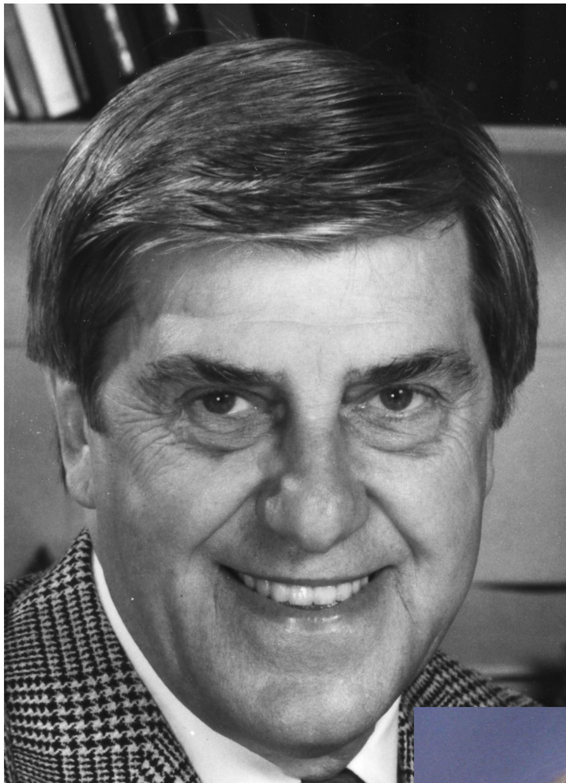
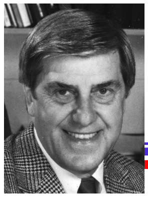


Decoding the Nucleus – John R. Huizenga: Pioneer, Scholar, Mentor

Honoring John Huizenga on the occasion of his 85. birthday, April 21, 2006.

W. Udo Schröder



Research Areas

Polymeric electrolytes, metal ion attachment and diffusion
→ radiotracer methods

Chemical dependence of nuclear beta decay
→ pressure sensitivity of EC rates

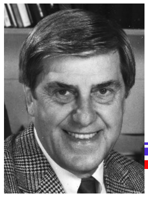
Cosmic abundances of elements → metorites
Nucleogensis via r-process → irradiation in reactors, bomb tests
Heavy elements

Spontaneous/induced fission, isotopic dependence
Fission delay times → muon induced prompt fission
Fission transition state shapes, Z^2/A and pairing dependence
K alignment → ff angular distributions

Spin/isospin/pairing dependent nuclear level densities
statistical nuclear decay → isomer ratios, Γ_n/Γ_f

Single-particle structure of actinides
→ characterization of Nilsson states

Interaction potentials and dissipative forces in heavy-ion reactions Interaction times, fusion probability
→ dissipation, deflection functions
Multi-nucleon diffusion → fragment-Z distributions- E_{Diss}



Community Service/Scientific Awards

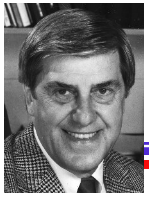
Community Service

Manhattan Project 1942-46
Co-founder of Gordon Conference on Nuclear Chemistry 1958
IAEA Technical advisor 1965
ERAB Panel 1984-90
DOE Cold-Fusion Panel 1989-92, Co-Chair
Advisory Council, G.T. Seaborg Institute for Transuranium Science (LLNL), 1991

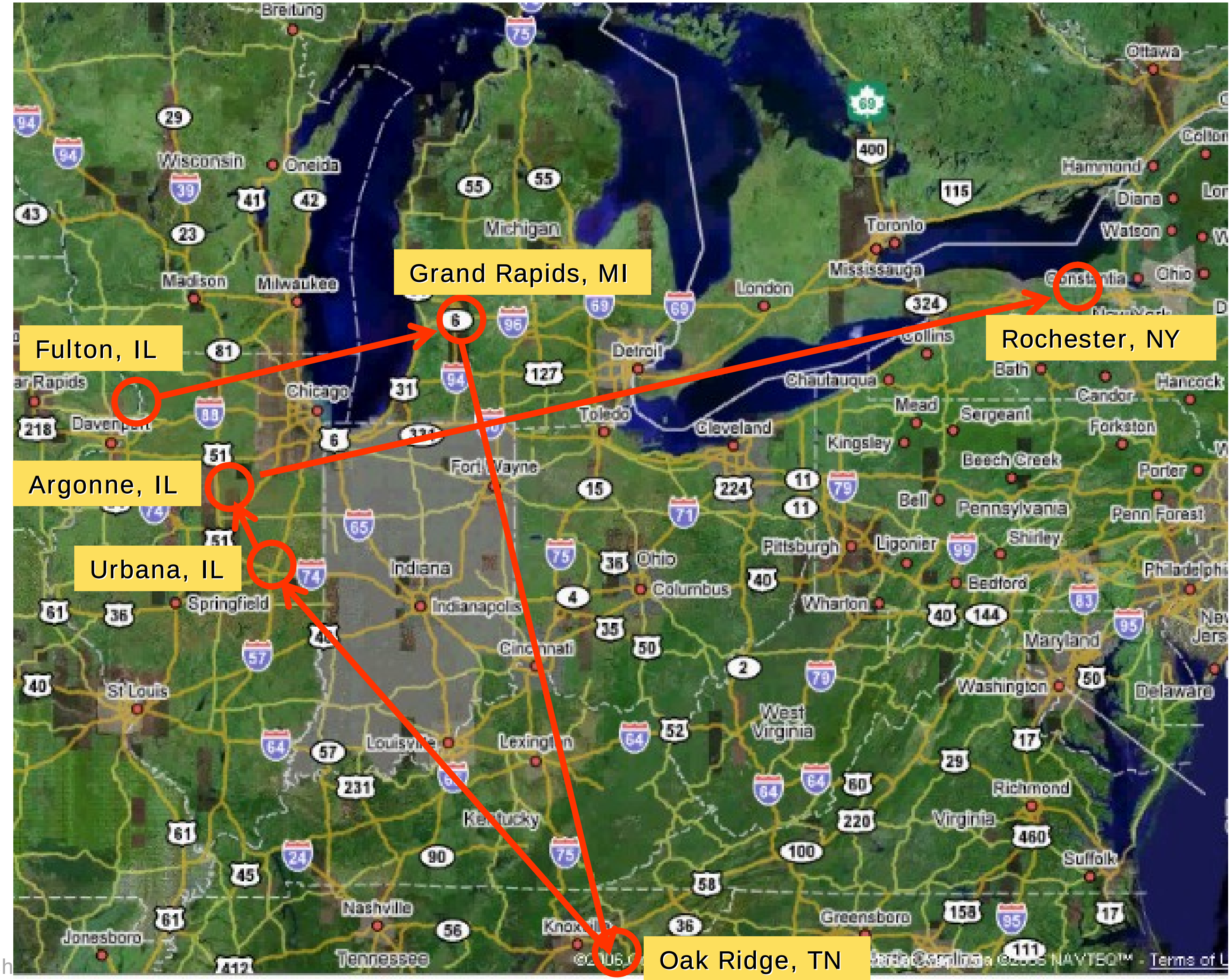
Book "Cold Fusion –The Scientific Fiasco of the Century" 1992/4

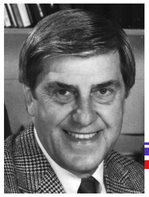
Scientific awards

1966 E. O. Lawrence Memorial Award for Research in Nuclear Fission.
1975 ACS Award for Nuclear Applications in Chemistry,
1975 Distinguished Alumni Award at Calvin College,
1976 Elected to the National Academy of Sciences,
1991 Leroy Randle Grumman Medal for Outstanding Scientific Achievement.
1954…74 Several Fulbright & Guggenheim Fellowships

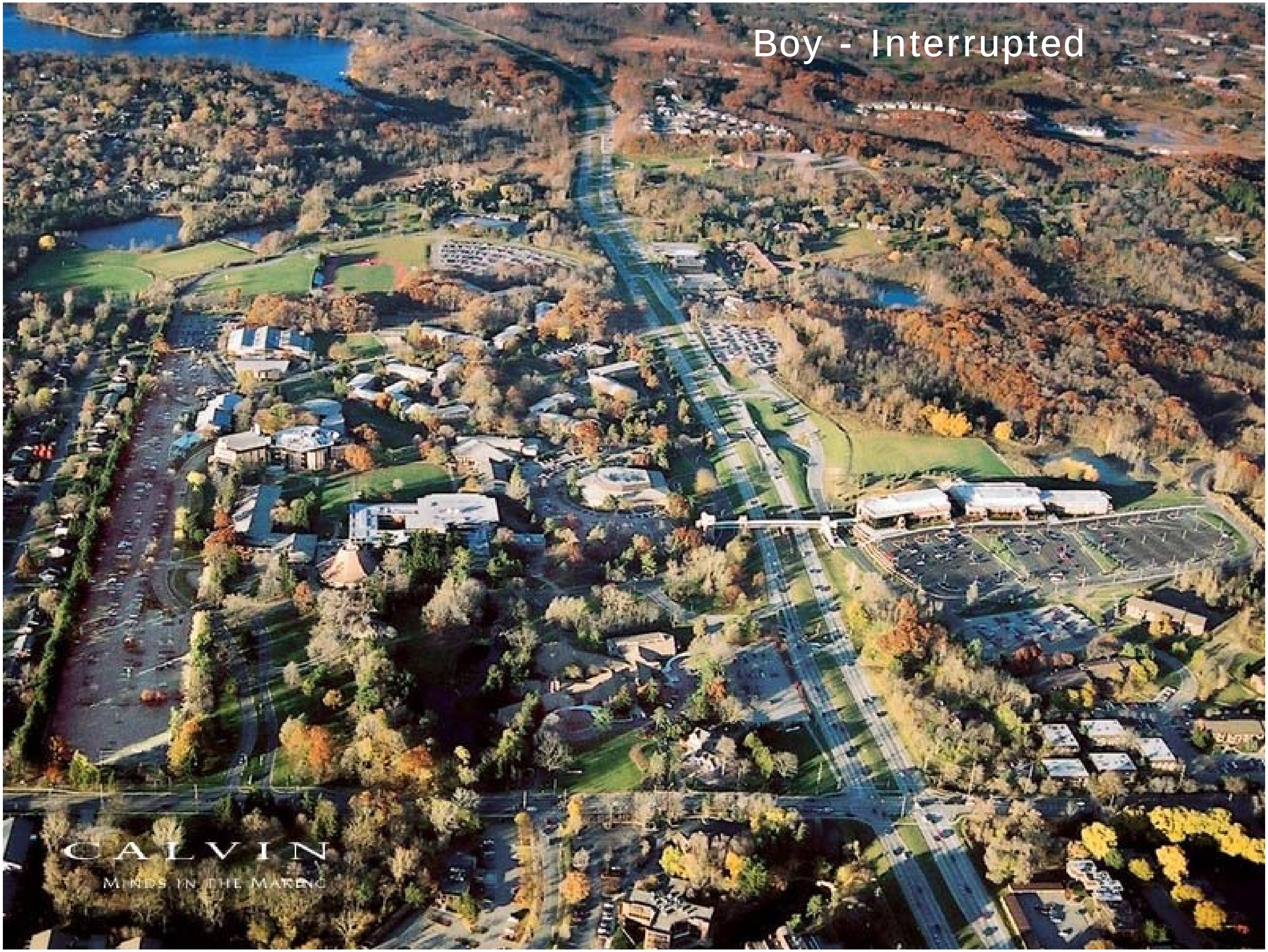


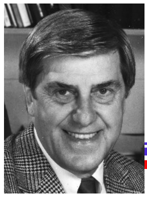
John’s Career Trail





1940-44: Calvin College: "Minds in the Making"



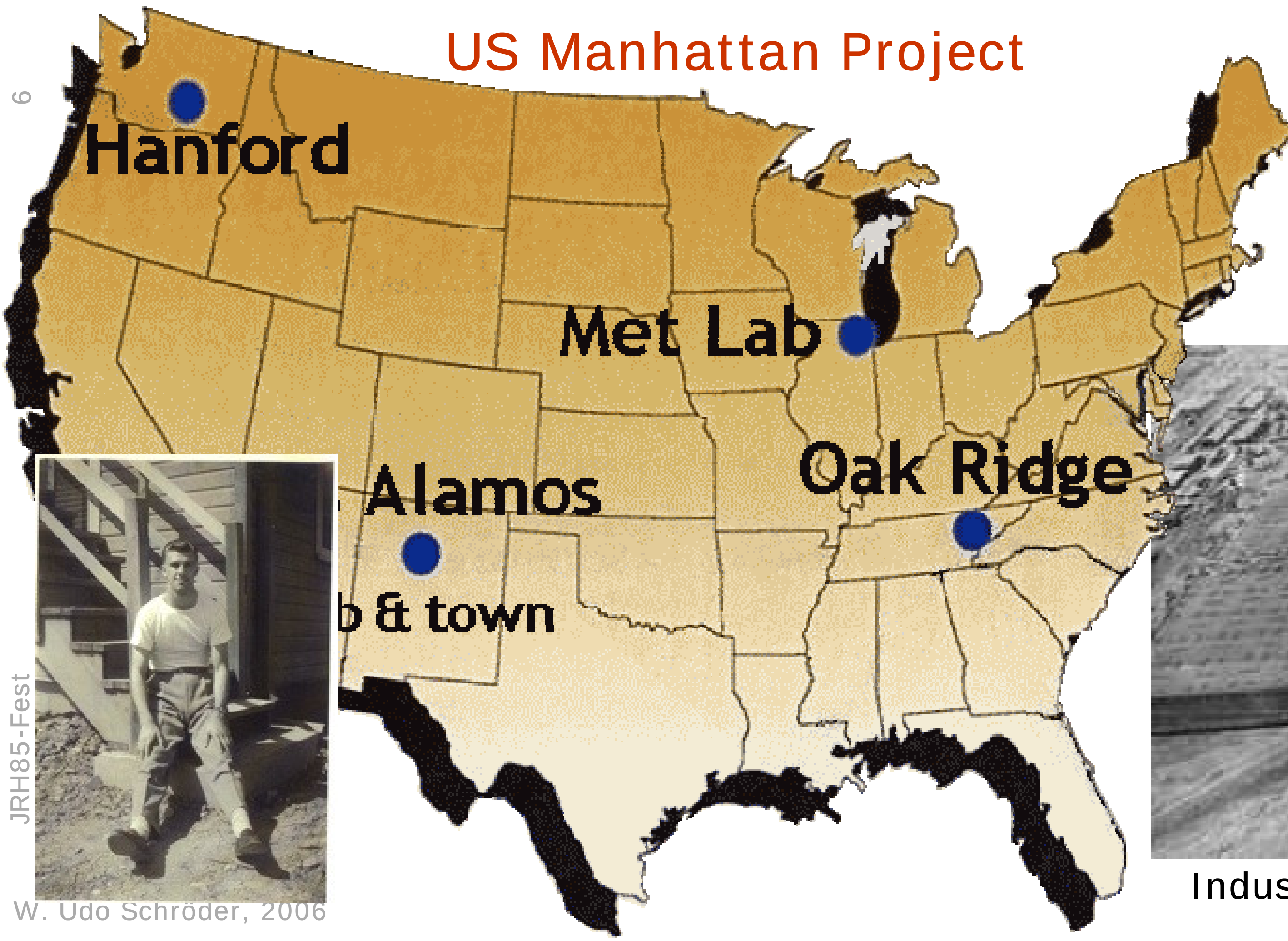


1944-46: Oak Ridge National Laboratory

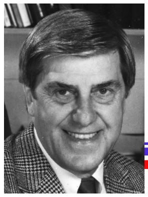
1941: Rudolph Frisch & Otto Peierls (in UK) calculate critical mass ^{235}U (~10 lbs)

Dec. 1942: Chicago Fermi's reactor critical
April 1943: Site Y: Los Alamos/NM laboratory

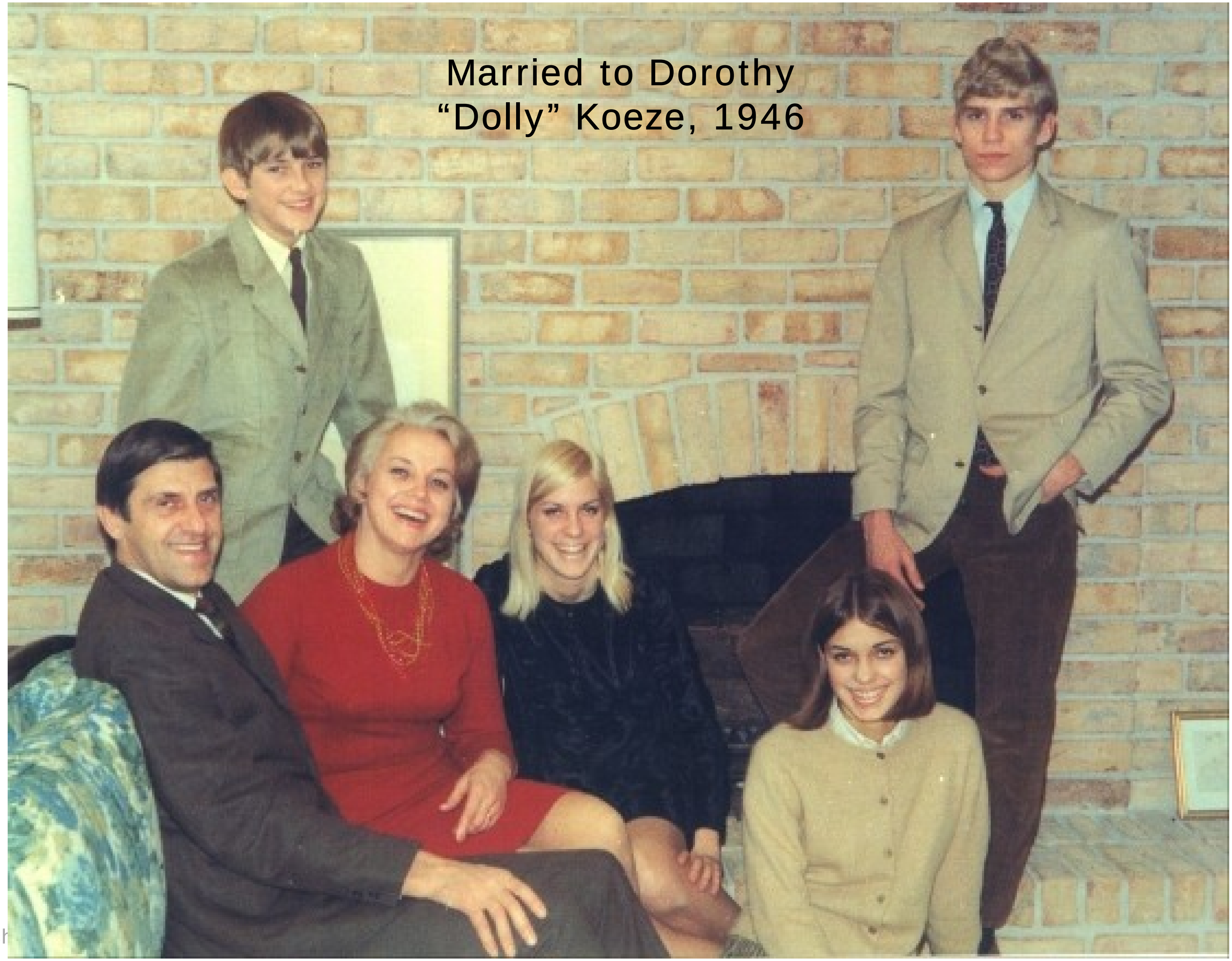
Aℓ centrifuge tubes, 40 feet high, 39 cm dia., 1 mm wall thickness

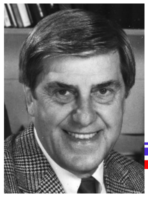


Industrial Scale Test Experiments



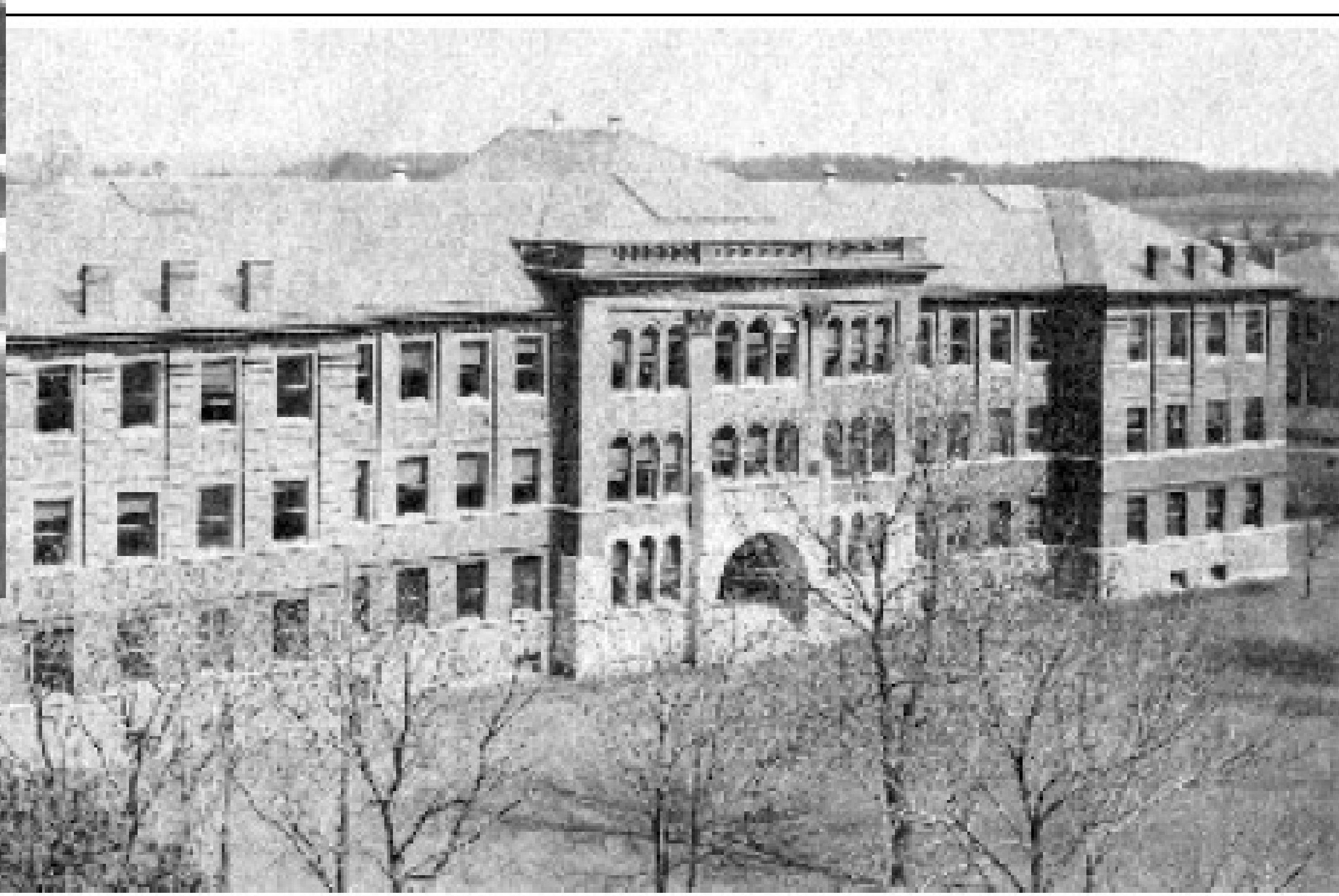
The Huizengas (1969)



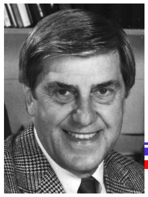


1946-49: University of Illinois, Urbana

Worked with Frederick T. Wall



Dept. Chemistry, Noyes Laboratory



1946-49 Grad. Studies: U Illinois/Urbana

Pioneering application of radio-tracer methods in electro-chemistry → Ph.D. Thesis

A STUDY OF THE TRANSFERENCE PROPERTIES OF POLYMERIC ELECTROLYTES USING RADIOACTIVE TRACERS

BY

JOHN ROBERT HUIZENGA

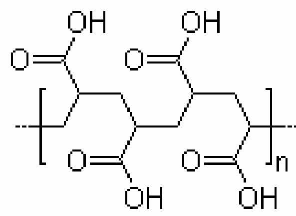
A.B., Calvin College, 1944

AN ABSTRACT OF A THESIS

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN CHEMISTRY IN THE GRADUATE COLLEGE OF THE UNIVERSITY OF ILLINOIS, 1949

URBANA, ILLINOIS

1949



$(C_3H_4O_2)_n$

2

a Hittorf type transference experiment with pH and conductance measurements. Since previous attempts (1,2,3,4) to measure the fraction of bound sodium are in extremely poor agreement, and since transference results are roughly midway between the other estimates, it appeared worthwhile to test the validity of the transference experiments in another way. This was accomplished by measuring the diffusion of radioactive sodium in otherwise uniform solutions of polyacrylic acid and sodium hydroxide, using the steady state technique (5,6). The results obtained from the diffusion experiments are in excellent agreement with the transference results. For comparison, the results of Stent obtained by using sodium amalgam electrode-E.M.F. measurements and of deButts obtained by repeating the pH and conductance measurements of Kern are included in Table I. The transference number, t_p, and the equivalent conductance, Λ_p, of the polyacrylate ion also appear in Table I.

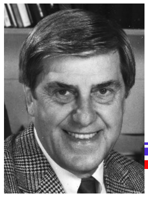
TABLE I.

0.0378 N. Polyacrylic Acid

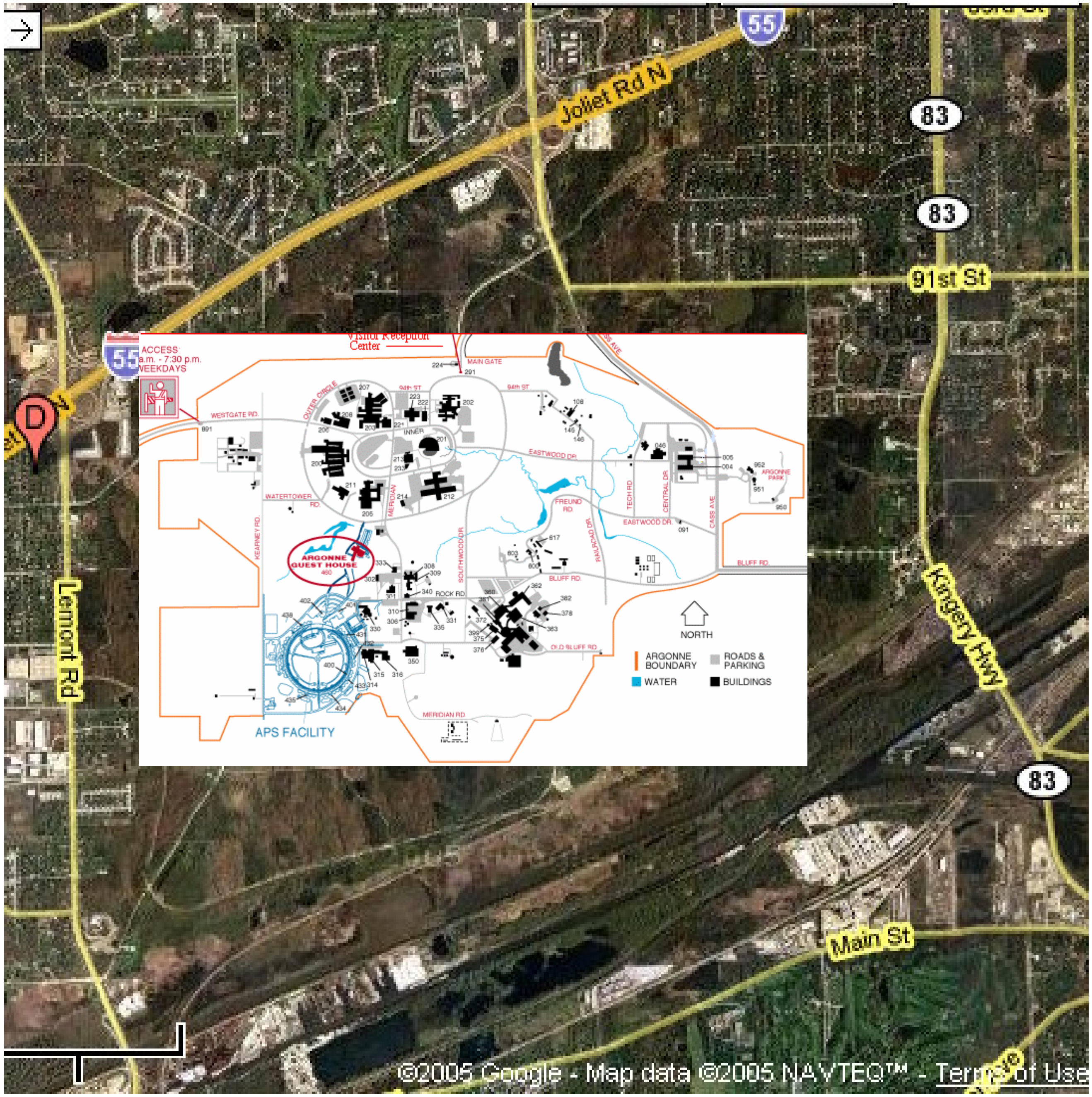
% Neutralization	Bound Sodium Fraction: deButts	Stent	Diffusion	Transference Conductance	t_p	Λ_p
9.60	0.00	0.78	0.12	0.14	0.31	24
24.0	0.00	0.89	0.29	0.27	0.42	34
41.3	0.00	0.90	0.41	0.41	0.46	40
61.7	0.06	0.87	0.51	0.54	0.49	45
81.6	0.25	0.80	0.59	0.60	0.49	44
97.9	0.40	0.73	0.62	0.62	0.43	34

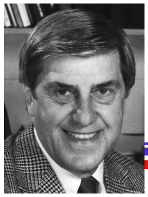
As can readily be seen from the above Table, the polymer ions conduct nearly one-half the current in the range 25 to 100 percent neutralization whereas in pure acid solutions hydrogen ions carry virtually all the current. deButts (3) assumed that a negligible fraction of the current was carried by the partially neutralized polymer ion in his calculation. In

Diffusion of radioactive Na in PAA/NaOH
Na^+ attachment to poly-acrylic acid

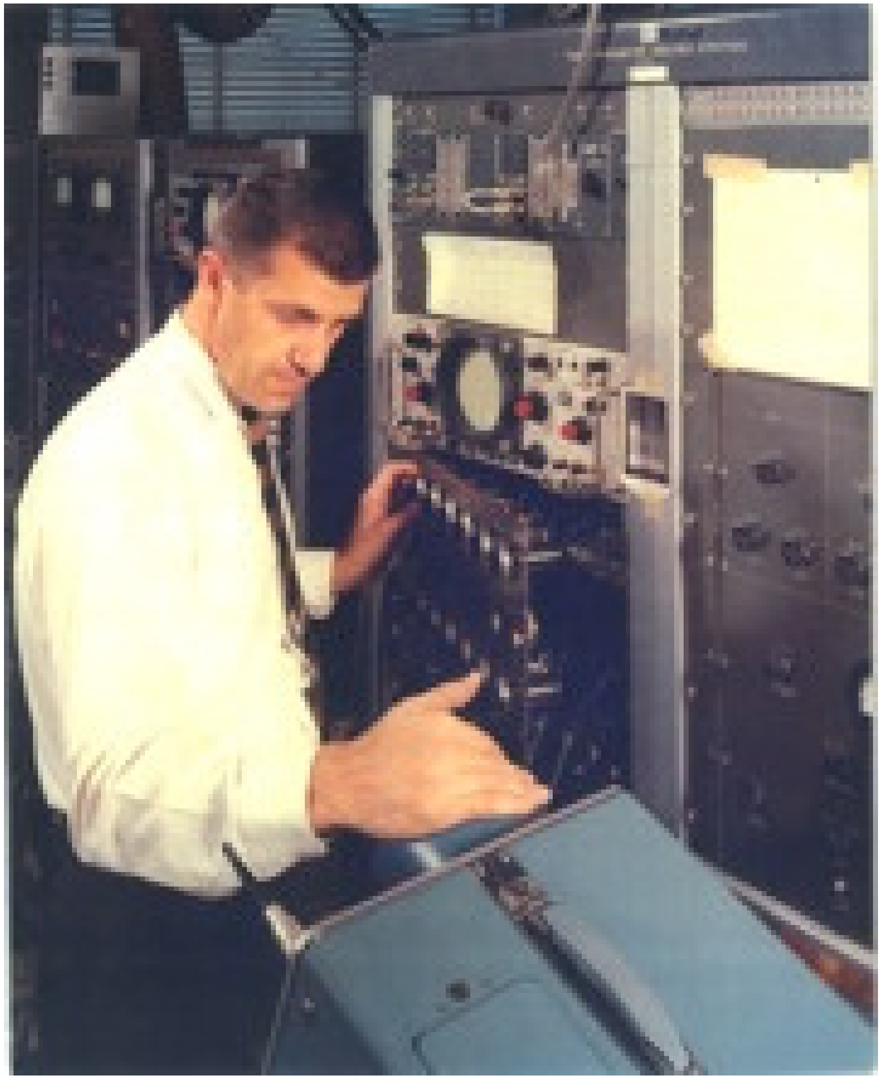


1949-67 Argonne National Laboratory



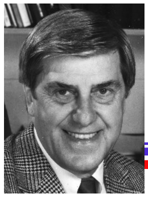


Radiochemical Work at ANL



Working with a 4k MCA

Loading a radioactive sample into a shielded detector



Cosmic Abundance of Elements

Radiotracing heavy elements in Meteorites (Chondrites)

Geochimica et Cosmochimica Acta, 1959, Vol. 17, pp. 125 to 135. Pergamon Press Ltd. Printed in Northern Ireland

Bismuth, thallium and mercury in stone meteorites by activation analysis*

W. D. Ehmann† and J. R. Huizenga
Argonne National Laboratory, Lemont, Illinois

(*Received* 23 *January* 1959)

Abstract—The radiochemical procedures for the assay of bismuth, thallium, and mercury in stone meteorites following neutron activation are described in detail. A Bi^{209} abundance of $2{\cdot}2 \times 10^{-9}$ gramme/gramme meteorite leading to a cosmic abundance of 0·0016 (per 10^6 Si atoms) was determined from the analysis of six stone meteorites. A Tl^{203} abundance of $0{\cdot}40 \times 10^{-9}$ g/g meteorite and a Hg^{202} abundance of 30×10^{-9} g/g meteorite corresponding to cosmic abundances of 0·00030 and 0·023 (per 10^6 Si atoms), respectively, were determined from analysis of five stone meteorites. Implications of these data as pertaining to the life history of meteorites are discussed.

Introduction

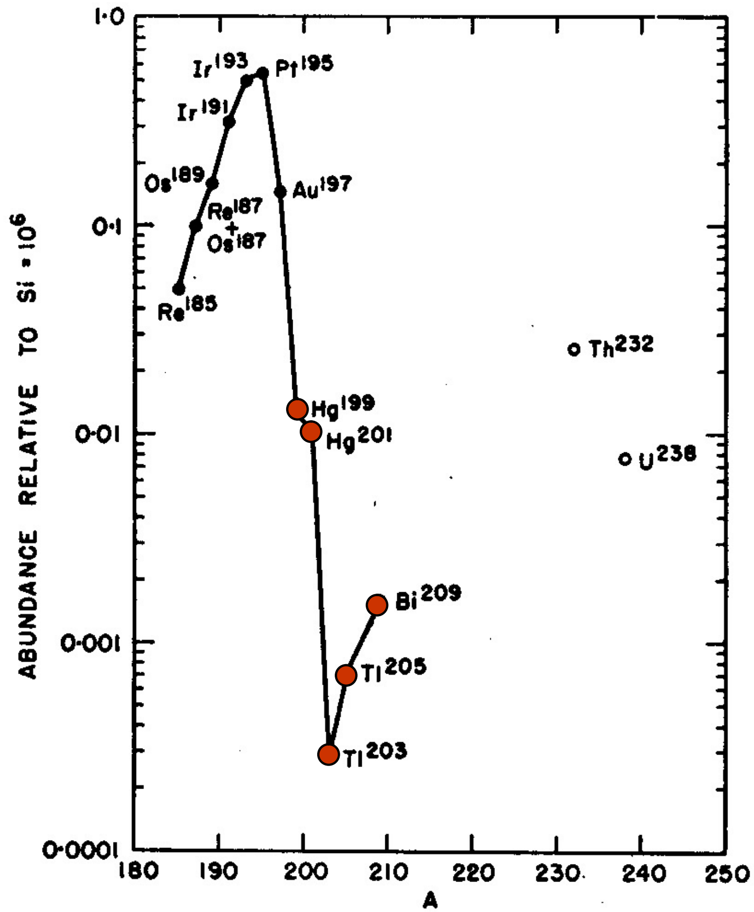
The heavy elements Hg, Tl, Pb and Bi are of particular interest to those working in geochemistry and cosmochemistry, since they are the highest atomic number nonradioactive elements in the periodic table. In this work the abundances of three of these, Hg, Tl and Bi, were determined by use of the very sensitive analytical tool of neutron activation.

The advantages and disadvantages of neutron activation analysis have been discussed at length in the literature (Boyd, 1949; Meinke, 1955; Plumb and Lewis, 1955; Jenkins and Smales, 1956), and will not be dealt with in detail here. It is sufficient to say that the two major advantages of the method are its high sensitivity (in this work abundances down to $\sim 10^{-10}$ g/g) and its freedom from contributions to an elemental abundance due to reagent contamination during chemical processing. The latter is of extreme importance for low abundance elements especially in the case of Hg owing to the generally high prevalence of Hg contamination in chemistry laboratories.

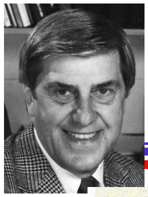
Previous data on heavy element abundances in stone meteorites at the time this investigation began were very sparse. Suess and Urey use an interpolated value of 0·284 (Si = 10^6) for the atomic abundance of mercury (Suess and Urey, 1956). They state, however, that all early analyses are suspect because of possible contamination in the laboratory. The Noddack's report the atomic abundance of thallium as 0·108 (Si = 10^6) (Noddack and Noddack, 1934), while Shaw (1952) reports thallium as less than 0·007 (Si = 10^6). El Badry and Kohman (1957) using microchemical techniques found the thallium abundance of the Plainview chondrite to be 0·0005 (Si = 10^6) based on one determination. Suess and Urey adopt 0·144 (Si = 10^6) for the atomic abundance of bismuth based on the work of the Noddacks (Noddack and Noddack, 1934). Recently Reed *et al.* (1958)

* Based on work performed under the auspices of the United States Atomic Energy Commission.
† Permanent address: Department of Chemistry, University of Kentucky, Lexington, Kentucky.

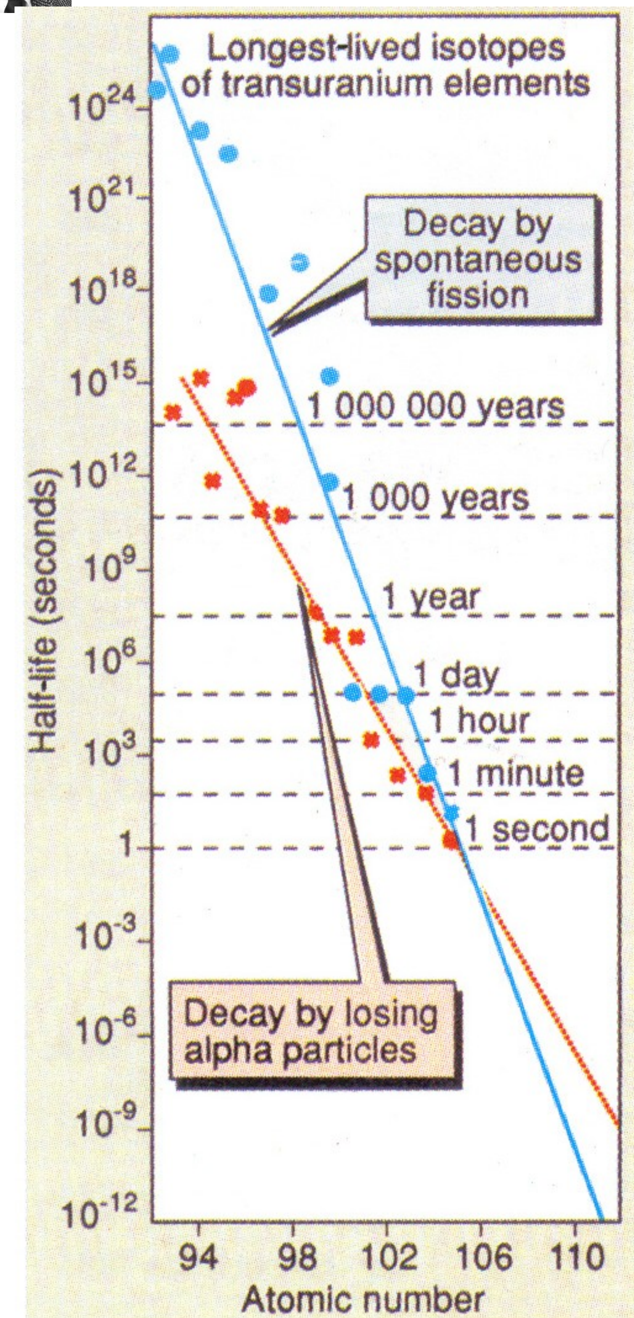
125



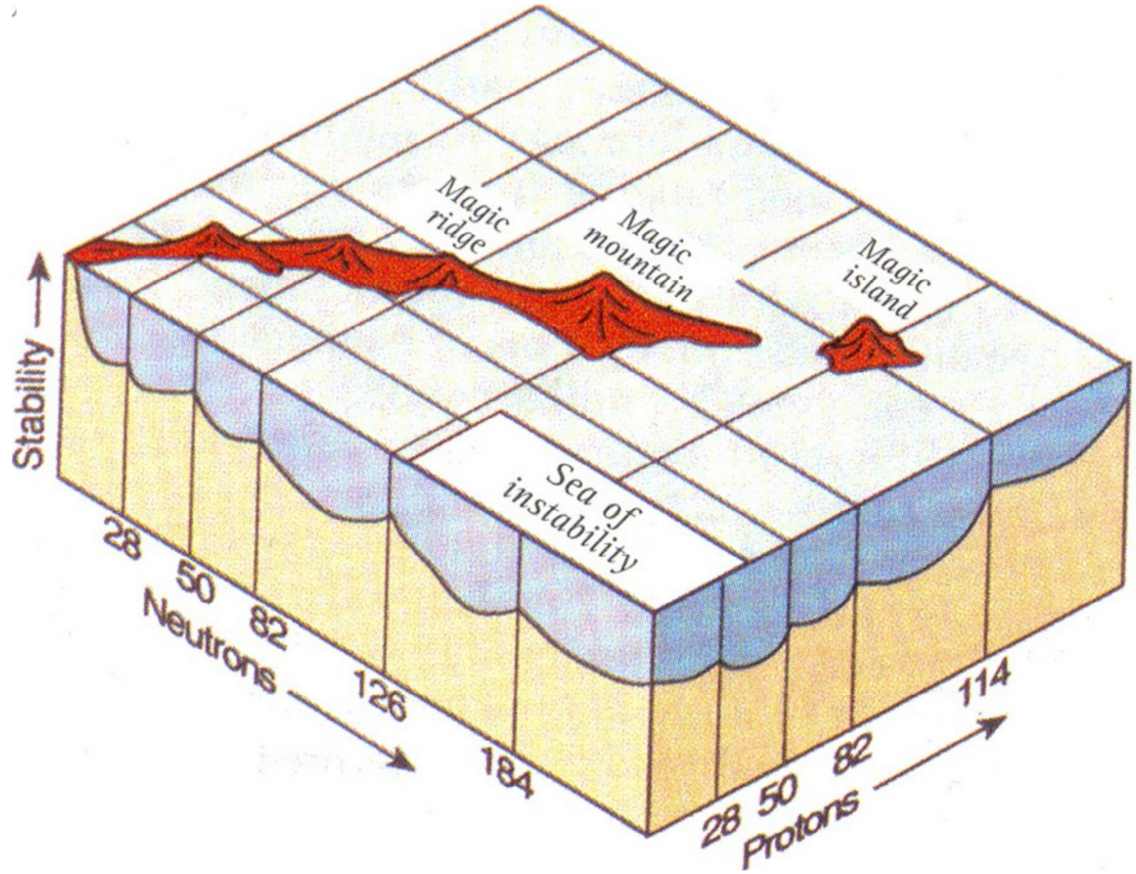
Cosmic abundances of heavy nuclides based on analyses of chondrites; (●) odd *A* nuclides; (○) even *A* nuclides. Re, Os, Ir, Pt and Au, Suess and Urey (1956); Hg, Tl and Bi, This work; Th, Bate *et al.* (1958); U, Hamaguchi *et al.* (1957).



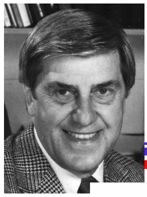
The Quest for (Super) Heavy Elements



Seaborg & Loveland, "The Search for New Elements," in *The New Chemistry* (N. Hall, Edt.) Cambridge U Press, Cambridge 2000



December 1952: Event Mike → LBL & ANL analyzed debris → Z=99,100
Reported 25 years later



Nucleogenesis by Multiple n Capture

PR 93, 1433 (1954)

Plutonium-244 from Pile-Irradiated Plutonium

M. H. STUDIER, P. R. FIELDS, P. H. SELLERS, A. M. FRIEDMAN, C. M. STEVENS, J. F. MECH, H. DIAMOND, J. SEDLET, AND J. R. HUIZENGA
Argonne National Laboratory, Lemont, Illinois
(Received February 1, 1954)

THE high neutron flux of the Materials Testing Reactor (MTR) enhances by manyfold the possibility of multiple-order neutron-capture reactions. For plutonium-239 irradiations, Studier and M
expected yields
grated flux. In
several plutoni
for progressive
having an integ
mental assemb
elsewhere.[2]

The chemica
tonium from t
fission product
multivalency o
then further p

The plutoni
trometer using
agreed very w
which they us
values used by Studier and Manning. In addition to the plutonium isotopes 239, 240, 241, 242, previously produced and identified in pile irradiations, this plutonium sample also contained Pu^{244}.[4] The Pu^{244}/Pu^{242} mole ratio was 0.0036 percent. Plutonium-244 is produced from Pu^{239} in the pile by the reactions shown in Fig. 1. The solid arrows represent the predominant reactions causing the production of the higher masses in the MTR. The dashed arrows indicate reaction paths of secondary importance. Plutonium-244 is formed by $Pu^{243}(n,\gamma)Pu^{244}$ reaction and possibly by electron capture of Am^{244}.

On the basis of a predicted alpha disintegration energy of 4.7 Mev for Pu^{244}, a closed cycle shows Pu^{244} to be approximately 1.3 Mev heavier than Cm^{244}. If the β^- energy of Am^{244} is greater than 1.3 Mev, it will be electron-capture unstable. If the β^- energy of Am^{244} is less than 1.3 Mev, Pu^{244} will be β^- unstable. In any case arguments from heavy element systematics indicate that the energies will be small (i.e., either the β^- energy of Pu^{244} or the electron-capture energy of Am^{244}). Other experiments have shown the β^-
f-
o-
a-
.[6]
24,
ne
s.
m
p-
a
re
n-
ne
he
ne

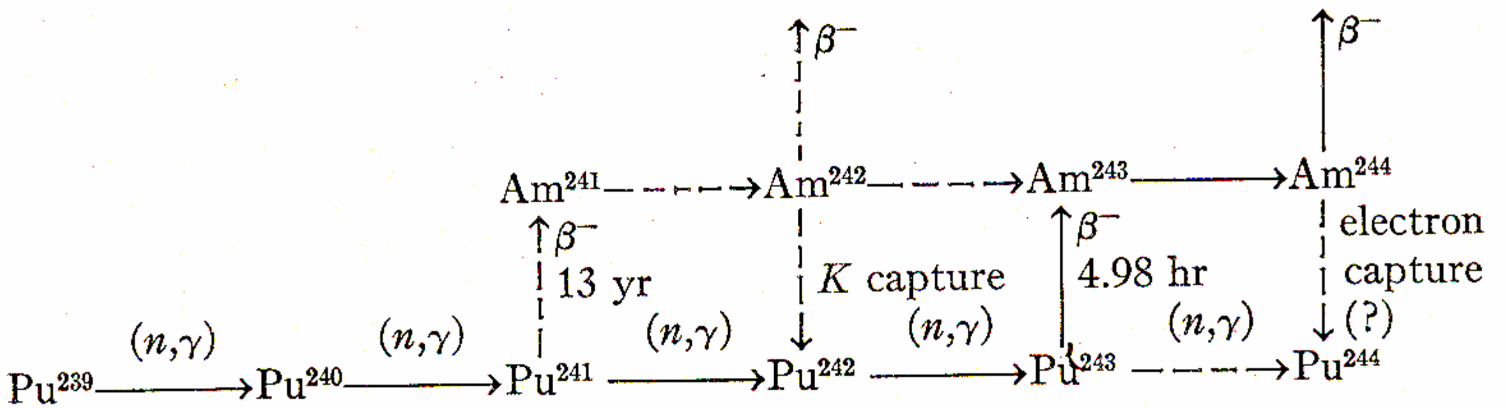
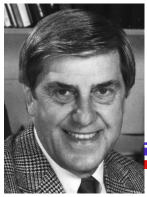


FIG. 1. Reactions in pile-irradiated Pu^{239}.

The technical assistance of C. H. Youngquist in the engineering aspects of these experiments is gratefully acknowledged. We also wish to thank W. M. Manning for many stimulating discussions.

[1] M. H. Studier and W. M. Manning (unpublished).
[2] A. B. Shuck (unpublished).
[3] P. R. Fields and M. A. Weiss (unpublished).
[4] This isotope was previously discovered by Hess, Fried, Pyle, and Inghram (unpublished).
[5] Fried, Pyle, and Fields (private communication).
[6] Pyle, Fields, and Huizenga (unpublished).
[7] Street, Ghiorso, and Seaborg, Phys. Rev. **79**, 530 (1950).



Discovery of Elements 99 and 100

January 23, 1978: 25th anniversary of the discovery

1 H																	2 He
3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne
11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
55 Cs	56 Ba	*	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
87 Fr	88 Ra	**	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Uub	113 Uut	114 Uuq	115 Uup	116 Uuh	117 Uus	118 Uuo

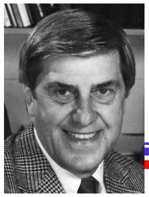
* Lanthanides	57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu
** Actinides	89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr

einsteinium – **fermium** – mendelevium
Er
Fm
Image:-TableImage.png
Full table

Known properties	
Name, Symbol, Number	Fermium, Fm, 100
Chemical series	Actinides
Period, Block	7, f
Appearance	unknown; probably metallic, silvery white or gray
Atomic weight	[257] amu
Electron configuration	$[Rn]5f^{12}\ 7s^2$
e^-'s per energy level	2, 8, 18, 32, 30, 8, 2
State of matter	Presumably a solid

Most stable isotopes

iso	NA	half-life	DM	DE MeV	DP
^{252}Fm	{syn.}	25.39 h	SF α	7.153	^{248}Cf
^{253}Fm	{syn.}	3 d	ε α	0.333 7.197	^{253}Es ^{249}Cf
^{255}Fm	{syn.}	20.07 h	SF α	7.241	^{251}Cf
^{257}Fm	{syn.}	100.5 d	α SF	6.864	^{253}Cf



Particle Transmission Coefficients

Accelerator studies in the 1960s

Thorough analysis.
"Bestseller" - still used today in statistical model codes.

2.E

Nuclear Physics **29** (1962) 462—473; © *North-Holland Publishing Co., Amsterdam*

THEORETICAL REACTION CROSS SECTIONS FOR ALPHA PARTICLES WITH AN OPTICAL MODEL

J. R. HUIZENGA
Argonne National Laboratory, Argonne, Illinois
and
G. IGO
Lawrence Radiation Laboratory, Berkeley, California †

Received 23 May 1961

Abstract: The transmission coefficients T_l and total reaction cross sections σ_R for alpha particles in the energy range 0-46 MeV interacting with 20 target nuclei with atomic numbers ranging from 10 to 92 are calculated with an optical model program in which a previously determined complex nuclear potential is utilized. The dependence of the T_l values and hence σ_R on the Woods-Saxon parameters is investigated as a function of projectile energy. The optical model reaction cross sections are compared to those derived from (1) a square well potential and (2) a model which approximates the real optical model potential barrier by a parabola and makes use of the Hill-Wheeler penetration formula for a parabolic potential.

Used different simple functions for the real part of optical potential for medium-weight to heavy target nuclei.

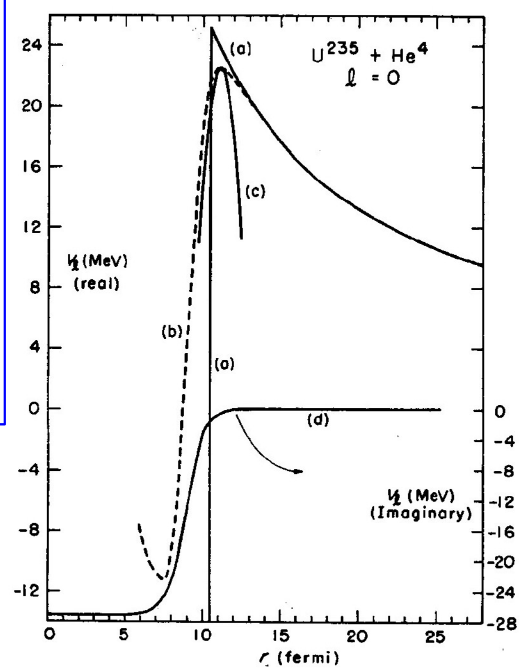


Fig. 1. Potential barriers for the reaction $_{92}U^{235}+{_2}He^4$ for angular momentum $l = 0$. (a) Square well potential for radius equal to $(1.50A^{\frac{1}{3}}+1.21)$ fm and a constant nuclear potential of $V = -50$ MeV for $r < R$ and $V = 0$ for $r > R$. (b) Optical model potential (real part) given by eq. (2) with a nuclear potential given by expression (8). (c) Parabolic approximation of the real part of the optical model potential (see eqs. (5), (6), and (7)). (d) Imaginary part of the optical model potential which is given by expression (9).

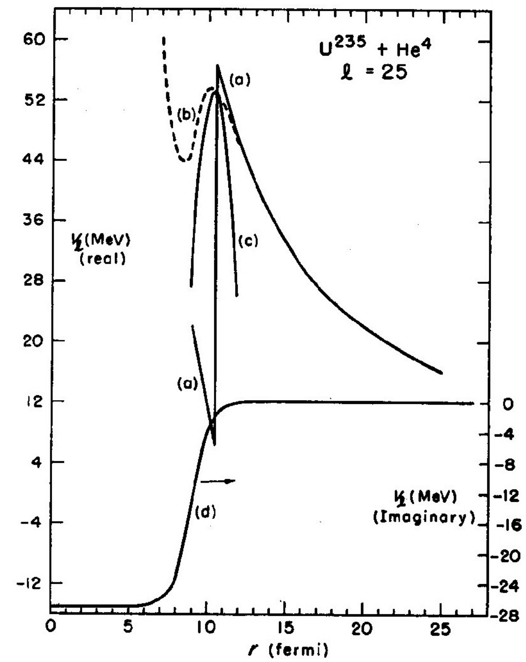
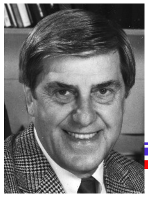
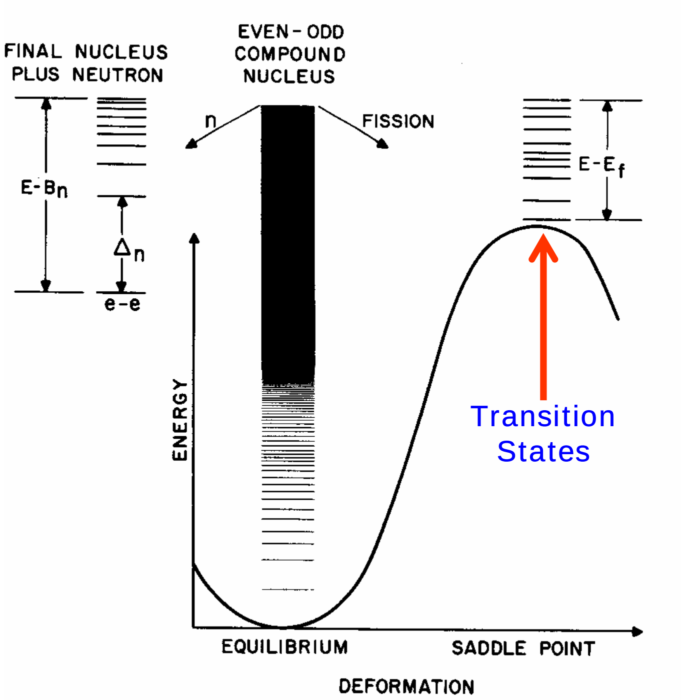


Fig. 2. Potential barriers for the reaction $_{92}U^{235}+{_2}He^4$ for angular momentum $l = 25$. See caption of fig. 1 for description.



Nuclear Fission

. Competition between Fission and Neutron Emission



Neutron evaporation / fission branching

$$\frac{\Gamma_n(A)}{\Gamma_f(A)} \approx \frac{2A^{2/3}}{K_0} T \cdot e^{\frac{E_f(A)-B_n(A)}{T}}$$

B. Theoretical Expectations for Γ_n/Γ_f

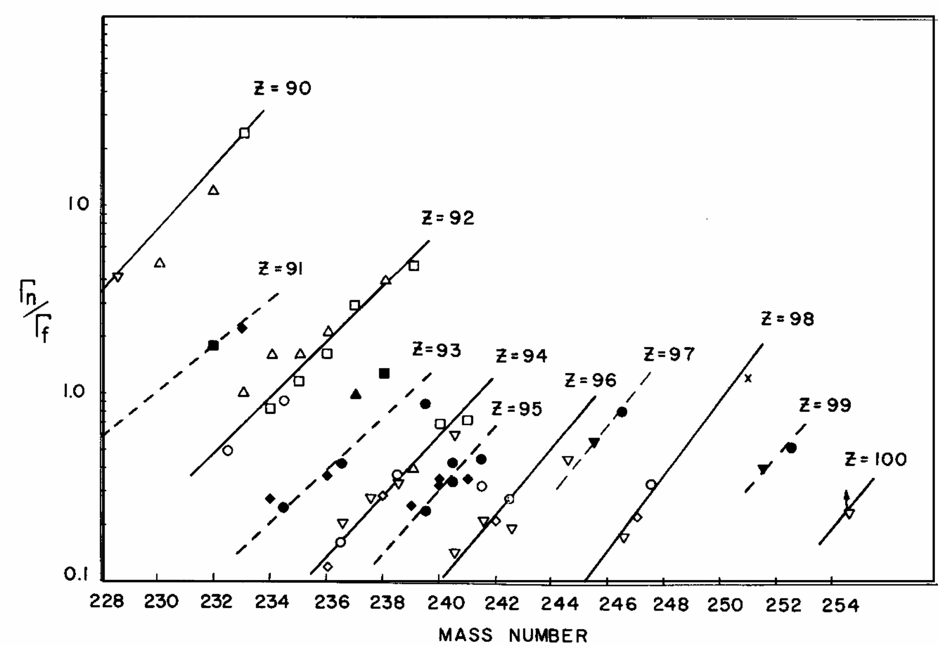
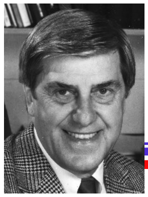


Fig. VII-3. Neutron emission to fission width ratios are plotted as a function of ma

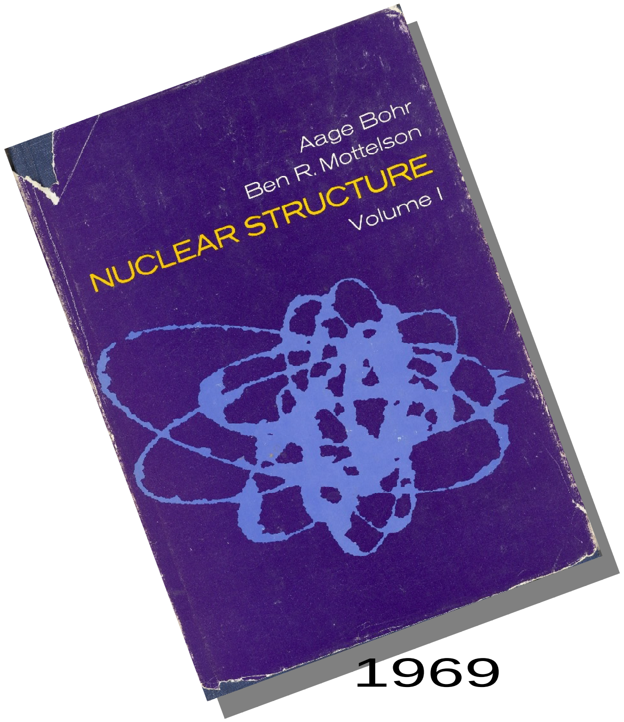
For heavy nuclei $A \geq A_0$

$$\boxed{B_n(A) \approx B(A_0)\cdot\left(1 - A/A_0\right)}$$

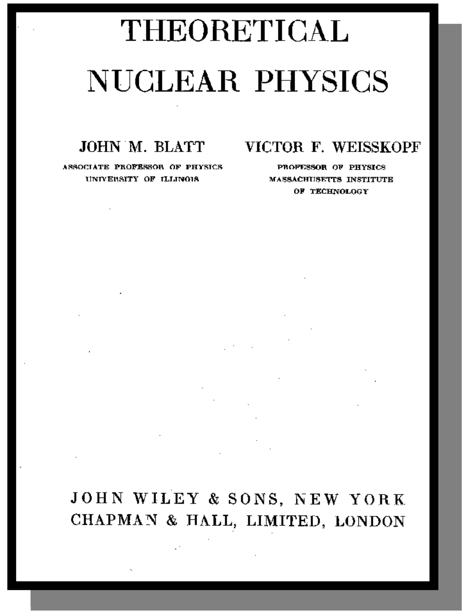
Fission barrier $E_f \approx const.$



Classic Works in Nuclear Science



1969



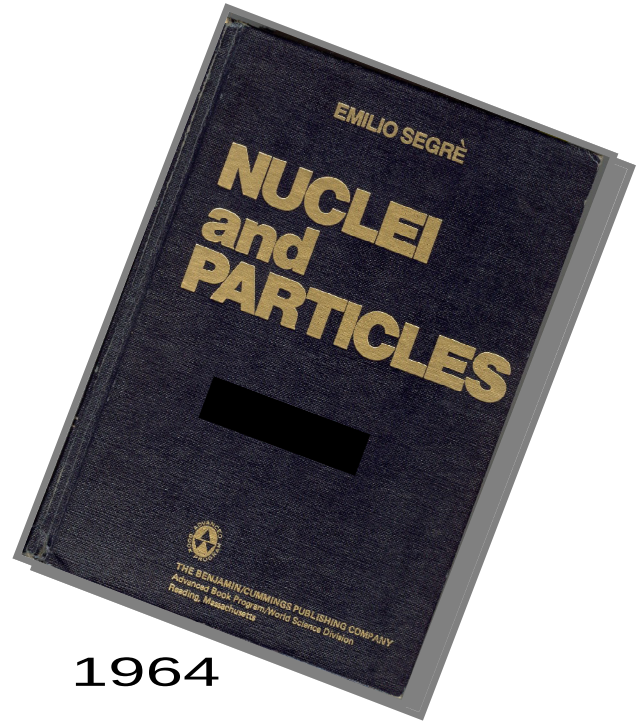
THEORETICAL
NUCLEAR PHYSICS

JOHN M. BLATT
ASSOCIATE PROFESSOR OF PHYSICS
UNIVERSITY OF ILLINOIS

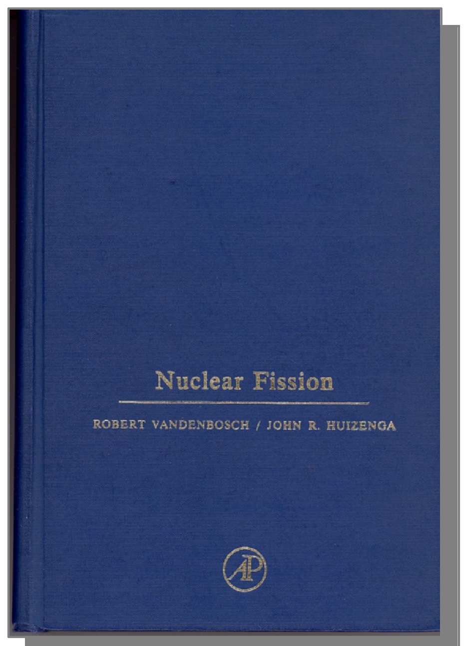
VICTOR F. WEISSKOPF
PROFESSOR OF PHYSICS
MASSACHUSETTS INSTITUTE
OF TECHNOLOGY

JOHN WILEY & SONS, NEW YORK
CHAPMAN & HALL, LIMITED, LONDON

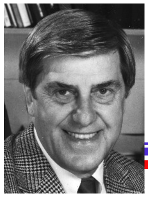
1954



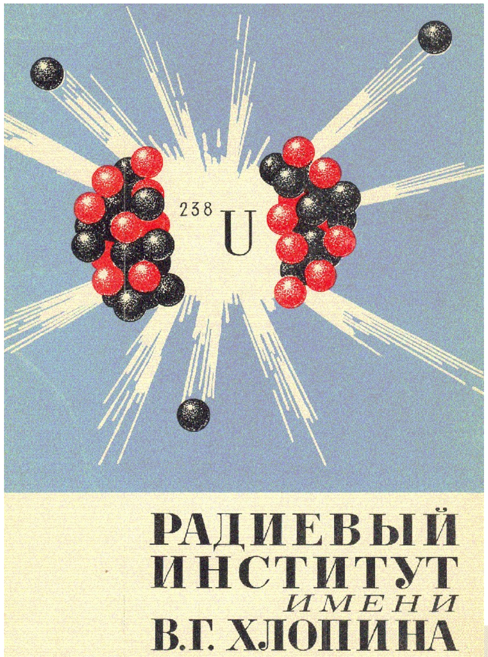
1964



1974

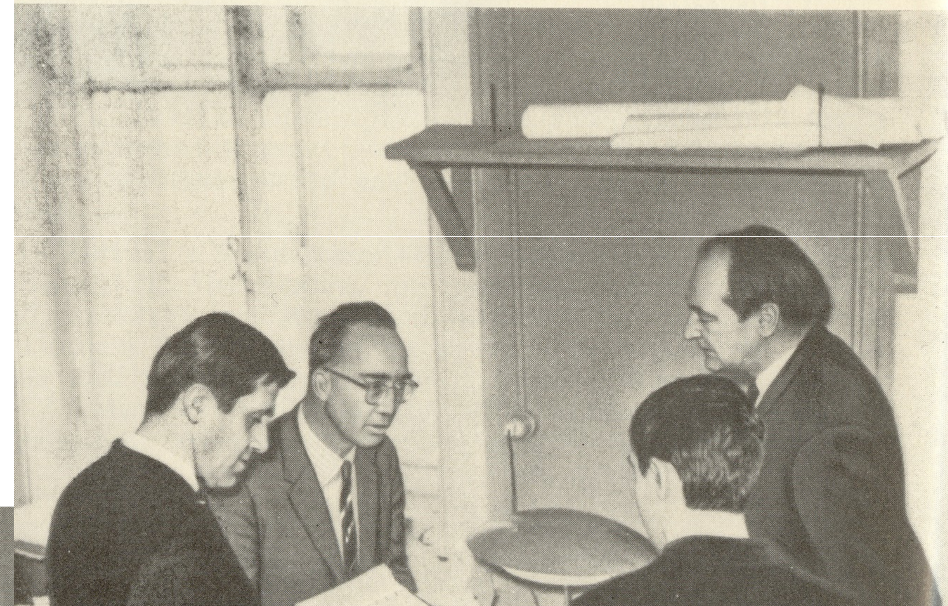


“Scientific Ambassador” During Cold-War Era



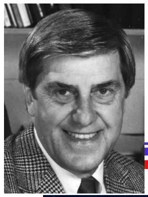
Khlopin
Radium Institute
St. Petersburg

Американские физики доктор Д. Р. Хойзинга (*слева*) и
доктор П. Даймонд в лаборатории члена-корреспондент
АН СССР Б. С. Джелепова (*справа*), 1966 г



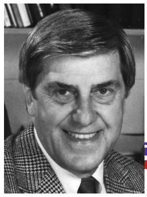
Визит доктора Д. Р. Хойзинга
в Радиевый институт в 1966 г.

Справа налево: доктор Д. Р. Хойзинга, профессор
Н. А. Перфилов, доктор О. В. Ложкин.

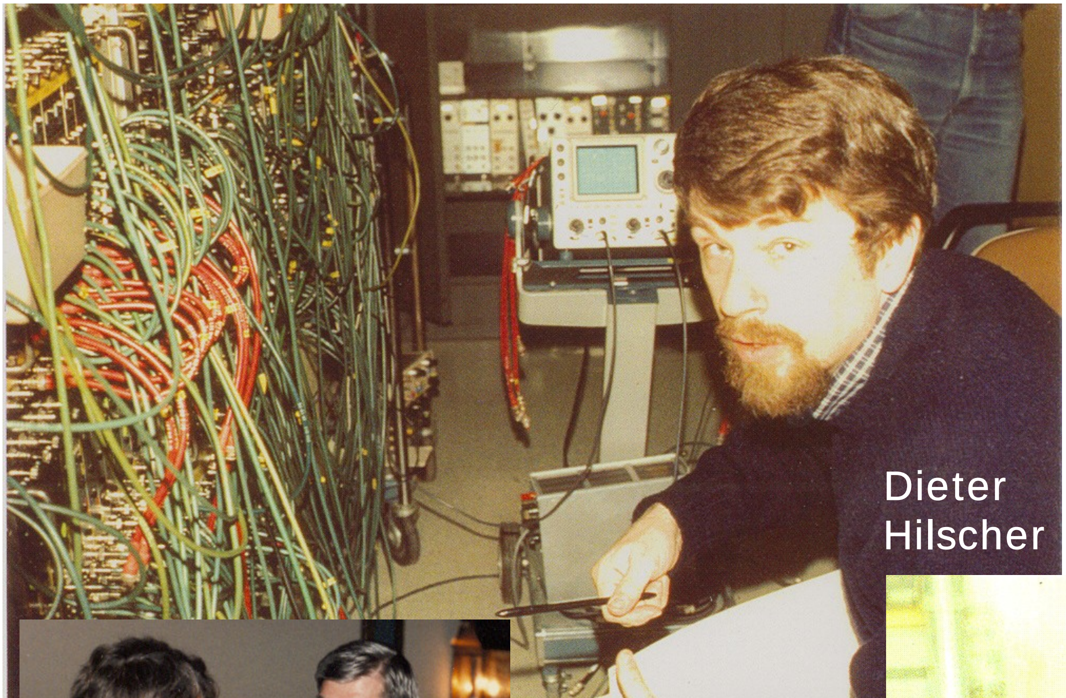


1967 → University of Rochester/NSRL

NSRL Office



Outside Users at National-Laboratories



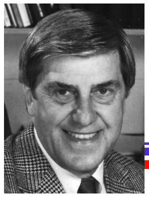
At SuperHILAC
Berkeley

At LAMPF
Los Alamos

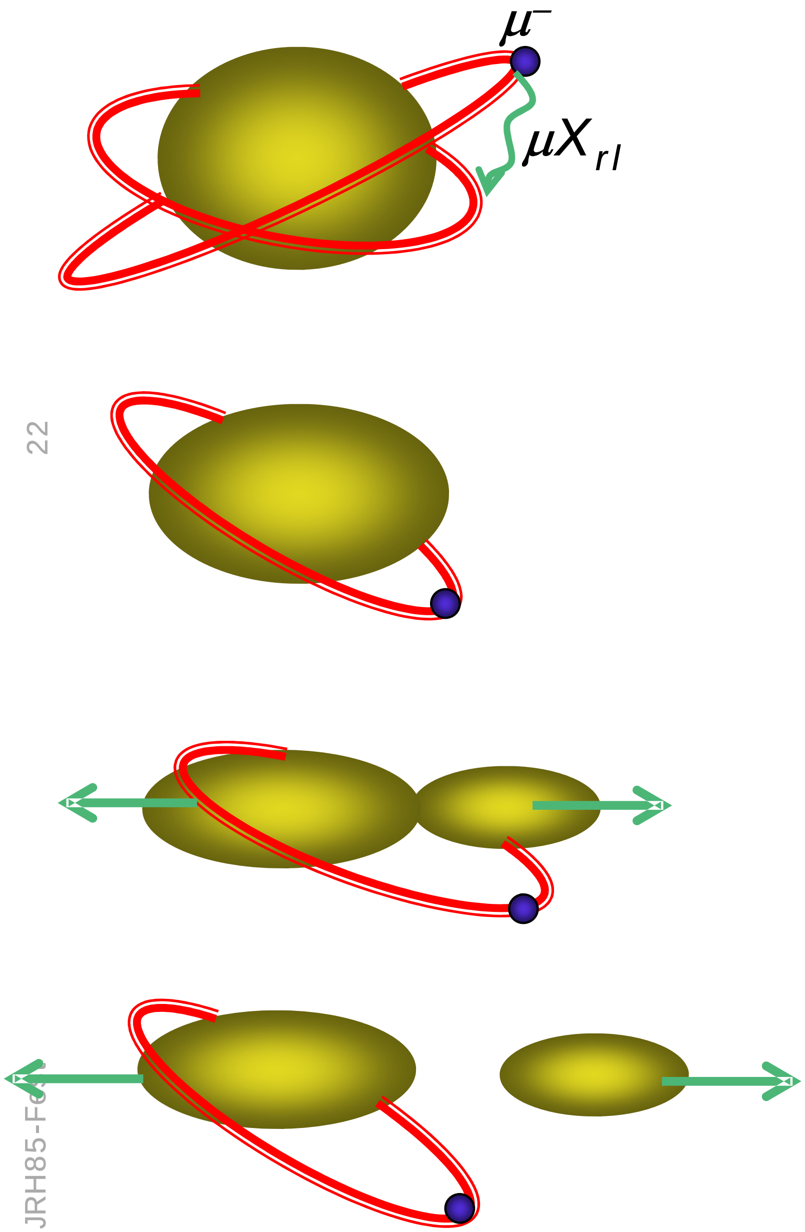
John Browne

Udo Schröder

John with Dieter Hilscher, Berlin 1988



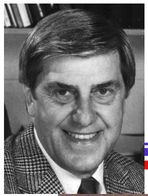
Remarkable results at LAMPF



Prompt, muon-induced fission induced by radiation less transitions →

Observation: Muon is captured by heavy fission fragment
→ adiabatic fission process relative to muonic motion

→ Constraint on nuclear viscosity in fission



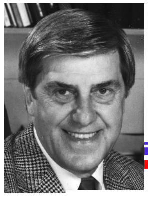
„Nuclear Chemistry Jet Set“ RAM

Tired even before the start of the experiment ...

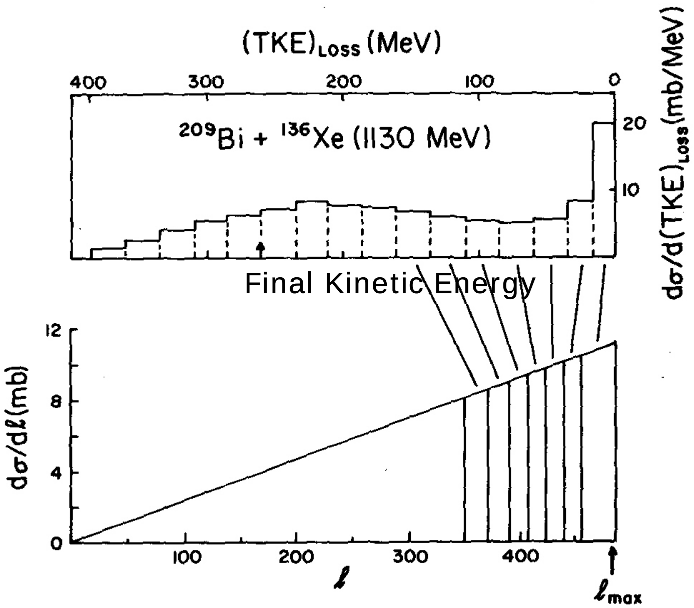
Laura Tubbs, Arden Hoover, Dieter Hilscher, WUS, John Birkelund

Watching the data flow: Vic Viola, Kevin Wolf, Dieter Hilscher, WUS

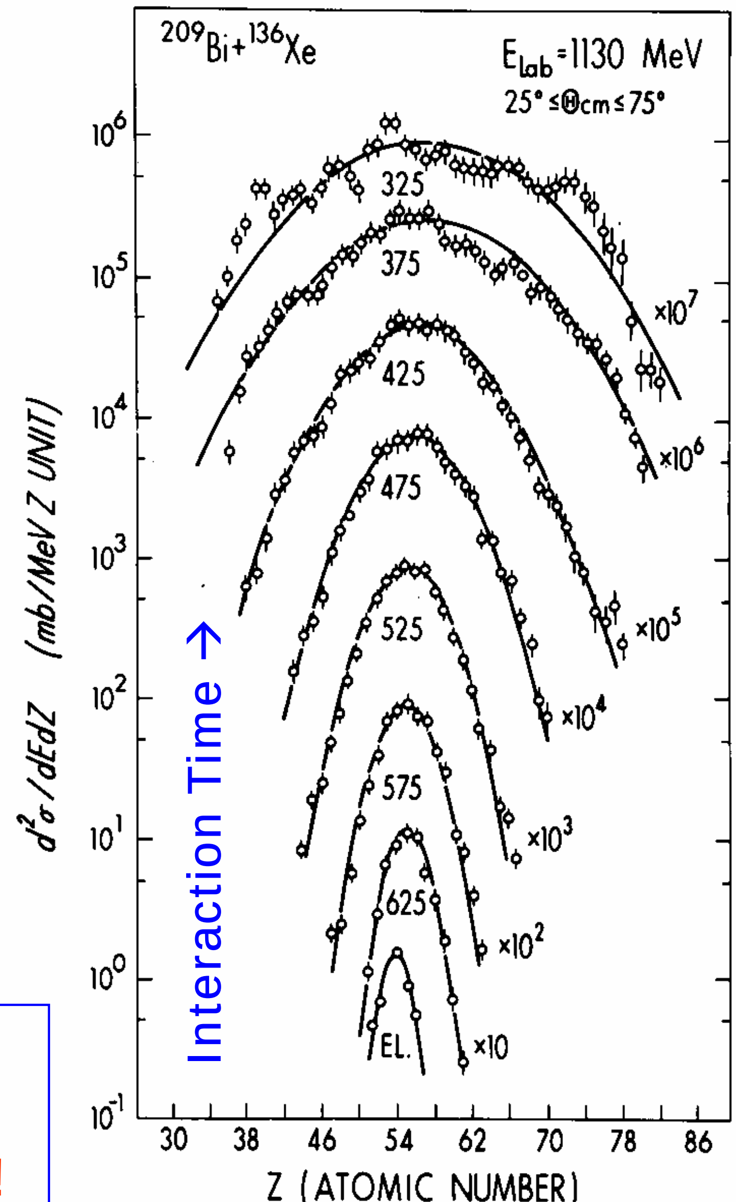
(Photos: Winfried Wilcke)

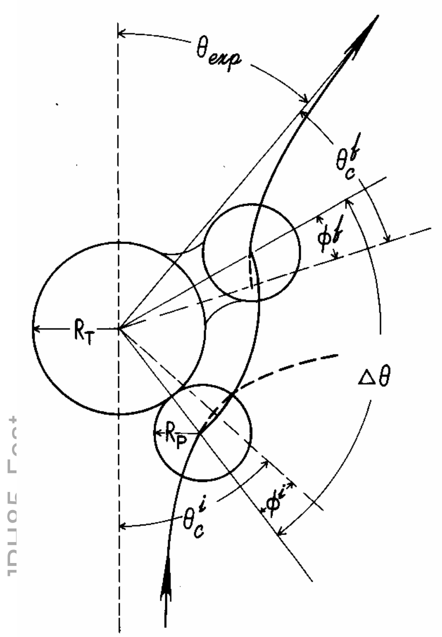


An Elegant Analysis Scheme



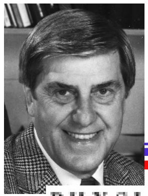
Z(Xe) = 54





Dissipated energy (TKE_{Loss})
→ impact parameter
+ deflection angle
→ interaction time

Multi-nucleon exchange between heavy nuclei is similar to a diffusion process !



Remarkable Results from SuperHILAC Work

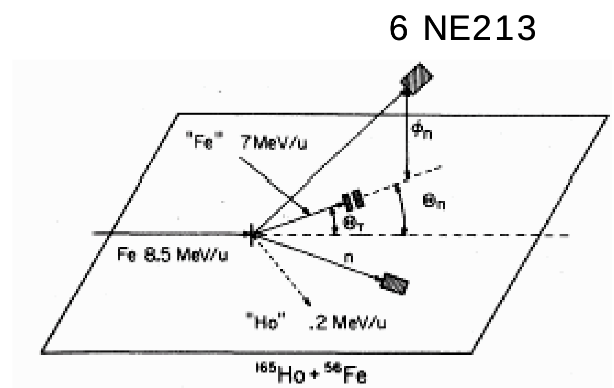
PHYSICAL REVIEW C VOLUME 20, NUMBER 2 AUGUST 1979

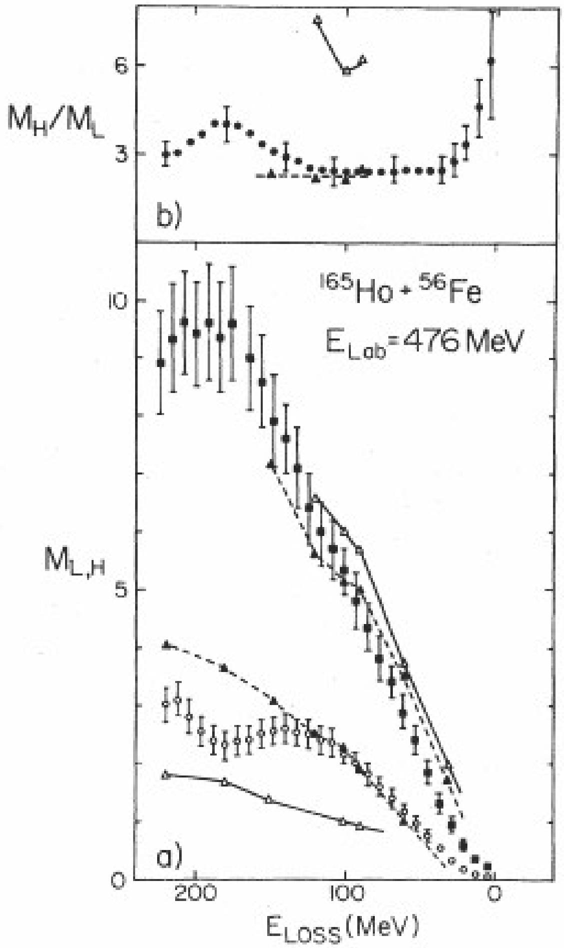
Neutron emission in the reaction $^{165}Ho + ^{56}Fe$ at $E_{lab} = 8.5$ MeV/u

D. Hilscher,* J. R. Birkelund, A. D. Hoover, W. U. Schröder, W. W. Wilcke, and J. R. Huizenga
Departments of Chemistry and Physics, University of Rochester, Rochester, New York 14627

A. C. Mignerey and K. L. Wolf
Argonne National Laboratory, Argonne, Illinois 60439

H. F. Breuer and V. E. Viola, Jr.
Department of Chemistry, University of Maryland, College Park, Maryland 20742
(Received 8 March 1979)

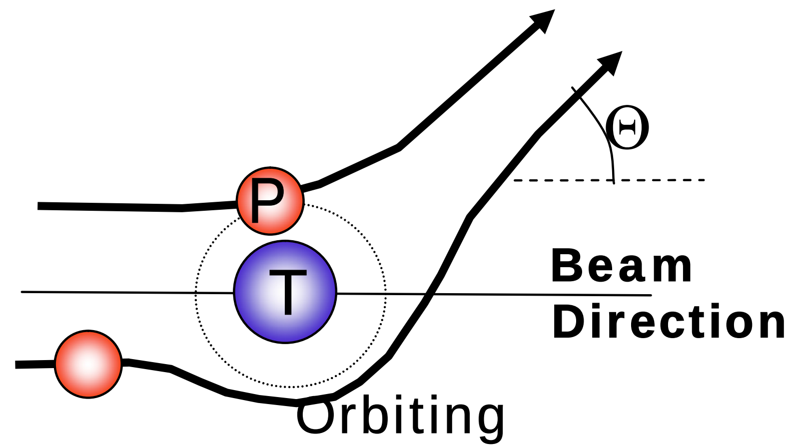




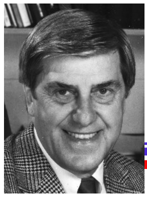
Diffusive Transport

- Energy-partition
- A/Z-relaxation
- (Spin relaxation)

Reaction Dynamic



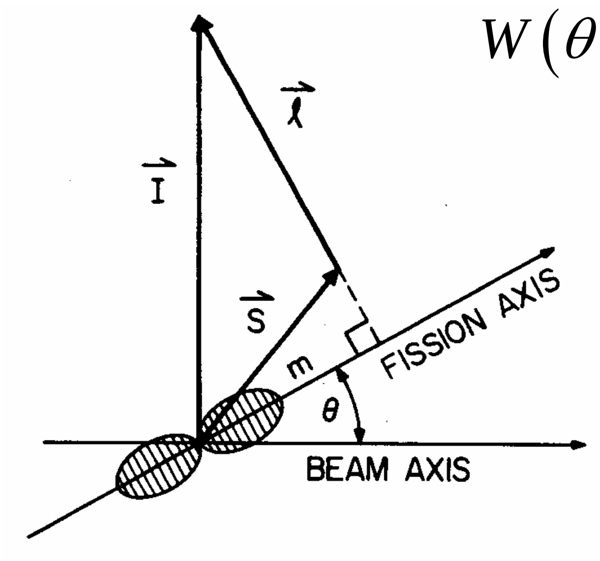
Neutrons carry most of the E* signal → $M_n(E^*)$

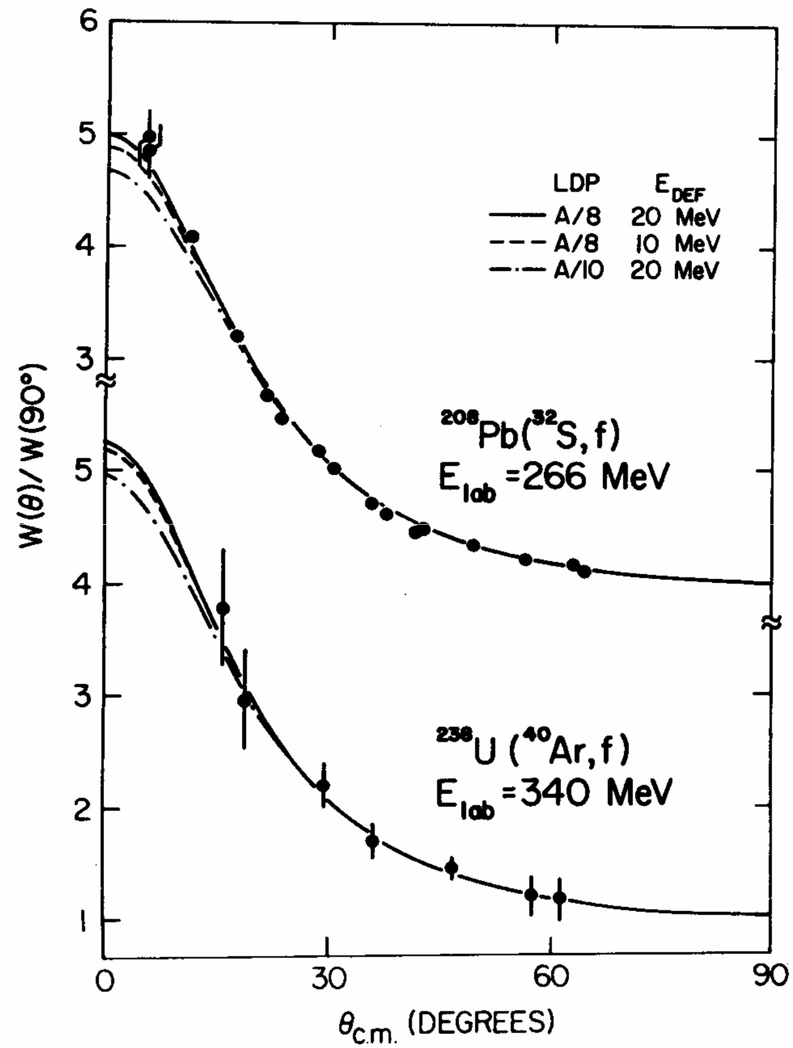


Application: HI Induced Nuclear Fission

Statistical Scission Model

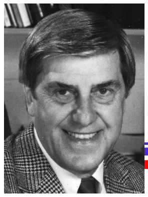
$$W(\theta) \propto \sum_{I_{min}}^{I_{max}} \frac{(2I+1)}{2} T_I \sum_{m=-I}^{m=+I} \frac{2I+1}{\sum_k \exp(-m^2/2S_0^2)} \left| D_{0,m}^{I}(\theta) \right|^2 e^{(-m^2/2S_0^2)}$$





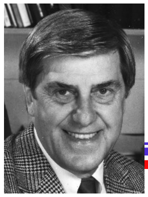
Statistical partition of I into orbital ℓ and channel spin $S_1 + S_2$

$$S_0^2 = 2\frac{\Im_1 + \Im_1}{\hbar^2} T$$

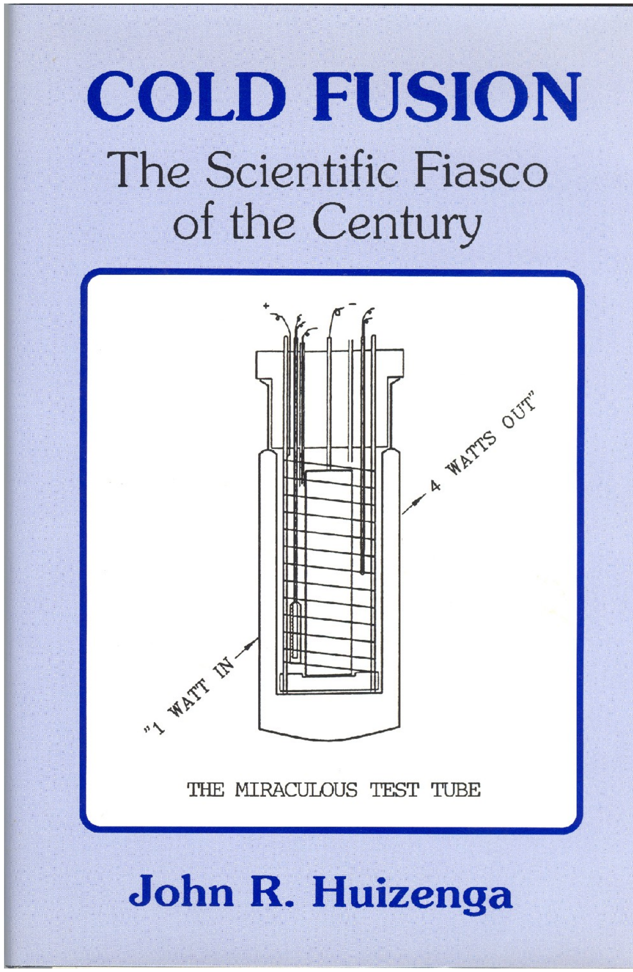


Department Chairmanship 1983-1988

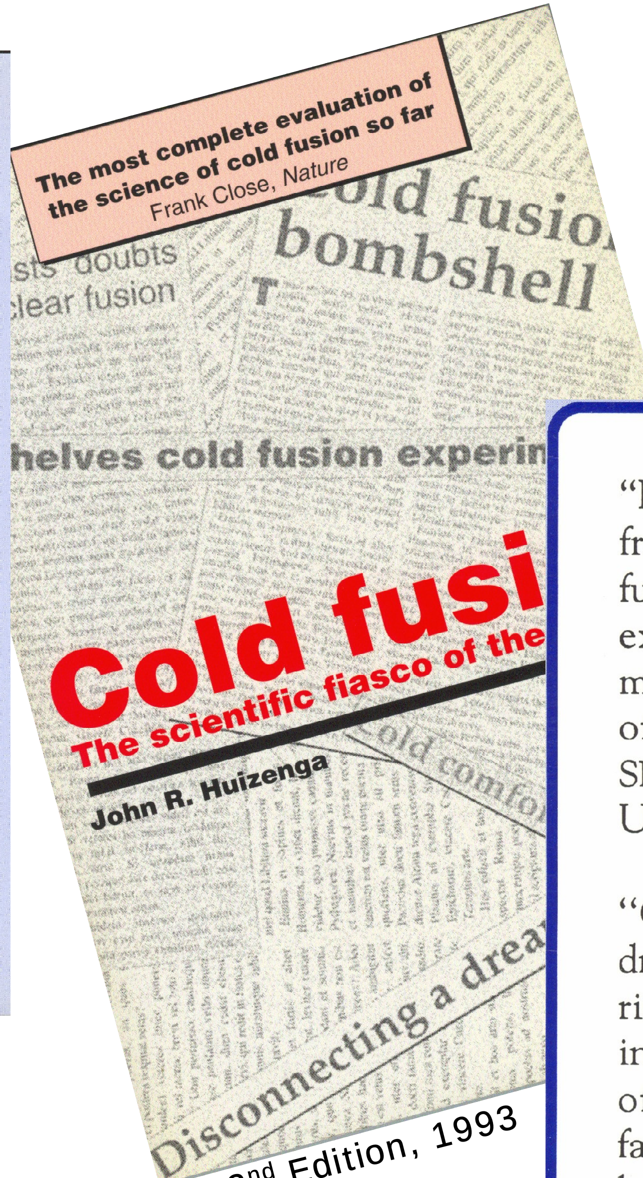
→ R. K. Boeckman for appraisal



Chronicle of the “Cold Fusion” Scientific Fiasco



1st Edition, 1992



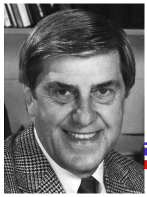
2nd Edition, 1993

23 March 1989 Press Conference in Salt Lake City University of Utah

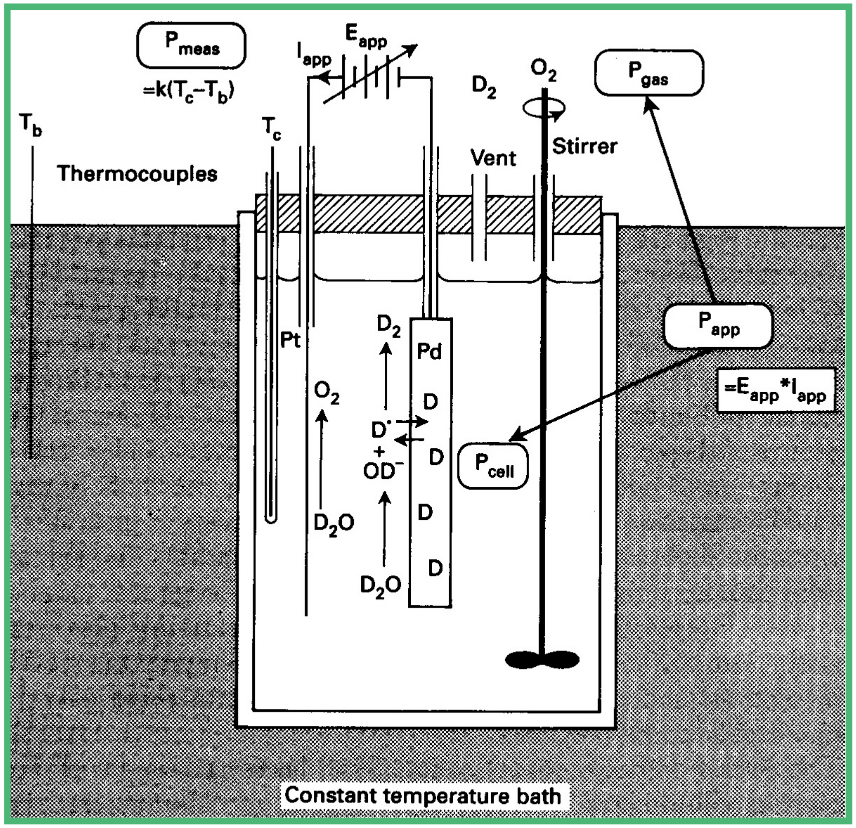
M. Fleischmann & B.S. Pons: Table-top DD Fusion

“Huizenga has written an authoritative, frank, hard-hitting account of the cold fusion fiasco. He compares this with other examples of pathological science and makes suggestions for the proper operation of the scientific process”. GLENN T. SEABORG, Nobel Laureate in Chemistry, University of California at Berkeley.

“Cheap, clean energy is everybody’s dream. John Huizenga tells the story of the rise and decline of cold fusion from the inside, as co-chairman of the Department of Energy panel on cold fusion – a fascinating account…a book to read and keep”. DOUGLAS R.O. MORRISON, particle physicist, CERN, Geneva.



Chronicle of the “Cold Fusion” Scientific Fiasco



Claim: D_2O Electrolysis followed by DD fusion in Pd cathode absorbing D.

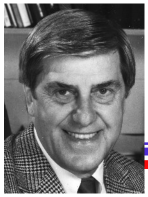
Excess heat through DD fusion.

Potential perils of experiment: extreme radiation levels

The approximate branching ratios for the D+D reaction at low energies are included.

Reaction	Energy Release (MeV)	Reactions sec^{-1} per 1 Watt Output	Branching ratio
(1a) $D + D \rightarrow {}^3He + n$	3.27	1.91×10^{12}	~0.5
(1b) $D + D \rightarrow T + p$	4.03	1.55×10^{12}	~0.5
(1c) $D + D \rightarrow {}^4He$ + gamma	23.85	2.61×10^{11}	$\sim 10^{-7}$
(2) $p + D \rightarrow {}^3He$ + gamma	5.49	1.14×10^{12}	
(3) $p + T \rightarrow {}^4He$ + gamma	19.81	3.15×10^{11}	
(4) $D + T \rightarrow {}^4He + n$	17.59	3.55×10^{11}	

Theoretical estimate (Koonin et al.): $\sigma \sim 10^{-64}$



John Huizenga as a Mentor of Students

Student Name	Thesis Title
Atcher, Robert Whitehill.	New radionuclide generator systems for use in nuclear medicine / by Robert Whitehill Atcher.
Boyno, John Stephen, 1946-	Levels of Tb excited in helium induced single proton transfer reactions.
Butler, Michael Alan, 1957-	Study of reaction processes with characteristics intermediate between damped and fusion processes
Chan, Woon-chun, 1944-	Significance of shell corrections in the parameterization of numerical state density calculations.
De Souza, Romualdo T., 1963-	Role of the potential energy surface in the evolution of mass and charge asymmetry in storngly damped heavy-ion reactions
Hensley, Walter King, 1945-	Effect of pressure on the radioactive decay rate of Be
Hoover, Arden Diane, 1954-	Mass exchange and energy dissipation in the reaction 165Ho+56Fe at 8.5 MeV per nucleon
Kildir, Mehmet, 1947-	Isospin dependence of the nuclear level width from cross section fluctuations
Kosky, John Peter, 1947-	Energy loss and fragment Z dependence of alpha particle emission in both the damped and fusion reactions between iron and holmium
Rizzo, Gary Trott, 1946-	Fragment angular distributions for dipole photofission of U, U and Np. Lithium ion induced fission of Th and U
Tubbs, Laura Ellen, 1954-	Classical trajectory model of heavy ion fusion and an experimental study of momentum transfer in fission reactions of 292 MeV Ne on Ho, Ta, Au, Bi, and U
Vaz, Louis Cajetan, 1937-	Effect of isospin on compound nucleus decay and a study of statistical properties of nuclei.
Waldman, David Lee, 1959-	Tc-99m radioaerosol clearance as an index of pulmonary epithelial permeability / by David Lee Waldman
Johnson, M. William, 1952	Fission and Neutron-Emission Phenomena in Actinide Muonic Atoms

Greetings from Former Students

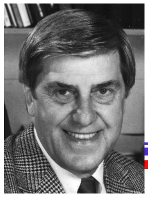
To Dr John Huizenga

You gave me the opportunity no one else would take a chance on. You went out of your way to help a student way out of your field. No one else would have that compassion for education. I will never forget how many doors you opened for me. And look, it all worked out ok. Highlight of my education was scoring 100% on the nuclear chemistry final.

I am sorry I missed this great day.

HAPPY BIRTHDAY

David L Waldman MD,PhD
Professor and Chair
Department of Imaging Sciences
University of Rochester Medical Center

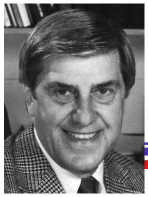


Greetings from Former Associates

Thomas Elze

Dear John,
Due to health problems, I find myself unable to attend your birthday celebration….
I came to Rochester 39 years ago in the fall of 1967. The first tour I took through the lab was truly impressing. I found the research area filled with state-of-the-art equipment, the Emperor-accelerator, the Enge spectrograph, to name just two major components. In addition, there was a library containing almost everything needed for nuclear research. There was ample office and laboratory space. In my recollection, the lab ranged among the top university-based laboratories in the U.S., if not in the world. There were numerous research groups engaged in various aspects of nuclear research, nuclear structure as well as nuclear reaction mechanisms. In addition, the development of new detector systems and the application of computers for data acquisition and analysis were the subject of ongoing and successful research.

John - I wish to thank you again for inviting me to join your research group at the NSRL 39 years ago and participate in the fascinating research going on at that time. For the coming years I send you my best wishes. I trust, you and all those attending the celebration will have a nice and long remembered meeting in Rochester.
Thank you.
Tom



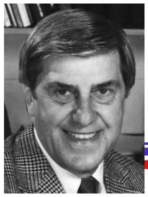
Messages from Colleagues

Luciano Moretto

Dear John:

I am sure that, in terms of praises, you must be close to saturation by now. So, let me temper the atmosphere with a few words of reproach.

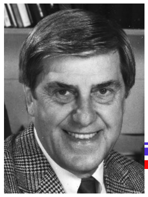
While you were with us we looked up to you for example, direction and guidance. Now, without you, we are like sheep without shepherd (Somebody might correct that as shepherds without sheep, given the shortness of graduate students). You kept us with your steady hand, to the straight and narrow of Nuclear Science. Now we are led astray by the physicists with phase transitions, negative heat capacities, bimodalities etc., all things that a good chemist of the old school with his thermodynamical good sense would have stayed away from like the devil from holy water. I myself, I must confess, have been tempted by that, and I have even done the unthinkable of trying my hand with quark gluon plasma, for which I now stand aside red faced.



Joe Natowitz

Hi John

Congratulations on 85 years! What a milestone.
I really regret not being there personally to help you celebrate. You have been an inspiration to me since the early sixties when I was a graduate student and then post-doc. I have always admired your work. I have also always appreciated your enthusiasm and your intellectual honesty and tried to incorporate as much of that as possible into my own work. Looking for pictures of us together I found this one from the Fall Creek Falls meeting in 1977. Unfortunately it confirms my fears- I have aged while you continue to remain young.
Best wishes for the next 85.

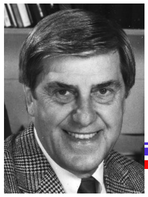


Dear John,

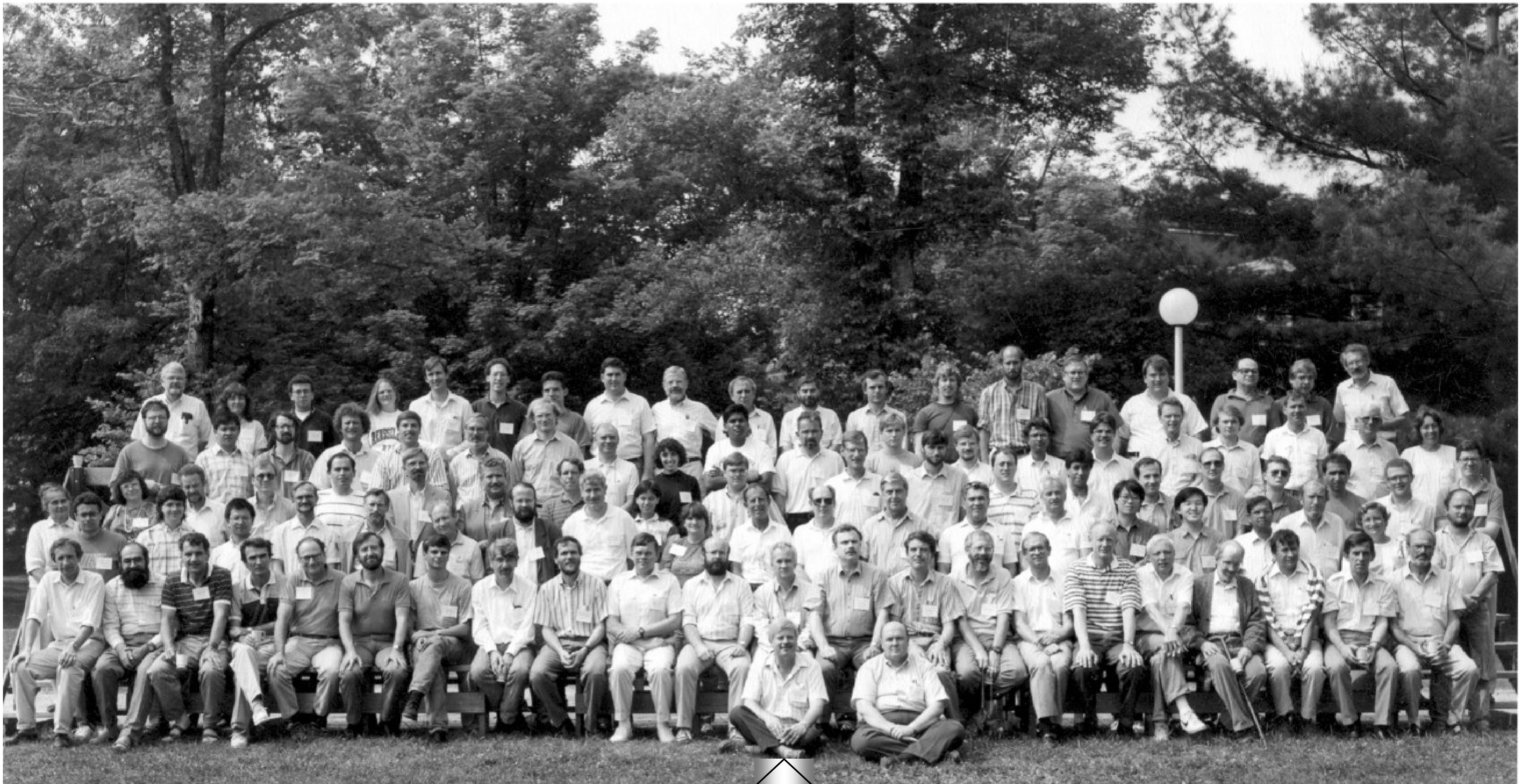
Sorry that I am unable to join you for this celebration. We are in the midst of moving (part-time) to Arizona.

Sue and I have nearly completed a book on the science and politics of nuclear waste disposal. In the course of trying to find a publisher I have come to realize I owe you a large debt of gratitude for doing all the leg work in getting our book on Nuclear Fission published. In spite of the hassles Sue and I have found researching the nuclear waste issue very interesting. Now we are learning how to walk away from the computer to enjoy the sunshine. I hope you can continue to do this in North Carolina.

Sincerely,
Bob V.



Thank You, John, from me and many others !



Yours Truly