

ANNUAL REPORT
OF THE
MICHIGAN STATE UNIVERSITY
CYCLOTRON LABORATORY
FOR THE PERIOD
JULY 1, 1978 TO JUNE 30, 1979

BY
PROJECT STAFF

DECEMBER 1979
EAST LANSING, MICHIGAN

This Annual Report documents program accomplishments of the MSU Cyclotron Laboratory for the period July 1, 1978 to June 30, 1979. In this period, the National Science Foundation continued to be the major source of support for Laboratory programs with substantial additional support from Michigan State University. Sources of support are summarized in Table I.

Contents of this report include a staff roster (Table II), brief summaries of much of the work in progress in the Laboratory, title pages of articles appearing in print, and abstracts of both oral presentations to scientific meetings and of papers submitted for publication. (We caution that the work presented in the progress reports is often preliminary in nature and should be quoted only with permission of the individuals concerned.)

Turning to the traditional comments on program status and highlights we first of all note that the 50 MeV cyclotron continued in its 24 hour, seven-day-a-week running mode throughout the reporting period, except for two, two-week shutdowns for modification of a computer used for data taking. Major research support systems were fortunately also free of serious maintenance problems through the period. The major event of terminating operation of the 50 MeV came shortly after the end of the reporting period on July 22, 1979 for the purpose of starting to rearrange the experimental floor for the 500 MeV cyclotron program.

Research activities in the period continued to have a strong involvement with exploration of new avenues of heavy ion research, but intensive effort was also concentrated on completing ongoing experiments requiring the unique capabilities of the 50 MeV cyclotron before its shutdown. Research highlights in the year include 1) heavy ion induced pion production studies at the Bevalac which show anomalies in pion production with heavy ions near threshold energy, 2) (in collaboration with IUCF) the study of the giant Gamow-Teller resonance in the (p,n) reaction, 3) first observation of deep hole states in two neutron transfer reactions, 4) investigation of parity violation in certain nuclear reactions, 5) structure studies of platinum isotopes, 6) inelastic scattering on heavy deformed nuclei with coupled channels analysis, and 7) gamma ray experiments studying high spin states.

In parallel with the nuclear research program, work on construction of the 500 MeV cyclotron continued to move forward in a satisfactory way throughout the period. The major milestone of achieving full operating voltage on the prototype rf resonator was first reached in a low frequency test on May 25, 1979 and in a middle frequency test on May 29, and finally, in a high frequency

test July 13. The superconducting magnet continued to operate smoothly, completing its 25th month in operating status on June 24; these many months of magnet operation have yielded a great deal of valuable experience in cryogenic system operation. In this period the field of the magnet has been extensively mapped and the geometry of the pole tips has now been refined to final form with the addition of a number of previously omitted details including holes for the trim coil leads, holes for phase selection slits, holes for extraction system actuating arms, etc. The design of the extraction system has also been finalized, based on a pair of electrostatic deflectors with supplemental focusing by a series of inert iron focusing bars.

Looking to the future, work began after the 50 MeV shutdown on reconfiguring the experimental floor into the configuration needed for the "Phase I" years, i.e. the years 1980 through 1983 when the experimental program will be based on beams from the 500 MeV cyclotron. The transport system in this period will dominately consist of existing elements connecting the cyclotron to existing experimental facilities. A new spectrograph will be introduced, constructed from existing magnets, and tailored to provide magnetic analysis capability up to the full magnetic rigidity of the 500 MeV cyclotron. This low budget spectrograph will have relatively poor resolution (one in one thousand) but will be ideal for a number of important programs such as elastic scattering, giant resonance, etc.

In October, a Users mailing list was set up to provide information for prospective users of the 500 MeV cyclotron facility. This mailing list is also being used as an information channel to solicit comments and advice relative to the design of experimental facilities for the coupled 500+800 MeV cyclotron system. Users have also been invited to come to the laboratory for visiting appointments to work on devices of interest to them or to work independently on experimental devices which they feel are being neglected.

Turning to the Phase II project, we first note that fiscal year 1980 funding was approved by Congress in September and the laboratory's contract with the Department of Energy for facility construction went into effect on November 1, 1979. An architect has been selected and is at work planning the sizable addition to the present laboratory which is included in the Phase II project and bids are being solicited on long lead procurement items. Intensive design studies are also in progress on two large new spectrographs for the Phase II project, one a high resolution spectrograph with bending ability matched to the second cyclotron and the other, a mass spectrograph designed to do mass separation of nuclei recoiling

from targets. Major features of both of these large devices must be fixed soon in order to provide design guidelines for the architect. (Design of these devices was recently reviewed in a workshop on "Magnetic Devices for the Superconducting Cyclotron Facility" held at MSU in early December 1979.)

A distinguished professorship, the John A. Hannah Chair in Nuclear Physics, was made available by the University this year; Dr. David Scott was subsequently appointed to fill this position and arrived in the lab this fall. Dr. Scott took his Ph.D. at Oxford and his research in the last eight years has emphasized exploitation of the unique features of heavy ion reactions.

In summary we feel this has been a year of satisfying productivity and achievement at the laboratory. An important part of this effort involves collaborative projects with faculty and students from other institutions; many projects of this type have been carried to completion during the last year with mutually satisfactory results. We look forward to a continued trend in this direction and invite inquiries from all interested persons regarding use of the new superconducting cyclotron facility!

Henry Blosser

Aaron Galonsky

Note from the Editor:

Section III of the Annual Report (Title Pages of Published Papers) includes both papers from the nominal reporting period July 1, 1978 through June 30, 1979 and also carry-over papers from previous periods if they have not previously appeared in this section of one of our annual reports (as a consequence of not being received by the editorial deadline for the previous report). Section IV (Abstracts of Papers in Press) includes both work from previous periods which has not yet appeared in Section III and work since July 1, 1979 (for the purpose of making the Annual Report as up to date as possible).

P. Pirnie

TABLE I.--Sources of support for the experimental program at the MSU Cyclotron Laboratory for the period July 1978-June 1979.

Institution or Agency		Per cent of total
National Science Foundation	Grants PHY78-22696 and PHY78-01684 (Experimental Nuclear Physics)	76.2
National Science Foundation	Grant PHY76-20097 (Theoretical Nuclear Physics)	4.1
Michigan State University		19.7

The above figures do not include the funding, essentially all for capital equipment, for the construction of the K=500 superconducting cyclotron.

TABLE II.--Scientific staff of the MSU Cyclotron Laboratory for the period July 1, 1978-June 30, 1979 and their principal sources of support.

Faculty	supported by	present address
Richard Au	NSF-exp,MSU	
Sam M. Austin	NSF-exp,MSU	
Fred Becchetti*	NSF-exp,MSU	University of Michigan
Giovanni Bellomo	NSF-exp,MSU	
Walter Benenson	NSF-exp,MSU	
Ulrich Berg	NSF-exp	Institut fur Kernphysik,W.Ger.
George F. Bernthal	on leave	APS Fellow, Wash, D.C.
Norman Bird	NSF-theory,MSU	
Henry G. Blosser	NSF-exp,MSU	
Hans Guenter Bock	NSF-exp,MSU	
Jerzy Borysowicz	NSF-theory, MSU	
Lisa J. Brown	NSF-exp,MSU	Old Dominion U, Norfolk, VA
Jason Chai	NSF-theory	
Gerard M. Crawley	NSF-exp,MSU	
Peggy Dyer	NSF-exp,MSU	
Elsa Fabrici	NSF-exp,MSU	
Richard Firestone	NSF-chem	LBL, Berkeley, CA
Scott Francis	NSF-exp,MSU	Orsay, France
Sydney Gales	NSF-exp	
Aaron I. Galonsky	NSF-exp,MSU	
Claus-Konrad Gelbke	NSF-exp,MSU	
Morton M. Gordon	NSF-exp,MSU	
Robert Gress	NSF-exp,MSU	
William Harder	NSF-exp	
Leigh Harwood	NSF-exp,MSU	
Harold Hilbert	NSF-exp	
Yosoo Iwasaki	NSF-exp,MSU	Groningen, The Netherlands
Brian Jeltama	NSF-exp,MSU	
David Johnson	NSF-exp,MSU	
William Johnson	NSF-exp,MSU	
Edwin Kashy	NSF-exp,MSU	
Wm.H. Kelly	NSF-exp,MSU	
Jack Kitmiller	NSF-exp,MSU	
Helmut Laumer	NSF-exp,MSU	
Donald Lawton	NSF-exp,MSU	
Esko Liukkonen	U. of Jyvaskyla	Open Univ, Milton Keynes,UK
Raymond Mackintosh	NSF-exp.	
Donato Magistro	NSF-exp,MSU	
Merrit Mallory	NSF-exp,MSU	
Raymond Manweiler	NSF-theory	Ada,MI
Wm. C. McHarris	NSF-exp,MSU	
Hugh McManus	NSF-theory,MSU	
Norval Mercer	NSF-exp,MSU	
Peter Miller	NSF-exp,MSU	
Joel M. Moss**	Texas A&M	Los Alamos, NM
Jerry A. Nolen,Jr.	NSF-exp,MSU	Argonne National Lab
Richard Pardo	NSF-exp,MSU	
David Poe	NSF-exp,MSU	
Francesco Resmini	NSF-theory,MSU	
Dan O. Riska	NSF-exp,MSU	
R.G.H. Robertson	NSF-exp,MSU	
Reginald Romningen	NSF-exp,MSU	
Fred Serri	NSF-theory	
Wlm Sterrenburg	NSF-exp	
Gunter Stork	NSF-exp,MSU	
Phillip Walker	NSF-exp	
David Weber	NSF-exp	
B.H. Wildenthal	NSF-exp,MSU	Aerospace Corp,Los Angeles,CA

* Visiting

** Adjunct

supported by present address

Graduate Students

Ahmad Amjadi	NSF-exp	
Tim Antaya	NSF-exp	
Rahmat Aryaeinejad	NSF-chem	
Terry Awes	NSF-exp	
Kevin Beard	NSF-exp	
Wayne Bentley	NSF-exp	
Mary Brake	NSF-exp	
Jim Carr	NSF-theory	
Don-Bok Cha	NSF-theory	
Lin-Wen Chien	NSF	
Dan Coyle	NSF-chem	
Mark Curtin	NSF-exp	
Kurt Czuhai	NSF-exp	
Paul Deason	NSF-exp	
Ray DeVito	NSF-exp	
Marcello Distasio	NSF-chem	
Steve Faber	NSF-chem	Dupont Corp, Savannah River,S.C.
Ali Hosseini	NSF-exp	GSI, Darmstadt, W. Germany
Robert Hufman	NSF-exp	Argonne National Lab
Jung Kim	NSF-exp	Amherst,MA
Arno Ledebuhr	NSF-exp	
Mike Marshall	NSF-chem	
Nobuo Matsushita	NSF-chem	
Robert Melin	NSF-exp	
Dave Mundingger	NSF-theory	
Janaki Narayanaswamy	NSF-exp	Univ. of Texas, Austin, TX
Gary Richter	NSF-theory	
Lawrence Robinson	NSF-exp	
Haitook Sarafian	NSF-exp	
Karen Stricker	NSF-theory	Universite de Neuchatel,Switzerland
John Yurkon	NSF-exp	
Cecil Williamson	NSF-exp	Rochester, MN

I. Research in Progress

	Page		Page
1. Mass Measurements and Exotic Nuclei		3. Elastic, Inelastic, and Charge Exchange Scattering	
Mass of ${}^6\text{Li}$ in its Ground and $0^+T=1$ States, R.G.H. Robertson and J.A. Nolen	1	An Empirical Effective Interaction for Inelastic Nucleon Scattering and Charge Exchange, S.M. Austin	21
Mass of ${}^9\text{C}^+$, E. Kashy, W. Benenson, J.A. Nolen, Jr., and R.G.H. Robertson	3	Inelastic Proton Scattering on ${}^{194,196,198}\text{Pt}$, P.T. Deason, R.M. Ronningen, C.H. King, T.L. Khoo, F.M. Bernthal and J.A. Nolen, Jr.	23
Mass of ${}^{146}\text{Gd}$ and ${}^{147}\text{Gd}$ and Shell Closure at $Z = 64$, R.C. Pardo, S. Gales, R.M. Ronningen and L.H. Harwood	5	Quadrupole and Hexadecapole Moments in Lanthanide and Actinide Nuclei from Proton Inelastic Scattering, R.M. Ronningen, R.C. Melin, J.A. Nolen, Jr., G.M. Crawley, C.H. King, J.E. Finck, and C.E. Bemis, Jr.	25
The Mass and Excited States of ${}^{89}\text{Mo}$, R.C. Pardo, L.W. Robinson, W. Benenson, E. Kashy and R.M. Ronningen	7	Energy Dependence in the ${}^{92}\text{Mo}(p,p'){}^{92}\text{Mo}$ Reaction, R.A. Moyer, R.W. Finlay and G.M. Crawley	28
A Study of the $A=24$, $T=2$ States with a Recoil Mass Analyzer and Cryogenic He-jet, A.G. Ledebuhr, R.G.H. Robertson, L.H. Harwood and T.J. Bowles	7a	The ${}^{26}\text{Mg}(p,n)$ Reaction and Values of $V_{\sigma T}$ and V_T , W.A. Sterrenburg, S.M. Austin, U.E.P. Berg and R.P. DeVito	30
2. Transfer Reactions		Evidence for Isovector Giant Resonances in the Continuum of (p,n) Reactions on Isotopes from ${}^{90}\text{Zr}$ to ${}^{208}\text{Pb}$, W.A. Sterrenburg, S.M. Austin, R.P. DeVito and A.I. Galonsky	32
A Study of High-Spin States in Light Nuclei with the $({}^3\text{He},p)$ Reaction, L.H. Harwood and G.M. Crawley	8	Elastic Scattering of ${}^6\text{Li}$ at 73.7 MeV, R. Huffman, A. Galonsky, R. Markham and C. Williamson	34
The ${}^{48}\text{Ca}(d,n){}^{49}\text{Sc}$ Reaction at 20 MeV; Spectroscopic Factors From the (d,n) and $({}^3\text{He},d)$ Reactions, Y. Iwasaki, A. Galonsky and D.J. Weber	10	Inelastic Scattering of ${}^6\text{Li}$ from ${}^{58}\text{Ni}$ at 71 MeV, C. Williamson, A. Galonsky, R. Huffman and R. Markham	36
High-Lying Neutron Hole Strength in Zr, Sn, Te, and Sm Isotopes Via the (p,d) Reaction at 42 MeV, S. Gales, G.M. Crawley, D. Weber and B. Zwieglinski	11	Optical Model Studies of Neutron Elastic Scattering at 30.3 and 40 MeV, R.P. DeVito, S.M. Austin, W.A. Sterrenburg and U.E.P. Berg	38
Deep Hole States Observed in One and Two Particle Transfer Reactions on the Sn Isotopes, G.M. Crawley, W. Benenson, S. Gales, D. Weber and B. Zwieglinski	12	4. Beta and Gamma Ray Spectroscopy	
Study of the (p,t) Reaction on the Cadmium Isotopes, G.M. Crawley, S. Gales, D. Weber and B. Zwieglinski	14	Test of the Weak-Coupling Triaxial Model for ${}^{143}\text{Eu}$, A. Aryaeinejad, R.B. Firestone, W.H. Bentley and W.C. McHarris	40
Energy Levels in ${}^{60}\text{Ni}$ From a Study of the ${}^{59}\text{Ni}(d,p)$ Reaction, J.A. Nolen, Jr., M.S. Curtin, R.C. Melin, R.M. Ronningen, S. Raman and H. Nann	15	Sidebands in ${}^{168}\text{Yb}$ Studied by the $(\alpha,2n)$ Reaction, J.L.S. Carvalho, P.M. Walker, W.H. Bentley and S.R. Faber	42
The ${}^{206,204}\text{Pb}(p,\alpha){}^{203,201}\text{Tl}$ Reactions at 35 MeV, D. Weber, G.M. Crawley and P.A. Smith	16	Sidebands in ${}^{170}\text{Yb}$ Studied by $(\alpha,2n)$ and $(\alpha,4n)$ Reactions, P.M. Walker, S.R. Faber, W.H. Bentley, R.M. Ronningen, R.B. Firestone and R.M. Bernthal	43
Quartet-plus-Doublet Interpretation of the Excited-Core States in ${}^{63}\text{Cu}$, Y. Iwasaki and G.M. Crawley	17	Sidebands in ${}^{172}\text{Yb}$ Studied by the $(\alpha,2n)$ Reaction, P.M. Walker, S.R. Faber, W.H. Bentley, R.M. Ronningen and R.B. Firestone	44
Deep Hole States in Two Particle Transfer Reactions at 90 MeV Bombarding Energy, G.M. Crawley, D. Weber, S. Gales, W. Benenson, B. Zwieglinski, B.M. Spicer, V. Officer, G.G. Shute, D. Friesel and A.D. Bacher	18	Excited States in ${}^{141}\text{Pm}$ Via the $(P,2n\gamma)$ and $(\alpha,4n\gamma)$ Reactions, R. Aryaeinejad, R.B. Firestone, B.H. Bentley and Wm. C. McHarris	45
$L=2$ Amplitude in the (p,t) Transition Between the Ground States of Odd-Proton Nuclei Having the Same Spin-Parity, I. Iwasaki	19	In-Beam γ -Ray Spectroscopy of Excited States in ${}^{143}\text{Eu}$, R. Aryaeinejad, R.B. Firestone, W.H. Bentley and W.C. McHarris	46
Study of the (p,t) Reaction on ${}^{174}\text{Yb}$ at $E_p = 38$ MeV, K. Miura, Y. Iwasaki and J.A. Nolen	20		

	Page		Page
High Spin States in ^{116}Sb , W.H. Bentley, C.B. Morgan, W.H. Kelly and Wm. C. McHarris	47	Second-Order Corrections in Low Energy Pion Nucleus Scattering, J.A. Carr, K. Stricker and H. McManus	78
Resolution of the ^{145}Gd ϵ/β^+ Decay Branching Ratio Anomalies, R.B. Firestone, R.C. Pardo and Wm. C. McHarris	49	Self Consistency Check of Quasi-Elastic Component of the Pion Potential, J.A. Carr, H. McManus, G.F. Bertsch and G. Richter	80
Measurement of the M1 Analogue γ -ray Transition to ^{22}Na Beta Decay, R.B. Firestone and L. Harwood	57	Transverse Form Factors, Dongwoo Cha	82
A Study of 6.13 MeV γ -Rays from $^{16}\text{O}(p,p'\gamma)^{16}\text{O}$, J. Narayanaswamy, S. Faber, S.M. Austin and W. Bentley	58		
5. Heavy Ion Collisions		7. Biological Studies	
Low Energy Pion Production at 0° with Heavy Ions, W. Benenson, G. Bertsch, G.M. Crawley, E. Kashy, J.A. Nolen, H. Bowman, J.G. Ingersoll, J.O. Rasmussen, J. Sullivan, M. Koike, M. Sasao, J. Peter, and T.E. Ward	59	Use of $^{13}\text{NO}^-$ to Determine the Reduction of Nitrate to Ammonia in Anaerobic Environments, H.F. Kaspar, J.M. Tiedje, R.B. Firestone	83
Light Particle Spectra Observed in Central and Peripheral Collisions of $^{16}\text{O} + ^{238}\text{U}$ at 20 MeV/nucleon, T.C. Awes, B.B. Back, H. Breuer, P. Dyer, C.K. Gelbke, A.C. Mignerey, V.E. Viola and K.L. Wolf	62	Inhibition by Sulfide of Nitric and Nitrous Oxide Reduction by Denitrifying <u>Pseudomonas fluorescens</u> , J. Sorensen, J.M. Tiedje and R.B. Firestone	85
Observation of Isoscalar Giant Resonance Structure in the Fission of ^{238}U , T.C. Awes, B.B. Back, C.K. Gelbke, J. Mahoney, D.K. Scott, A.C. Shotter and T.J. Symons	64	Short Term Studies of Nitrogen and Carbon Assimilation in Nodulated Leguminous and Non-Leguminous Plants Using ^{13}N and ^{11}C Tracers, K.R. Schubert, G.C. Coker III, and R.B. Firestone	87
Momentum Transfer to Target Residue in ^{16}O Induced Reactions at 20 MeV/nucleon, T.C. Awes, B.B. Back, H. Breuer, P. Dyer, C.K. Gelbke, A. Mignerey, V.E. Viola and K.L. Wolf	66	Factors Effecting Denitrification in an Anaerobic Lake Sediment, A.J. Sexstone, J.M. Tiedje and R.B. Firestone	90
An Experiment to Measure Nuclear Lifetimes in the Attosecond Time Range by K X-rays, P. Dyer and L.H. Harwood	68	Production of ^{13}N , ^{11}C , ^{15}O , and ^{18}F at 25 MeV per Nucleon, R.B. Firestone, M.K. Firestone and J.M. Tiedje	91
6. Theoretical Studies		8. Technical Developments	
Compressible Fluid Model of Heavy Ion Collision, D. Munding and G. Bertsch	69	50 MeV Cyclotron Operation Summary, P. Miller, H. Laumer and W. Harder	92
Heavy Ion Reactions at Intermediate Energy, G. Bertsch, F. Serr and D. Munding	71	Beam Energy Calibration System, P. Dyer and R.G.H. Robertson	93
Decay of Giant Vibrations, G. Bertsch	72	Back Angle Dispersion Matching, R.C. Melin, R.M. Ronningen, J.A. Nolen, Jr. G.M. Crawley	94
Pion Production in pp Collisions, D.O. Riska and J. Chai	73	Production of a ^{103}Rh Source for a Mossbauer Experiment, P. Miller, A. Galonsky, R. Firestone, J. Spijkerman and J. Singh	96
The Role of the N (1688) Resonance on Nuclear Charge Form Factors, D.O. Riska	73	Developments on the Multiwire Proportional Counter, R.C. Melin, R. Pardo, R. Fox and R.G. Markham	98
The Reactive Parts of the Pion-Nucleus Optical Potential, D.O. Riska, C.M. Ko and J. Chai	73	Recent Work in the Target Laboratory, D. Cole	100
The Role of the Δ (1236) Pion Exchange Current on Total Photoabsorption Rates, D.O. Riska and H. Sarafian	73	A K = 800 High Resolution Heavy Ion Spectrograph, J.A. Nolen, Jr., L.H. Harwood and E. Kashy	102
Model Independent Analysis of Scattering Experiments, Jerzy Borysowicz	74	Status of the Reaction Product Mass Spectrograph, L. Harwood, J. Nolen, E. Kashy, R. Pardo and H. Enge	105
E4 Transition Strengths, B.H. Wildenthal	75	9. The 500 Q²/A MeV Superconducting Cyclotron	
M3 Transition Strengths, B.H. Wildenthal, B.A. Brown and W. Chung	76	Design of the h=1 Central Region for the K=500 MeV Superconducting Cyclotron, E. Liukkonen and T. Antaya	107
Absorption and 163 MeV Pion-Nucleus Scattering, K. Stricker, J.A. Carr and H. McManus	77	Ion Source Experiments in the Superconducting Magnet, M.L. Mallory	116
		Centering of the Coil and the Cryostat in the K500 Magnet, P. Miller, D. Johnson, H. Blosser, D. Poe, H. Laumer and G. Stork	117

Superconducting Magnet Cryogenic Operation, M.L. Mallory, H. Laumer and D. Poe	120
Study of Vertical Motion in the Central Region of the K = 500 MeV Cyclotron, M.M. Gordon and E. Liukkonen	123
Calibration of Magnet Mapping Apparatus, P. Miller, G. Bellomo, B. Jeltema, H. Laumer, D. Poe, F. Resmini and G. Stork . . .	126
Z-Probe Design, H. Laumer	130
A Method for Calculating the Vacuum Requirements of Heavy Ion Cyclotrons, M.L. Mallory	132
Estimate of Electron-Loss Cross Sections at High Energies, F.D. Becchetti	138
Vacuum Tests Related to K = 500 Cyclotron Project, F.D. Becchetti and J. Wilson	139
Survey of U.S. Heavy Ion Facilities, F.D. Becchetti	140
Irradiation of Accelerator Materials With Energetic Heavy Ions, F.D. Becchetti	140

II. Abstracts and/or Titles of Talks at
American Physical Society Meetings
and Other Meetings and Conferences
(July 1978 - June 1979)

APS Durham, NC Meeting - September 1978

Cross-Section Measurements for the $\alpha + \alpha$ and $P + {}^{16}\text{O}$ Reactions at Intermediate Energies, B.G. Glagola, G.J. Mathews, A. Nadasen, R.A. Moyle, P.G. Roos, H.F. Breuer, V.E. Viola and S.M. Austin	141
--	-----

APS Asilomar Meeting - November 1978

Giant Vibrations, G. Bertsch	141
Elastic Scattering of ${}^{16}\text{O} + {}^{28}\text{Si}$ and ${}^{12}\text{C} + {}^{32}\text{S}$ and the ${}^{28}\text{Si}({}^{16}\text{O}, {}^{12}\text{C}){}^{32}\text{S}$ Transfer Reaction, T.C. Awes, U.E.P. Berg, C.K. Gelbke, J. Barrette, M.J. Levine and P. Braun-Munzinger	141
Momentum Transfer in Peripheral Reactions of 20 MeV/A ${}^{16}\text{O}$ with ${}^{238}\text{U}$, B.B. Back, A. Mignerey, L.K. Wolf, T.C. Awes, P. Dyer, C.K. Gelbke, H. Breuer, V.E. Viola and W.G. Meyer	141
Heavy Ion Source Operation in the MSU Superconducting Cyclotron Magnet, M.L. Mallory	142
Cross Section Ratios for Elastic Scat- tering of 30.3 MeV Protons from ${}^{40,44,48}\text{Ca}$, S.M. Austin, C.H. King, E. Kashy, R. Markham, I Redmount and R. Ronningen	142
Pion Production Near Threshold in Heavy Ion Collisions, W. Benenson, G. Bertsch, G.M. Crawley, E. Kashy, J.A. Nolen, Jr., J.O. Rasmussen, H. Bowman, M. Sasao, J. Ioannou, M.C. Lemaire, J. Sullivan, L. Oliveira, M. Loike and J. Chiba	142
Elastic and Inelastic Scattering of ${}^6\text{Li}$, A. Galonsky, R. Huffman, R. Markham and C. Williamson	142

APS New York Meeting - January/February 1979

Design Considerations of a Recoil Mass Separator for MSU, J.A. Nolen, Jr., L. Harwood, E. Kashy and H.A. Enge	142
Densely Measured (p, t_0) Angular Distribu- tions and a Zero-Range DWBA Analysis, Y. Iwasaki, E. Kashy and R.G. Markham	142
The Masses of ${}^{10}\text{C}$ and ${}^{14}\text{O}$ and Superalloved Beta Decay, J.A. Nolen, Jr., P.H. Barker and M.S. Curtin	143
In-Beam γ -Ray Spectroscopy of Excited States in ${}^{143}\text{Eu}$, R. Aryaeinejad, R.B. Fire- stone, W. Bentley and Wm. C. McHarris	143

APS Washington Meeting - April 1979

Mass of ${}^6\text{Li}$ in its ground and 0^+ , $T=1$ States, R.G.H. Robertson and J.A. Nolen, Jr.	143
Broad Cross Section Enhancements in (p, n) Reactions, W.A. Sterrenburg, S.M. Austin, U.E.P. Berg, R. DeVito and A.I. Galonsky	143
Status Report on 500 MeV Superconducting Cyclotron, H.G. Blosser	143
The Masses of ${}^{146}\text{Gd}$, ${}^{147}\text{Gd}$, and ${}^{108}\text{Sn}$, R.C. Pardo, S. Gales, R.M. Ronningen and L.H. Harwood	143
Isomeric Negative-parity Yrast Band in ${}^{170}\text{Yb}$, P.M. Walker, S.R. Faber, W.H. Bentley, R.M. Ronningen, R.B. Firestone and F.M. Bernthal	144
An Estimate of the Tensor Force and $V_{\sigma\tau}$ from the ${}^7\text{Li}(p, n){}^7\text{Be}$ Reaction	144
Proton Scattering at 35 MeV to Ground Band States in ${}^{152,154}\text{Sm}$, ${}^{176}\text{Yb}$, ${}^{186}\text{W}$, ${}^{232}\text{Th}$ and ${}^{230}\text{U}$, R.M. Ronningen, G.M. Crawley, J.E. Finck, C.H. King, R.C. Melin, J.A. Nolen, Jr., P.T. Deason and F.M. Bernthal	144
Analysis of the ${}^{194,196,198}\text{Pt}(p, t)$ and (p, p') Reactions in Terms of the $O(6)$ Limit of the Interacting Boson Approx- imation Model, P.T. Deason, R.M. Ronningen, C.H. King, J.A. Nolen, Jr., T.L. Khoo and F.M. Bernthal	144
In-beam γ -Ray Spectroscopy in the Odd Mass $N=80$ Region, R. Aryaeinejad, R.B. Firestone, W. Bentley and Wm. C. McHarris . .	144
The ${}^{48}\text{Ca}(d, n){}^{49}\text{Sc}$ Reaction at $E_d=20$ MeV, Y. Iwasaki, A. Galonsky and D.J. Weber	144
Search for Light Tin Isotopes, D.C. Coyle, F.B. Firestone and Wm. C. McHarris	145
Mass of ${}^{89}\text{Mo}$, R. Pardo, L.W. Robinson, E. Kashy, W. Benenson and R.M. Ronningen . .	145
Determination of Nuclear Densities and Radii from the Elastic Electron Scat- tering, J.R. Borysowicz	145
Experimental Resolution of the ${}^{145}\text{Gd} \epsilon/\beta^+$ Decay Branching Ratio Anomalies, R.B. Firestone, R.C. Pardo and Wm. C. McHarris .	145

Page	Page
Isobaric Mass Quartets for A=21, 29, and 37, L.W. Robinson, W. Benenson, E. Kashy and R. Pardo	145
High-Spin Isomers in ^{200,201,202} Pb, C.L. Dors, J. Wilson, S.K. Saha, H. Helppi, P.J. Daly, S.R. Faber and F.M. Bernthal	145
Pion Nucleus Scattering in the Resonance Region, K. Stricker and H. McManus	146
The ¹⁴ C(p,n) ¹⁴ N(g.s.) and ¹⁴ N(p,n) ¹⁴ O(g.s.) Reactions and the Tensor Force, T.N. Taddeucci, R.R. Doering, L.C. Dennis, A. Galonsky and S.M. Austin	146
The Two-Nucleon Components of the Pion-Nucleus Optical Potential, D.O. Riska and J. Chai	146
Inelastic Pion-Nucleus Scattering Calculations, J.A. Carr and H. McManus	146
Cross-Section Measurements for ⁶ He, ^{6,7} Li and ⁷ Be in the $\alpha\alpha$ Reaction at 61.5-159 MeV, B.G. Glagola, H.F. Breuer, G.J. Mathews, A. Nadasen, P.G. Roos, V.E. Viola and S.M. Austin	146
<u>Escuela Latin American De Fisica, Mayaguez P.R. - July 1978</u>	
Three Lectures on Heavy Ion Theory, G. Bertsch	146
<u>Gordon Conference on Nuclear Structure, Tilton, New Hampshire - July 1978</u>	
Inelastic Scattering and Charge Exchange Reactions, Effective Interactions and Analogs to Electromagnetic Transitions, S.M. Austin	146
Mass Measurements with Exotic Heavy Ion Reactions, J. Nolen	146
<u>International Conference on Nuclear Structure, Canberra, Australia - Sept. 1978</u>	
Pion Production Near Threshold in Heavy Ion Collisions, G.M. Crawley, W. Benenson, G. Bertsch, E. Kashy, J.A. Nolen, Jr., J.O. Rasmussen, H. Bowman, M. Sasao, J. Ionannou, M.C. Lemaire, J. Sullivan and L. Oliveira	147
<u>Hamburg Topical Workshop on Nuclear Physics, Hamburg, Germany - September 1978</u>	
A New Technique for Measuring Ratios of Elastic Scattering Cross Sections: An Application to the Calcium Isotopes, S.M. Austin	147
<u>Oak Ridge Users Group Meeting, Oak Ridge, Tennessee - September 1978</u>	
Future Trends in Heavy Ion Physics, G. Bertsch	147
<u>Eighth International Conference on Cyclotrons and Their Applications, Bloomington, Indiana - September 1978</u>	
Design Characteristics of the K=800 Superconducting Cyclotron Project at MSU, F. Resmini, G. Bellomo, E. Fabrici, H.G. Blosser	148
Injection Studies for the K = 800 Superconducting Cyclotron Project at MSU, G. Bellomo, E. Fabrici and F. Resmini	148
Central Region Studies on the MSU 500 MeV Superconducting Cyclotron, E. Liukkonen and J. Bishop	148
A Method for Minimizing Trim Coil Power Requirements in Superconducting Cyclotrons, G. Bellomo and F. Resmini	148
The Michigan State University Superconducting Cyclotron Program, H.G. Blosser	148
Design Calculations for the Beam Extraction System of the MSU Superconducting Cyclotron, E.M. Fabrici and M.M. Gordon	149
Computer Control of the MSU 50 MeV Cyclotron, J.F.P. Marchand	149
Charge Exchange Losses During Cyclotron Acceleration: Experiment and Theory, R.A. Gough and M.L. Mallory	149
Magnetic Field Measurements in the MSU 500 MeV Superconducting Cyclotron, P. Miller, H. Blosser, D. Gossman, D. Johnson and P. Marchand	149
Beam Emittance Measurements with a Dispersion Matched Magnetic Spectrograph, P.S. Miller, E. Kashy and J.A. Nolen, Jr.	149
Operating Experience with the Michigan State University Superconducting Cyclotron Cryogenic System, M.L. Mallory	149
Particle Optics Due to an Ion Source D.C. Extraction Grid, S. Motzny	150
<u>Workshop on Continuous Spectra, Bad Honneff, Germany - November 1978</u>	
Inclusive Cross Sections, G. Bertsch	150
<u>XVII International Winter Meeting on Nuclear Physics, Bormio Italy January 1979</u>	
A = 9 Isobaric Quartet, E. Kashy	150
<u>Particle Accelerator Conference, San Francisco - March 1979</u>	
Progress Report on the 500 MeV Superconducting Cyclotron, H. Blosser	150
Lifetime Improvements of Heavy Ion Source Cathodes, P.S. Miller, H. Laumer, M.L. Mallory and J.A. Nolen, Jr.	150
<u>Conference on the Use of Magnet Spectrometers in Nuclear Physics, Daresbury, England - March 1979</u>	
Tuning Techniques for High Resolution, E. Kashy	150
<u>Conference on the (p,n) Reaction and the Nucleon-Nucleon Force, Telluride, Colorado March 1979</u>	
Empirical Extraction of the Effective Interaction, S.M. Austin	150

	Page
Excitation of Spin-flip, Isospin-flip States in (p,n), (e,e') and (Y,Y'): A Comparative Study on $^{24,25,26}\text{Mg}$, U.E.P. Berg	150
Giant Gamow-Teller Transitions in (p,n) Reactions, A.I. Galonsky	151
Foundations of the Microscopic Relation Between Gamow-Teller Beta Decay, Magnetic Dipole Radiation, and Hadronic Charge Exchange Processes, B.H. Wildenthal	151
<u>International School of Nuclear Physics, Sirce, Sicily - March and April 1979</u>	
Three Lectures on Heavy Ion Theory, G. Bertsch	151
<u>American Chemical Society Honolulu Meeting - April 1979</u>	
Group Theoretical Description of Deformed Nuclear States, Wm. C. McHarris	151
<u>Second International Conference on Meson-Nuclear Physics Houston, Texas - March 1979</u>	
Interpretation of π -Nucleus Scattering, H. McManus	151
<u>American Society for Microbiology Los Angeles Meeting - May 1979</u>	
Influence of Sulfide on NO and N ₂ O Reduction by Denitrifiers, J. Sørensen and J.M. Tiedje	151
Fate of Nitrate in Methanogenic Environments, H.F. Kaspar, A.J. Sextone and J.M. Tiedje	151
Assimilatory Nitrate Uptake in Pseudomonas fluorescens, M.R. Betlach and J.M. Tiedje	152
<u>International Conference on the Structure of Medium-Heavy Nuclei, Rhodes, Greece May 1979</u>	
Systematics of Deep Hole States Observed in One and Two Particle Transfer Reactions, G.M. Crawley	152
<u>Topical Conference on Large Amplitude Collective Nuclear Motions, Lake Balaton, Hungary - June 1979</u>	
Isovector Giant Resonances, A. Galonsky	152
III. Title Pages of Published Papers (July 1978 - June 1979)	
1. Journals	
Observation of the $T_{\frac{1}{2}} = \frac{45}{2}$ Components of Deep Hole States in ^{207}Pb via the ($^3\text{He},\alpha$) Reaction at 70 MeV, S. Gales, G.M. Crawley, D. Weber and B. Zwieglinski	153
Direct Determination of [(se) 3] $_{5/2}^{3/2}$ ($1p^{-2}$) $_{01}$ Component in ^{17}O (g.s.), H.T. Fortune, J.N. Bishop, L.R. Medsker and B.H. Wildenthal	154

	Page
Production of A=6 and 7 Isotopes in the $\alpha + \alpha$ Reaction, B.G. Glagola, G.J. Mathews, H.F. Breuer, V.E. Viola, Jr., P.G. Roos, A. Nadasen and S.M. Austin	155
Comparison of Heavy-Ion-Induced α Transfer and Backward-Angle Elastic Scattering, C.K. Gelbke, T. Awes, U.E.P. Berg, J. Barrette, M.J. LeVine and P. Braun-Munzinger	156
Fragmentations of ^{40}Ar at 213 MeV/Nucleon, Y.P. Viyogi, T.J.M. Symons, P. Doll, D.E. Greiner, H.H. Heckman, D.L. Hendrie, P.J. Lindstrom, J. Mahoney, D.K. Scott, K. Van Bibber, G.D. Westfall, H. Wieman, H.J. Crawford, C. McParland and C.K. Gelbke	157
Incomplete Momentum Transfer in Peripheral Heavy-Ion Collisions at 20 MeV/Nucleon, P. Dyer, T.C. Awes, C.K. Gelbke, B.B. Back, A. Mignerey, K.L. Wolf, H. Breuer, V.E. Viola, Jr. and W.G. Meyer	158
A Comparison of 180 MeV π^+ and π^- Scattering from ^{24}Mg , C.A. Wiedner, J.A. Nolen, Jr., W. Saathoff, R.E. Tribble, J. Bolger, J. Zichy, K. Stricker, H. McManus and J.A. Carr	159
Cross Sections for the Quasielastic $^{112,116,124}\text{Sn}(p,n)$ and $^{58}\text{Ni}(p,n)$ Reactions: A Test of the Forward Scattering Amplitude Approximation, S.D. Schery, S.M. Austin, A. Galonsky, L.E. Young and U.E.P. Berg	160
Shell-Model Predictions of Alpha-Spectroscopic Factors Between Ground States of $16 < A < 40$ Nuclei, W. Chung, J. van Hienen, B.H. Wildenthal and C.L. Bennett	161
Electroexcitation and the Determination of the K-Band Structure in ^{24}Mg , H. Zarek, S. Yen, B.O. Pich, T.E. Drake, C.F. Williamson, S. Kowalski, C.P. Sargent, W. Chung, B.H. Wildenthal, M. Harvey and H.C. Lee	162
Damping of Single-Particle States and Giant Resonances in ^{208}Pb , G.F. Bertsch, P.F. Bortignon, R.A. Broglia and C.H. Dasso	163
Monopole Excitations in ^4He , ^{12}C and ^{24}Mg in a Collective Model Description, H.P. Morsch and P. Decowski	164
$^{21}\text{Ne}(\text{He},p)^{23}\text{Na}$ Reaction, H.T. Fortune, J.R. Powers, R. Middleton, H. Nann and B.H. Wildenthal	165
Inelastic Scattering of 40 MeV Protons from ^{24}Mg . II. Microscopic Calculations for Positive Parity States, B. Zwieglinski, G.M. Crawley, W. Chung, H. Nann and J.A. Nolen, Jr.	166
Mass Measurements of Proton-Rich, Medium-Weight Nuclei by the ($^3\text{He},^6\text{He}$) Reaction, R.C. Pardo, E. Kashy, W. Benenson and L.W. Robinson	167
Heavy Ion Collisions at Intermediate Energy, G. Bertsch and A.A. Amsden	168
Configuration of $^{19}\text{Ne}(4.033, 3/2^+)$, H.T. Fortune, H. Nann and B.H. Wildenthal	169
Energy Levels in ^{57}Ni from a Study of the $^{59}\text{Ni}(p,t)^{57}\text{Ni}$ Reaction, H. Nann, A. Saha, and S. Raman	170

Page	Page		
52 Cr(p, α) ⁴⁹ V Reaction, P.A. Smith, J.A. Nolen, Jr., R.G. Markham and M.A.M. Shahabuddin	171	An Easily Prepared Scintillator for Viewing Accelerator Beam Spots, J.A. Nolen, Jr.	191
High-Spin States in ¹⁴⁶ Sm, C.H. King, B.A. Brown and T.L. Khoo	172	Tapped Delay Line Focal Plane Detectors, R.G. Markham	192
Inner Hole States in ²⁰⁷ Pb via the ²⁰⁸ Pb(³ He, α) ²⁰⁷ Pb Reaction at 70 MeV, S. Gales, G.M. Crawley, D. Weber and B. Zwieglinski	173	Analysis of Nuclear Spectroscopic Data with the Shell Model, B.H. Wildenthal	193
²⁰⁸ Pb(p, α) ²⁰⁵ Tl Reaction, P.A. Smith, G.M. Crawley, R.G. Markham and D. Weber	174	Initial Organic Products of Assimilation of [¹³ N] Ammonium and [¹³ N] Nitrate by Tobacco Cells Cultured on Different Sources of Nitrogen, T.A. Skokut, C.P. Wolk, J. Thomas, J.C. Meeks, P.W. Shaffer and W.S. Chien	194
Interpretation of the Anomalous Electron-Capture to Positron Decay Ratio in ²² Na, R.B. Firestone, Wm. C. McHarris and B.R. Holstein	175	The Acetylene Inhibition Method for Short-Term Measurement of Soil Denitrification and its Evaluation Using Nitrogen-13, M.S. Smith, M.K. Firestone and J.J. Tiedje	195
α -Transfer Spectroscopic Factors in ²³ Na, W. Chung, H.T. Fortune and B.H. Wildenthal	176	Application of the Semiclassical Method to Polarization, G. Bertsch and R. Schaeffer	196
Distribution of Particles in Fermi Systems, G. Bertsch and J. Borysowicz	177	Implications of Experimental Magnetic Moment Values in Light Nuclei for the Presence and Characteristics of Mesonic Exchange Currents, B.H. Wildenthal and W. Chung	197
g-Factor of the 19/2 ⁻ Isomer in ¹¹⁵ Sb, S.R. Faber, L.E. Young and F.M. Bernthal	178	Dynamics of Heavy Ion Collisions, G.F. Bertsch	198
α -Particle Spectroscopy in Ni and Zn, C.L. Bennett, H.W. Fulbright, J.F.A. van Hienen, W. Chung and B.H. Wildenthal	179	2. <u>Summer School and Conference Proceedings</u>	
Parity of ¹⁹ F(5.10) and ¹⁹ Ne(5.09), H.T. Fortune, J.N. Bishop, H. Nann and B.H. Wildenthal	180	Use of ¹³ N in Studies of Fixation of Dinitrogen and Assimilation of Ammonium by Cyanobacteria, J.C. Meeks, C.P. Wolk, J. Thomas, S.M. Austin and A. Galsonky	199
(p,t) and (p, ³ He) Reactions on ³³ S, H. Nann and B.H. Wildenthal	181	Shell-Model Interpretation of Inelastic Electron Scattering to Strong 2 ⁺ and 4 ⁺ States in the sd-Shell, W. Chung and B.H. Wildenthal	200
Mechanism of the ²⁶ Mg(¹⁸ O, ¹⁶ O) ²⁸ Mg Reaction at E _{18O} = 50 MeV and the Energy Levels of ²⁸ Mg, M. Bernas, M. Roy-Stephan, F. Pougheon, M. Langevin, G. Rotbard, P. Roussel, J.P. LeFevre, M.C. Lemaire, K.S. Low and B.H. Wildenthal	182	Intermediate Energy Heavy Ions -- From the Low Energy Perspective, C.K. Gelbke	201
Search for Parity Mixing in the ⁹³ Tc $\frac{1}{2}$ Isomer: Measurements of Partial γ -Decay Widths, B.A. Brown, O. Hausser, T. Faestermann, D. Ward, H.R. Andrews and D. Horn	183	Pion Production Near Threshold in Heavy Ion Collisions, G.M. Crawley, W. Benenson, G. Bertsch, E. Kashy, J.A. Nolen, Jr., J.O. Rasmussen, H. Bowman, M. Sasao, J. Ioannou, M.C. Lemaire, J. Sullivan, L. Oliveira, M. Koike and J. Chiba	202
Role of the RMS Radius in DWBA Calculations of the (p,d) Reaction, A. Moalem, J.F.A. van Hienen and E. Kashy	184	The Michigan State University Superconducting Cyclotron Program, H.G. Blosser	203
A Study of the ⁵⁴ Fe(p,d) ⁵³ Fe Reaction at 40 MeV, T. Suehiro, J.E. Finck and J.A. Nolen, Jr.	185	Design Characteristics of the K=800 Superconducting Cyclotron at M.S.U., F. Resmini, G. Bellomo, E. Fabrici, H.G. Blosser and D. Johnson	204
Study of ⁶⁰ Zn and ⁶¹ Zn, D.J. Weber, G.M. Crawley, W. Benenson, E. Kashy and H. Nann	186	Injection Studies for the K=800 Superconducting Cyclotron at M.S.U., G. Bellomo, E. Fabrici and F. Resmini	205
High-Spin Rotational Levels in ¹⁷⁸ W Populated in the ¹⁷⁷ Hf(α ,3n γ) Reaction, C.L. Dors, F.M. Bernthal, T.L. Khoo, C.H. King, J. Borggreen and G. Sletten	187	A Method for Minimizing Trim Coil Power Requirements in Superconducting Cyclotrons, G. Bellomo and F. Resmini	206
Study of the ¹⁰ Be(d,p) ¹¹ Be Reaction at 25 MeV, B. Zwieglinski, W. Benenson, R.G.H. Robertson and W.R. Coker	188	Beam Extraction System for the K=500 Superconducting Cyclotron, M.M. Gordon and E.M. Fabrici	207
Charge-Dependent Two-Body Interactions Deduced from Displacement Energies in the 1f ₇ Shell, B.A. Brown and R. Sherr	189	Design of the Central Regions for the MSU 500 MeV Superconducting Cyclotron, E. Liukkonen, J. Bishop, S. Motzny and T. Antaya	208
Fast Resolution Optimization in a Magnetic Spectrograph, E. Kashy, P.S. Miller and J.A. Nolen, Jr.	190		

Page	Page
Magnetic Field Measurements in the MSU 500 MeV Superconducting Cyclotron, P. Miller, H. Blosser, D. Gossman, B. Jeltema, D. Johnson and P. Marchand	209
Operating Experience with the Michigan State University Superconducting Cyclotron Cryogenic System, M.L. Mallory	210
Beam Emittance Measurements with a Dispersion-Matched Magnetic Spectrograph, P.S. Miller, E. Kashy and J.A. Nolen, Jr.	211
Charge Exchange Losses During Cyclotron Acceleration: Experiment and Theory, R.A. Gough and M.L. Mallory	212
Progress Report on the 500 MeV Superconducting Cyclotron, H. Blosser and F. Resmini	213
Lifetime Improvements of Heavy Ion Source Cathodes, P.S. Miller, H. Laumer, M.L. Mallory and J.A. Nolen	214
Short-Term Measurement of Denitrification Rates in Soils Using ^{13}N and Acetylene Inhibition Methods, J.M. Tiedje, M.K. Firestone, M.S. Smith, M.R. Betlach and R.B. Firestone	215
Cross Sections Relevant to Gamma Ray Astronomy, P. Dyer, D. Bodansky and D.R. Maxson	216
IV. Abstracts of Papers in Press	
Inelastic Scattering of ^6Li from ^{58}Ni at 71 MeV, C. Williamson, A. Galonsky, R. Huffman and R. Markham	217
Systematics of Deep Hole States Observed in One and Two Particle Transfer Reactions, G.M. Crawley	218
Multipole Moments of ^{154}Sm , ^{176}Yb , ^{232}Th , and ^{238}U from Proton Inelastic Scattering, C.H. King, J.E. Finch, G.M. Crawley, J.A. Nolen, Jr. and R.M. Ronningen	219
The Mass and Excited States of the New Nucleus ^{89}Mo , R.C. Pardo, L.W. Robinson, W. Benenson, E. Kashy and R.M. Ronningen	220
The (p,n) Reaction for $89 < A < 130$ and an Anomalous Optical Model Potential for Sub-Coulomb Protons, C.H. Johnson, A. Galonsky and R.L. Kernell	221
Pion Production with Heavy Ions from 125 to 400 MeV/nucleon, W. Benenson, G. Bertsch, G.M. Crawley, E. Kashy, J.A. Nolen, Jr., H. Bowman, J.G. Ingersoll, J.O. Rasmussen, J. Sullivan, M. Koike, M. Sasao, J. Peter and T.E. Ward	222
Light Attenuation in Liquid Organic Scintillators, J.E. Yurkon and A.I. Galonsky	223
The 194, 196, 198 Pt(p,t) Reactions at 35 MeV, P.T. Deason, C.H. King, T.L. Khoo, J.A. Nolen, Jr. and F.M. Bernthal	224
Observation of Particle Alignment in the Octupole Band of ^{170}Yb , P.M. Walker, S.R. Faber, W.H. Bentley, R.M. Ronningen and R.B. Firestone	225
The Octupole States in ^{63}Cu and the Particle-Core-Coupling Picture, Y. Iwasaki, G.M. Crawley, R.G. Markham, J.E. Finck and J.H. Kim	226
The Energy Dependence of the Differential Cross Sections for the (p,t) Reaction, Y. Iwasaki	227
A Singular Property of the Volume-Absorptive Optical Potential as Used in the Zero-Range DWBA Calculation of the (p,t ₀) Angular Distribution, Y. Iwasaki	228
Methods for the Production and Use of ^{13}N in Studies of Denitrification, J.M. Tiedje, R.B. Firestone, M.K. Firestone, M.R. Betlach, M.S. Smith and W.H. Caskey	229
The Influence of Nitrate, Nitrite and Oxygen on the Composition of the Gaseous Products of Denitrification in Soil, M.K. Firestone, M.S. Smith, R.B. Firestone and J.M. Tiedje	230
Shell-Model Predictions of Alpha-Spectroscopic Factors Between Ground States of $16 \leq A \leq 40$ Nuclei, W. Chung, J. van Hienen, B.H. Wildenthal and C.L. Bennett	231
Comment on g-Transfer Spectroscopic Factors in ^{23}Na , W. Chung, H.T. Fortune and B.H. Wildenthal	232
Isobaric Quartets in Nuclei, W. Benenson and E. Kashy	233
Ratios of Cross Sections for Elastic Scattering of 30.3 MeV Protons from ^{40}Ca , ^{44}Ca , ^{48}Ca - A New Method, S.M. Austin, E. Kashy, C.H. King, R.G. Markham, I. Redmount and R.M. Ronningen	234
The Decay of ^{201}Pb , R.E. Doebler, Wm. C. McHarris and W.H. Kelly	235
Production of A=6 and 7 Isotopes in the $\alpha + \alpha$ Reaction, B.G. Glagola, G.J. Matthews, J.F. Breuer, V.E. Viola, Jr., P.G. Roos, A. Nadasen and S.M. Austin	236
The MSU Superconducting Cyclotron Project, R. Au, G. Bellomo, H. Blosser, R. Burleigh, E. Fabrici, M. Gordon, B. Jeltema, D. Johnson, W. Johnson, H. Laumer, D. Lawton, M. Mallory, P. Miller, F. Resmini, J. Riedel and G. Stork	237
Charge Dependence of Pion Production in Heavy Ion Collisions, G. Bertsch	238
$^{14}\text{C}(p,n)^{14}\text{N}$ and the Isovector Tensor Component of the Effective Two-Nucleon Interaction, R.R. Doering, T.N. Taddeucci, A. Galonsky and D.M. Patterson	239
Neutron Angular and Energy Distributions from 710-MeV Alphas Stopping in Water, Carbon, Steel and Lead and 640-MeV Alphas Stopping in Lead, R.A. Cecil, B.D. Anderson, A.R. Baldwin, R. Madey, A. Galonsky, P. Miller, L. Young and F.M. Waterman	240
Elastic Scattering of ^6Li at 73.7 MeV, R. Huffman, A. Galonsky, R. Markham and C. Williamson	241
V. Thesis Titles (July 1978 - June 1979)	
Thesis Titles	242