University Advisory VCommittee for Selection of CIT Dean
 University Senate Council, Member-at-Large

4) Noteworthy Students

Norman R. Corwin, Ph.D. in Theological Studies ("The Scientist's Responsibility in the Development of Weapons")

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Thomas Leith, Ph.D. in Philosophy ("Pepper's Views of Theory Formation compared with the Development of Post-Relativistic Cosmological Models")

Judith Mueller, CLA, Honors Student in Physics (Tutorial in Philosophy of Science).

Joan Bromberg, Ph.D. candidate in History of Science at University of Wisconsin.

5) Extra Curricular Activities

Chairman, Boston Colloquium for the Philosophy of Science
Member, Woodrow Wilson Foundation Regional Selection Committee
Member, Executive Committee, Boston Area Faculty Group on Public Issues
Member, National Council, Emergency Civil Liberties Committee
Advisor on Science and Philosophy, Routledge and Kegan Paul Ltd., London.

D. Edmonds, Dean, Jr.

1) Conferences and Symposium

Served as judge at State Science Fair in Rockwell Cage MIT, May 4, '63

2) Research Activities

Associated with Professor Wolfgang Franzen on his NSF supported research in Optical Pumping.

F. Franzen, Wolfgang

1) Publications

"Generation of Uniform Magnetic Fields by means of Air-Core Coils,"
Review of Scientific Instruments, 33(1962), 933-938.

____ Cochran, L.W. "Pulse Ionization Chambers and Proportional
Counters," Chapter I of Nuclear Instruments and Their Uses.
New York: John Wiley & Sons, Inc., 1962.

"Non-Isothermal Superconducting Bolometer," Journal of the Optical
Society of America(1963), 596-603.

2) Committee Services

Chairman of the Graduate Studies Committee and Chairman of
the Colloquium Committee of the Physics Department

3) Research Activities

Research activities include an experimental study of cross-beam light modulation produced by an optically-pumped vapor of rubidium at a double quantum resonance; a theoretical investigation of magnetic resonance of coupled spins; and an experimental investigation of Mössbauer resonance by nuclei undergoing magnetic resonance. Grantee of the National Science Foundation.

4) Extra-Curricular Activities

Member of the Board of Editors of the Review of Scientific Instruments

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Consultant to the Committee on Nuclear Science of the National Science Research Council.

G. Hawkins, Gerald

1) Publications

_____, S.K. Rosenthal, "The Trajectory of Tektites," SAO Report(1962)
 "Impacts on the Earth and Moon," Research Report No.3, NASA Grant
 and P.W. Mitchell, "Catalogue of Lunar Craters I", Research
 Report No.4(1962), NASA Grant
 and P.W. Mitchell, "Catalogue of Lunar Craters II," Research
 Report No.5(1963), NASA Grant.
 "Final Report Tektite Project," (1959-62, 1962) NASA Grant NSG-21-59.
 "Expansion of the Universe", Nature, 194, No. 4828(1962).
 "A Study of Tektites," Journal of Geophysical Research, 68, No.3(1963).
 "Impacts on the Earth and Moon," Nature, 197, No. 4869(1963).
 "A New Theory of the Universe," Science Digest(1962), 40.
 "The Initial Diameter of Meteor Trails", Smithsonian Contributions
 to Astrophysics, 7, 23(1963).
 "The Harvard Radio Meteor Project," Smithsonian Contributions to
 Astrophysics, "7, 53(1963).
 _____ and D.M. Lazarus. "The Mass of Meteoroids," Smithsonian Con-
 tributions to Astrophysics," 7, 221 (1963).
 _____, R.B. Southworth. "Statistics of Meteor Streams," Smithsonian Contrib-
 utions to Astrophysics, 7, 261(1963).
 _____ and Fred Moore. "The Sun and Its Planets. New York: Holt,
 Rinehart and Winston,(in press).

2) Lectures

Sept. 12, 1962	U.S. Army War College, Carlisle Barracks, Pa.
Oct. 2, 1962	Springfield, Massachusetts
Nov. 1, 1962	Gamma Delta
Nov. 2, 1962	Harvard College Observatory Open Night
Jan 31, 1963	Boston University Club of Boston
Feb. 27, 1963	Boston University ^{Club} of Back Bay
May 14m 1963	Fels Planetarium, Philadelphia

Club
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3) Committee Service

- Physics Department Graduate Committee
- CLA- Superior Student Committee
- CLA-Honors Committee
- CLA-Group II Science Requirement Committee
- GRS- Space Science Fellowship Committee, Chairman
- University: Distinguished Lectures Committee
- Advisory Committee on Computer Education
- Boston University Research Committee
- University Affairs Council

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4) Research Activities

Lunar Craters (NASA Grant)
Tektites (NASA Grant) (Expired September 1962)
Radio Propagation (AFRC)
Radio Meteor Project (NSF, NASA)

5) Noteworthy Students

Mrs. Sumanda Basu, M.A. 1963.

H. O'Neill, Edward L

1) Publications

_____ and A. Walter. "The Question of Phase in Image Formation,"
Optics Acta, Jan(1963).
_____ and W. Brewer and A. Walter. "Matrix Optics and Eikonal
Theory," Applied Optics, Dec(1963), in press.
Introduction to Statistical Optics. Massachusetts: Addison-Wesley,
June, 1963. ^

Reading, Mass.

2) Committee Service

CLA Library Committee
Advisor to Physics Club
Committee on Undergraduate Physics Program
Ad-hoc Committee on NSF Proposal for Superior Student Program.

3) Research Activities

Principal Investigator- U.S. Army Grant on "Statistical Optics"

4) Honors

Named Fellow of the Optical Society of America, Oct., 1962
NSF Visiting Scientist Program
Invited Lecturer at Rochester University Summer Institute of Optics

5) Extra-Curricular Activities

Consulting: Completed the Programming and Machine calculations at the physical optics wavefront and frequency response functions off-axis for all wavelengths, focal settings and combinations of third and fifth order geometrical aberration.

I. Read, John

1) Publications

Metropolitan Science Test, Grades 9-12, Harcourt, Brace, and World.
Read General Science Test, Second Edition, Harcourt, Brace, and World.
Co-author, four books of junior High series in science, plus tests and workbooks, L.W. Singer Co., Syracuse, New York.

2) Committee Service

University Educational Council
By-Laws, Senate Council and Dean's Council
Committee to choose a Dean for CIT

J. Rice, Michael

1) Publications

"A Simple Spring Gun: Experiments; Demonstrations," American Journal of Physics, Vol. 31, No.2(1963), 89-91.

2) Lectures

"Quadrupole Relaxation in Nuclear Magnetic Resonance", Physics Department Colloquia, Smith College, December, 1962.

K. Roman, Paul

1) Lectures

Three talks on the "Present Status of Elementary Particle Theory" for the Faculty and Research Students of the Boston University Physics Department, Summer 1962.

"Some Recent Facts and Some Speculations on Elementary Particles", Toronto University, Canada, April, 1963.

"Recent Experimental and Theoretical Discoveries in Elementary Particle Physics," U.S. Naval Research Laboratories, Washington, D.C., April, 1963.

2) Committee Service

Department of Physics: Graduate Committee
Colloquia Committee
Ad hoc Committee on Graduate Curriculum Reform

3) Research Activities

- a. A new approach to higher symmetries of elementary particles (in preparation)
- b. On the connection between analytic behaviour and phase retrieval (In cooperations with A. Marathay; to be written up as joint paper in the near future).
- c. Determination of source-correlations from the observed field-correlations (to be written up in the near future).

Richard M. Millard, Dean, C.L.A.
Richard S. Bear, Dean, G.R.S.

June 12, 1963

Robert S. Cohen, Chairman, Department of Physics
Annual Report for the Department of Physics, 1962-63

This report is set forth in the following sections:

- I. Progress and Problems
- II. Undergraduate Affairs
- III. Graduate Affairs
- IV. Staff Affairs
- V. Faculty Record

I. Progress and Problems

The general activities of the department during the Summer of 1962 and the academic year 1962-63 were full and satisfactory. Research in several areas of investigation has begun to yield results, both scientifically and educationally. In several areas, the teaching of our courses has been improved, and the organization of our facilities made more efficient. A number of substantial grants for research has been received and a new large grant for educational laboratory facilities has also been received. The number and quality of graduate students has once again improved as compared with previous years, but this has not been matched by comparable improvement among the undergraduate majors. A considerable number of honors have been received by our students and our faculty.

A number of problems remain with us. Unlike every physics department known to our faculty we do not have a well equipped lecture room, suitable for scientific demonstration lectures, well lighted and able to hold 300-350 students in comfort. We now have 10 undergraduate courses, meeting at various hours of the academic year, including evening, which require such a lecture hall. We cannot provide the small preparation room adjacent to room 50 in the Stone Chemistry Building with the full range of demonstration equipment needed for these various courses. That preparation room is too small, most of the needed equipment is also needed in other courses and laboratories, and the time available to prepare demonstrations is severely limited due to the extraordinary number of courses which meet in room 50. Room 50 would be completely used by other departments even if we were to withdraw all of our needs for it. As a result of these circumstances, our undergraduate introductory courses, despite careful lecture preparation and fine text books and associated laboratory work, are the weakest of our curriculum in physics. The overwhelming majority of physics departments, including those in very small and very poor liberal arts colleges, teacher colleges, and junior colleges, have lecture facilities with spacious preparation rooms, which are far superior to ours, and almost always these lecture rooms are conveniently adjacent to the general physics equipment storage rooms. We badly need a lecture room to be constructed at the

Annual Report of the Department of Physics, 1962-63

11.

4) Research Activities

- Lunar Craters (NASA Grant)
- Tektites (NASA Grant) (Expired September 1962)
- Radio Propagation (AFRC)
- Radio Meteor Project (NSF, NASA)

5) Noteworthy Students

Mrs. Sumanda Basu, M.A. 1963.

H. O'Neill, Edward L

1) Publications

_____ and A. Walter. "The Question of Phase in Image Formation,"
Optics Acta, Jan(1963).

_____ and W. Brower and A. Walter. "Matrix Optics and Eikonal
Theory," Applied Optics, Dec(1963), in press.

Introduction to Statistical Optics. Massachusetts: Addison-Wesley,
June, 1963. ^

2) Committee Service

- CLA Library Committee
- Advisor to Physics Club
- Committee on Undergraduate Physics Program
- Ad-hoc Committee on NSF Proposal for Superior Student Program.

3) Research Activities

Principal Investigator- U.S. Army Grant on "Statistical Optics"

4) Honors

- Named Fellow of the Optical Society of America, Oct., 1962
- NSF Visiting Scientist Program
- Invited Lecturer at Rochester University Summer Institute of Optics

5) Extra-Curricular Activities

Consulting: Completed the Programming and Machine calculations at the physical
optics wavefront and frequency response functions off-axis for all
wavelengths, focal settings and combinations of third and fifth
order geometrical aberration.

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Reading, Mass.

note

I. Read, John

1) Publications

Metropolitan Science Test, Grades 9-12, Harcourt, Brace, and World.
Read General Science Test, Second Edition, Harcourt, Brace, and World.
Co-author, four books of junior High series in science, plus tests and workbooks, L.W. Singer Co., Syracuse, New York.

2) Committee Service

University Educational Council
By-Laws, Senate Council and Dean's Council
Committee to choose a Dean for CIT

J. Rice, Michael

1) Publications

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2) Lectures

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"Recent Experimental and Theoretical Discoveries in Elementary Particle Physics," U.S. Naval Research Laboratories, Washington, D.C., April, 1963.

2) Committee Service

Department of Physics: Graduate Committee
Colloquia Committee
Ad hoc Committee on Graduate Curriculum Reform

3) Research Activities

- a. A new approach to higher symmetries of elementary particles (in preparation)
- b. On the connection between analytic behaviour and phase retrieval (In cooperations with A. Marathay; to be written up as joint paper in the near future).
- c. Determination of source-correlations from the observed field-correlations (to be written up in the near future).

- d. A new treatment of vacuum polarization phenomena (In cooperation with J. Herrera- must be further elaborated on before ready for publication).
- e. The mass of the muon in the framework of the gauge invariant theory of elementary particles (In cooperation with Prakash Chand- much further work has to done on it).

4) Honors

Elected to Sigma Xi Society, May 1963

5) Extra-Curricular Activities

Consultant to Addison-Wesley Publishing Company on undergraduate and advanced Physics textbooks.

Regular reviewer of theoretical physics papers and books for

"Mathematical Reviews "

"Zentralblatt für Mathematik", Germany

L. Sachs, Mendel

1) Publications

_____ and S.L. Schwebel. "On Covariant Formulations of the Maxwell-Lorentz Theory of Electromagnetism," Journal of Mathematical Physics, 3, 843(1962)

"The Pauli Exclusion Principle from a Self-Consistent Field Theory of Quantum Electrodynamics," Nuovo Cimento, 27 (1963), 1138.

_____ and S.L. Schwebel. "Implications of a New Approach to Quantum Electrodynamics in Electron-Proton Scattering," Nuclear Physics, 43 (1963).

Solid State Theory. New York: McGraw Hill Book Company, June 1963.

2) Lectures

"Derivation of the Pauli Principle" American Physical Society meeting, New York, 1963 (Bull. Amer. Phys. Soc. Sec. II, 8 No.1, 83(1963)

"Implications of a New Approach to Quantum Electrodynamics in Electron-Proton Scattering", International Conference on the Structure of Nucleon, Stanford University, June 1963.

3) Research Activities

General relativity

Quantum Electrodynamics

M. Siegel, Armand

1) Publications

"Expansions of the linear Boltzmann Operator," Bulletin of the American Physical Society, Series II, Vol. 8, 30 (1963). (With I. Kohlberg)

"Soluble Case of the Time-Dependent Linear Boltzmann Equation Using the 'CD Expansion.'" Bulletin of the American Physical Society, Series II, Vol. 8, 31 (1963). (With I. Kohlberg).

"Operational Aspects of Hidden-Variable Quantum Theories: With a Postscript on the Impact of Recent Scientific Trends on Art." Synthese 14, 171 (1962).

2) Lectures

a. Hillel Foundation, Boston University: "Is Disarmament Possible" public discussion (with Bernard Rubin of SPRC), Nov. 28, 1962.

b. Temple Isaiah of Lexington: "Who were the Heroes?", Panel Discussant, April 26, 1963.

c. Case Institute of Technology, Cleveland, Ohio. Theoretical Seminar, "Expansion of the Linear Boltzmann Operator," March 12, 1963.

3) Research Activities

Linear Boltzmann Operator; Functional Expansions in Turbulence Theory; Basic Aspects of Entropy.

4) Committee Service

Departmental Library Representative

Committee on Academic Programs and Policies, Graduate School

Telephone Committee, University

W. Stipe, J. Gordon

1) Lectures

Preparing a series of closed circuit Television Lectures for a General Physics course, being handled by Harvard Extension and WGBH, for Harvard Extension courses for the Polaris Submarine crews.

2) Committee and University Service

a. Served as Acting Chairman of Department for two and one-half months in Fall 1962, and three weeks in Spring 1963.

b. Premedical Advisory Committee

c. CLA-SAR Liason Committee

d. Ad hoc Committee on Group II Distribution Requirements for 1962-63.

e. Department Committee on revising undergraduate curriculum for physics majors.

3) Honors

Elected Secretary-Treasurer of the New England Section, American Association of Physics Teachers, 1963-64.

O. Willis~~is~~ Charles R.

1) Publications

"Approach to Equilibrium Quantum Mechanical Gibbsian Ensembles,"
Physical Review, 127(1962), 1405.

and P.G. Bergmann. "Quantum Mechanical Liouville Equation
for a System in Contact with a Reservoir," Physical Review, 128,
(1962), 391/

"Kubo Formalism for the Conductivity of a Plasma with Random
Scatterers," (to be published).

2) Lectures

- a. "Approach to Equilibrium in the Space of Density Matrices,"
Yeshiva University.
- b. Paper at Plasma Physics Meeting, Atlantic City, New Jersey, Nov, 1962.
- c. "Theory of Irreversibility in Plasmas", presented at the Bureau
of Standards, Washington, D.C.
- d. "Correlation Effects in a Plasma," Naval Research Laboratory,
Washington, D.C.
- e. "Kubo Formalism for the Conductivity of a Plasma," University of
Illinois
- f. "The Theory of Irreversibility," Boston University, Summer 1962.

P. Visiting Lecturers

1) Dr. Bertil-Anders Lindblad, Visiting Lecturer for second semester 1962-63 in Astrophysics, AS 702E.

2) Colloquium

Oct. 3	Dr. Benjamin Lax Lincoln Laboratory	"Magneto-Optical Phenomena in Solids"
Oct. 17	Dr. Y. Aharonov Yeshiva University	"Significance of Electro- magnetic Potentials in Quantum Theory"
Oct. 31	Prof. B. Chasan Boston University	"Direct Pair Production by High Energy Electrons"
Nov. 14	Prof. M. Sachs Boston University	"A New Approach to Quantum Electrodynamics"
Nov. 28	Prof. R.S. Ingarden University of Wroclaw, Poland	"Irreversible Thermodynamics of Optical Imagery"
Dec. 12	Dr. S. Bennett AVCO Research Lab- oratory	"Energy Spectrum and Positive Excess of Muons in Cosmic Ray Air Showers"
Feb. 13	Prof. G.E. Brown MIT and NORDITA (Copenhagen)	"Recent Developments in the Nuclear Many-Body Problem"
Feb. 27	Prof. M. Goldberger Princeton and MIT	"Regge Poles and High Energy Scattering"
Mar. 13	DR. H. Zepolsky Institute for Space Studies	"White Dwarfs, Rocks and Planets"
Mar. 27	Prof. A. Siegel Boston University	"Functional Expansions in Turbulence Theory"
April 17	Dr. Arthur E. Woodruff Yale University	"William Crookes and the Lessons of the Radiometer"
April 24	Dr. M. Skolnick	"Pion Exchange Currents in Deuteron Photo-Disinteg- ration"
May 1	Sir George Thompson Cambridge University	"The Discovery of the Elec- tron"

- December 11-12 Member, Conference on Curriculum-S (general or non-research physics undergraduate curriculum) sponsored by Commission on College Physics, Princeton University, Princeton, N.J.
- December 26 Chairman, Symposium on "Philosophy and Economic Theory," AAAS Annual Meeting, Cleveland, Ohio.
- ✓ December 27 "The Structure of Scientific Revolutions."
- February 10, 1964 Invited speaker at symposium, AAAS Annual Meeting. Lecturer and consultant to Department of Physics, Atlantic Union College (Mass.) for Visiting Scientists Program of the American Association of Physics Teachers.
- March 11 Panel member, "Disarmament and Arms Control," B.U. Founders Day program.
- ✓ March 24-April 4 Visiting Professor, Hungarian Academy of Sciences (with travel grant from Fabinowitz Foundation and appointment from the Hungarian Academy): conferences in Budapest and Szeged; and lectures to Institute of Physics ("Alternative Interpretations of the Quantum Theory, East and West") and to the Institute of Philosophy ("American Philosophy: From Johnathan Edwards to Current Problems").
- April 13 "Elementary Education and the Philosophy of Science," Scituate Central Elementary School, for B.U. SED program.
- April 23 "Marxism and Democracy," Symposium of the American Institute for Marxist Studies, New York.
- June 6 "Physics at B.U.," Contribution to B.U. Alumni Day symposium on "Science at B.U."
- June 15-July 16 Member, planning staff of research conference on "Science and Contemporary Social Problems," sponsored by Oak Ridge Institute of Nuclear Studies, NSF and AEC (Oak Ridge, Tenn.).
- June 19 "Science and Ethics," Oak Ridge Institute of Nuclear Studies Conference.

4) Courses

In addition to continuing the Physical Science course, largely taken by students from SAR and SED, and offered in DCE as well as day CIA, I offered a graduate physics seminar on philosophical foundations of physics. In this seminar, the topic for discussion was the quantum theory of measurement, or rather the history and differing interpretations of that theory. In this seminar, I was joined by Visiting Professor F. J. Zucker, and at various times we were joined by Professors Sachs, O'Neill, and Siegel. Some serious student talks were presented, both by physicists and philosophers. In addition to formal courses, I have served as tutor or thesis director to three graduate philosophy students, Michael Bradie, Caroline Snider, Joan Ringelheim, and also as doctorate adviser to a student at the University of Wisconsin department of the history of science.

Further, I have given a series of eight lectures on the history of physics to the first summer course on the history of science and medicine. It is still quite an open question as to whether this new course will have any positive effect.

5) Civic Activities

(a) Elected to Executive Committee of the Emergency Civil Liberties Committee (New York City).

(b) Served on the Boston Area Faculty Group on Public Issues (BAFGOPI).

6) Publications

Cohen, Robert S. Individuality and Common Purpose: The Philosophy of Science, The Science Teacher, XXXI (May 1964), 27-33.

Cohen, Robert S. Dialectical Materialism and Carnap's Logical Empiricism, in P. A. Schilpp, ed., The Philosophy of Rudolf Carnap. LaSalle, Illinois: Open Court, 1964, pp. 99-158.