14 March 2008

VITAE

ARTHUR M. POSKANZER

I. PERSONAL

Birth Date:	June 28, 1931
Citizenship:	USA
Family Status:	Married Lucille Block in 1954 3 children: Deborah 1956, Jeffrey 1958, Harold 1966
Home Address:	1113 Hillview Road Berkeley, CA 94708
Laboratory Address:	Lawrence Berkeley National Laboratory Nuclear Science Division MS 70-R319 Berkeley, CA 94720 510-486-5618 510-486-4818 fax AMPoskanzer at lbl dot gov

II. EDUCATION

A. Undergraduate:

1949-53, A.B. *cum laude*, Physics and Chemistry, Harvard College

B. Graduate:

1953-54, M.A., Chemistry, Columbia University
1954-57, Ph.D., Physical Chemistry, MIT

C. Languages:

French

III. RESEARCH EXPERIENCE:

A. Chronology

1957-59	Research Associate
1959-66	Chemist Chemistry Department Brookhaven National Laboratory Upton, New York

1966-69	Staff Scientist
1969-95	Staff Senior Scientist
1990-95	Program Head
1995-01	Distinguished Senior Scientist
2001-now	Distinguished Senior Scientist, emeritus
	Lawrence Berkeley National Laboratory

B. Extended Visits

Orsay, France, 1970-71
CERN, Geneva, Switzerland, 1979-80, 1986-87, and 1995-96

IV. PROFESSIONAL ACTIVITIES

Member, First Executive Committee of the LAMPF Users' Association, 1969
Chairman, Gordon Conference Nuclear Chemistry, 1970
Founder, Bevalac Users' Association, 1973
Member, LAMPF Policy Board, 1973-75
Member, Program Advisory Committee for LAMPF, 1971-74
Member, Program Advisory Committee for Bevalac, 1973-77
Chairman, Committee for Structure of the Scientific Staff of the Nuclear Chemistry Division, 1974
Member, Committee on Professional Research Staff Policy of LBL, 1975-76
Founder, Bevalac Seminars, 1975
Co-editor, Scientific Justification for the Bevalac Uranium Capability Project, 1975
Member, Organizing Committee of the Third International Conference on Nuclei Far From Stability, Corsica, 1976
Member, NAS Panel on the Future of Nuclear Science, 1976
Chairman, Division of Nuclear Chemistry and Technology of the American Chemical Society, 1977
Member, LBL Staff Committee, 1977-78
Organizer, Fourth High Energy Heavy lon Summer Study, 1978
Scientific Director, Bevalac 1978-79
Member, International Advisory Committee of the Conference on Extreme States in Nuclear System, Dresden, 1980
Leader, Plastic Ball Group, 1980-90
Convenor, Workshop on Detectors for Relativistic Nuclear Collisions, 1984
Member, Editorial Board of Physics Review C, 1984-86
Member, BNL Chemistry Department Visiting Committee, 1984-88
Member, LBL Awards Committee, 1984-85
Chairman, Fellowship Committee of the APS Division of Nuclear Physics, 1985-86
Member, Editorial Board, Particle World journal, 1988-95
Head, Relativistic Nuclear Collisions Program, 1990-95
Deputy Spokesperson, STAR Collaboration, 1991-92

Member, Inter. Advisory Committee of the Conference on Quark Matter, Gatlinburg, 1991
Member, NSD Staff Committee, 1991-94
Member, Computer Services Advisory Committee, 1991-94
Deputy Spokesperson, NA49 Collaboration, 1992-98
Member, Inter. Advisory Committee of the Conference on Quark Matter, Borlänge, 1993
Member, NSD Awards Committee, 1994-95
Chairman, Organizing Committee of the Conference on Quark Matter, Monterey, 1995
Member, Inter. Advisory Committee of the Conference on Quark Matter, Heidelberg, 1996
Member, Inter. Advisory Committee of the Conference on Quark Matter, Tsukuba, 1997
Member, Inter. Advisory Committee of the Conference on Quark Matter, Turin, 1999

V. HONORS

Scholarship, Harvard Club of New York, 1949
Higgins Fellowship, Columbia, 1953-54
Guggenheim Fellowship, 1970-71
NATO Senior Fellowship, 1975
Fellow, American Physical Society, 1976
CERN Scientific Associate, 1979-80
American Chemical Society Award in Nuclear Chemistry, 1980
US Senior Scientist Alexander von Humboldt Award, 1986-87, 1995-96
Fellow, American Association for the Advancement of Science, 1992
Bonner Prize in nuclear physics from the Amer. Physical Society, 2008

VI. RESEARCH ACTIVITIES

Poskanzer's research interest have been in nuclei far from stability, especially in the low-Z region, and in high energy nuclear reactions, particularly reactions induced by relativistic heavy ions. He is co-discoverer of 28 isotopes and has shown 5 others to be particle unbound. These are mostly in the light element region at the limits of particle stability and include beta-delayed proton and neutron emitters. For three nuclei he demonstrated beta-delayed two neutron emission, and was the co-discoverer of beta-delayed three neutron emission.

In the field of relativistic heavy ion reactions he led a group effort which pioneered the experimental study of central collisions and made major contributions to their theoretical interpretation in the form of the nuclear fireball and coalescence models. He was co-group leader of the Plastic Ball Project which was directed to the study of central collisions of relativistic heavy ions with the aim of learning about nuclear matter at high temperature and density. The group was a collaboration between GSI and LBL. Analyses of Plastic Ball data have revealed the phenomenon of collective flow of nuclear matter. This has been taken as direct evidence of having produced dense nuclear matter at the Bevalac. Other results have been measurements of both the thermal and chemical freeze-out densities of nuclear matter. In 1986 he helped start the experimental program at the CERN SPS in Geneva, Switzerland first using 200 GeV/A ^{16}O and ^{32}S beams, and then Pb beams starting in 1994. At CERN he was a member of WA80, NA35, and then Deputy Spokesperson of NA49 until 1998. In analyzing the NA49 data he developed the widely-used standard method of anisotropic flow analysis.

As Head of the Relativistic Nuclear Collisions Program from 1990 to 1995 he was a major force in coalescing the LBL efforts onto the STAR experiment at the Brookhaven RHIC. His elliptic flow analysis was the first paper from STAR. He then discovered the fourth harmonic in anisotropic flow at RHIC. His present research is still on anisotropic flow at RHIC.

Arthur M. Poskanzer

Poskanzer was a pioneer in the use of high energy reactions to produce low-Z nuclei far from stability. Most people had been searching for new light nuclei in simple low-energy reactions where they would be produced cleanly. Poskanzer realized that if one had very selective identification techniques the best way to produce exotic nuclei would be with GeV energy protons on uranium targets. Mainly in the course of exploiting this concept, he and his co-workers discovered 28 isotopes. The discovery of ^{11}Li and ^{14}Be were particularly significant, because both had been predicted not to exist. Five other isotopes were proved not to exist, that is, for these cases the limits of particle stability had been reached experimentally. Also they were the first to measure the decay of ten isotopes, including ^{8}He and many delayed proton emitters. The delayed proton emitter ^{37}Ca was of particular importance because of its significance for the Cl solar neutrino experiment. They obtained the first mass measurements for seven nuclei, revealing a new region of deformation, which was particularly interesting because it occurred at a magic number. In the course of this work Poskanzer developed the first ΔE-E-time-of-flight technique for Z and A identification which is in standard use today and invented a new time-zero detector. He also contributed significantly to the new technique of direct atomic mass measurements of short-lived nuclei. Then he demonstrated beta-delayed two neutron emission for three nuclei and was co-discover of beta-delayed three neutron emission. In the field of high energy proton-nucleus reactions Poskanzer and his colleagues performed the first differential recoil study and later the first counter study of nuclear fragmentation.

In more recent years Poskanzer shifted to the study of relativistic nuclear collisions. At the Berkeley Bevalac he and his co-workers obtained the first results on central collisions, which generated enormous interest. Poskanzer and his colleagues themselves generated the nuclear fireball and coalescence models to describe their data. These models opened up the whole new field of thermal models in describing the initial stage of relativistic nuclear collisions, and has had a profound effect on the theoretical approaches to these reactions.

Poskanzer was co-group leader of the Plastic Ball project, a collaboration with the GSI lab of Darmstadt, West Germany. The Plastic Ball was the first 4π charged particle detector for nuclear physics. It proved the importance of exclusive measurements in nuclear physics and prompted the construction of similar detectors at several other laboratories around the world, starting a new trend in nuclear physics. The Plastic Ball was not only a breakthrough in instrumentation, but the physics results greatly stimulated the whole field of relativistic nuclear collisions. The most significant result was the discovery of the collective flow of nuclear matter, which was taken as direct evidence of having produced dense nuclear matter. Detailed analyses showed that there were three significant collective flow effects: "bounce off", "side splash", and "squeeze out".

In 1986 when light heavy ions became available at the CERN SPS, the Plastic Ball was moved there to become part of a greatly expanded experimental program whose main purpose was to search for the predicted new state of matter called the Quark-Gluon Plasma. Poskanzer participated in the study of nuclear collisions in this new energy domain, first with experiment WA80, then with experiments NA35 and NA49. He was Deputy Spokesperson of NA49 through 1998. Also, he was the initial Deputy Spokesperson of the STAR Collaboration at the Relativistic Heavy Ion Collider at Brookhaven. From 1990 to 1995 he was Head of the Relativistic Nuclear Collisions Program which contained all of the high energy heavy ion research at LBNL. At present his research is concerned with the measurement of directed and elliptic flow with the STAR detector.

Best Pubs

15. New Delayed Proton Emitters: Ti ^{41}, Ca ^{37}, and Ar^{33}
    P. L. Reeder, A. M. Poskanzer, and R. A. Esterlund
    Phys. Rev. Letters **13**, 767 (1964)

22. New Isotopes: ^{11}Li, ^{14}B, and ^{15}B
    A. M. Poskanzer, S. W. Cosper, Earl K. Hyde and Joseph Cerny
    Phys. Rev. Letters **17**, 1271 (1966)

31. Fragment Production in the Interaction of 5.5-GeV Protons With Uranium
    A. M. Poskanzer, G. W. Butler, and E. K. Hyde
    Phys. Rev. C **3**, 882 (1971)

36. On-Line Mass-Spectrometric Measurement of the Masses of Neutron-Rich Sodium Isotopes
    R. Klapisch, R. Prieels, C. Thibault, A. M. Poskanzer, C. Riguad, and E. Roeckl
    Phys. Rev. Letters **31**, 118 (1973)

37. Discovery of Two Isotopes, ^{14}Be and ^{17}B, at the Limits of Particle Stability
    J. D. Bowman, A. M. Poskanzer, R. G. Korteling, and G. W. Butler
    Phys. Rev. C **31**, 614 (1973)

43. Final State Interactions in the Production of Hydrogen and Helium Isotopes by Relativistic Heavy Ions on Uranium
    H. H. Gutbrod, A. Sandoval, P. J. Johansen, A. M. Poskanzer, J. Gosset, W. G. Meyer, G. D. Westfall and R. Stock
    Phys. Rev. Letters **37,** 667 (1976)

44. Nuclear Fireball Model for Proton Inclusive Spectra from Relativistic Heavy Ion Collisions
    G. D. Westfall, J. Gosset, P. J. Johansen, A. M. Poskanzer, W. G. Meyer, H. H. Gutbrod, A. Sandoval, and R. Stock
    Phys. Rev. Letters **37**, 1202 (1976)

47. Central Collisions of Relativistic Heavy Ions
    J. Gosset, H. H. Gutbrod, W. G. Meyer, A. M. Poskanzer, A. Sandoval, R. Stock, and G. D. Westfall
    Phys. Rev. **C16**, 629 (1977)

52. Exotic Light Nuclei
    J. Cerny and A. M. Poskanzer
    Sci. Amer. **238**, 60 (1978)

72. Collective Flow Observed in Relativistic Nuclear Collisions
    H. A. Gustaffsson, H.H. Gutbrod, B. Kolb, H. Löhner, B. Ludewigt, A.M. Poskanzer, T. Renner, H. Riedesel, H.G. Ritter, A. Warwick, F. Weik, and H. Wieman
    Phys. Rev. Lett. **52**, 1590 (1984)

79. Nuclear Collective Flow as a Function of Projectile Energy and Mass
    K. G. R. Doss, H.A. Gustaffsson, H.H. Gutbrod, K.H. Kampert, B. Kolb, H. Löhner, B. Ludewigt, A.M. Poskanzer, H.G. Ritter, H.R. Schmidt, and H. Wieman
    Phys. Rev. Lett. **57**, 302 (1986)

96. A New Component of the Collective Flow in Relativistic Heavy-Ion Collisions
H.H. Gutbrod, K.H. Kampert, B. Kolb, A.M. Poskanzer, H.G. Ritter, and H.R. Schmidt,
Phys. Lett. **B216**, 267 (1989)

102. Plastic Ball Experiments
H.H. Gutbrod, A.M. Poskanzer, and H.G. Ritter
Reports on Progress in Physics **52**, 1267 (1989)

105. A History of Central Collisions at the Bevalac
A.M. Poskanzer
"The Nuclear Equation of State," Ed. by W. Greiner and H. Stöcker, Plenum Press, New York, 1990

109. Squeeze-out of Nuclear Matter as a Function of Projectile Energy and Mass
H.H. Gutbrod, K.H. Kampert, B. Kolb, A.M. Poskanzer, H.G. Ritter, R. Schicker, H.R. Schmidt
Phys. Rev. **C42**, 640 (1990)

170 Proceedings of the Eleventh International Conference on Ultra-Relativistic Nucleus-Nucleus Collisions.
A.M. Poskanzer, J.W. Harris, and L.S. Schroeder
Quark Matter '95, 1995, Monterey, California, Elsevier.

191 Directed and elliptic flow in 158 GeV/nucleon Pb+Pb collisions
NA49 Collaboration, H. Appelshäuser et al.
Phys. Rev. Lett. **80**, 4136 (1998)

193 Methods for analyzing anisotropic flow in relativistic nuclear collisions
A.M. Poskanzer and S.A. Voloshin
Phys. Rev. C **58**, 1671 (1998)

211. Elliptic Flow in Au + Au Collisions at sqrt(S_{NN}) = 130 GeV
STAR Collaboration, K.H. Ackerman et al.
Phys. Rev. Letters **86**, 402 (2001)

221. Effects of Momentum Conservation on the Analysis of Anisotropic Flow
N. Borghini, P.M. Dinh, J.Y. Ollitrault, A.M. Poskanzer, and S.A. Voloshin
Phys. Rev. C. **66**, 014901 (2002)

Directed and elliptic flow of charged pions and protons in Pb + Pb collisions at 40 and 158A GeV
NA49 Collaboration, C. Alt et al.
Phys. Rev. C **68**, 034903 (2003)

Azimuthal Anisotropy at the Relativistic Heavy Ion Collider: The First and Fourth Harmonics
STAR Collaboration, J. Adams et al.
Phys. Rev. Letters, **92**, 062301 (2004)

Azimuthal anisotropy in Au + Au collisions at sqrt(S_{NN}) = 200 GeV
STAR Collaboration, J. Adams et al.
Phys. Rev. C, to be published (2005)

History of Flow

The GSI-LBL Plastic Ball detector was built at Berkeley during 1980-81 under the leadership of three co-group leaders: Art Poskanzer, Hans Gutbrod, and Hans-Georg Ritter. The major physics result was the discovery of the collective flow of nuclear matter in 1983. The data analysis for this was done by Ritter with the help of Poskanzer. Soon after, this discovery was confirmed by the Streamer Chamber Collaboration. The Plastic Ball Collaboration then did a systematic study of directed flow including also a study of fragment flow. After an initial hint from the Diogene Collaboration, the Plastic Ball Collaboration reported squeeze-out in 1989 and then performed a systematic study of this effect.

Ritter then led the EOS Collaboration in building a TPC in 1988-89 for further studies of relativistic heavy ion collisions at the Bevalac. The EOS TPC was moved to the AGS in 1994 to continue these studies at higher energies. Poskanzer studied flow at the SPS in the NA49 Collaboration and reported in 1997 the first systematic study of directed and elliptic flow at these energies. In the STAR Collaboration he was the first to report elliptic flow at RHIC, and more recently, the higher harmonics.

The study of collective flow has produced major physics results at all beam energies at every high energy heavy ion accelerator in the world. Flow has been related to the equation of state of nuclear matter, and at the higher bombarding energies, to the degree of equilibration. At RHIC it is the prime indicator of the applicability of hydrodynamics at early time in the collision and suggests that the partons flow before they coalesce into hadrons.