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Budinger Bio

# BIOGRAPHICAL SKETCH

*(Give the following information for all professional personnel listed on page 3, beginning with the Principal Investigator. Use continuation pages and follow the same general format for each person.)*

| NAME | TITLE | BIRTHDATE (Mo., Day, Yr.) |
|---|---|---|
| Thomas F. Budinger | M.D., and Henry Miller Professor of Research Medicine | |
| **PLACE OF BIRTH (City, State, Country)** | **PRESENT NATIONALITY (If non-U.S. citizen, indicate kind of visa and expiration date)** | **SEX** |
| Evanston, Illinois, U.S.A. | U.S.A. | [X] Male [ ] Female |

EDUCATION (Begin with baccalaureate training and include postdoctoral)

| INSTITUTION AND LOCATION | DEGREE | YEAR CONFERRED | SCIENTIFIC FIELD |
|---|---|---|---|
| Regis College, Denver, Colorado | B.S. | 1954 | Chemistry (Analytical |
| University of Washington, Seattle | M.S. | 1957 | Physical Oceanography |
| University of Colorado, Denver | M.D. | 1964 | Medicine |
| University of California, Berkeley | Ph.D. | 1971 | Medical Physics |

HONORS
Magna cum laude, 1954
Top Man Awards (USCG Academy, OCS), 1957
Gold-Headed Cane (Top Man in Medicine), University of Colorado, 1964
Alpha Omega Alpha (Medical Honor Society) 1964

| MAJOR RESEARCH INTEREST | ROLE IN PROPOSED PROJECT |
|---|---|
| Medical Physics Research | Principal Investigator<br>Project 1 Leader |

RESEARCH SUPPORT (See instructions)

D.O.E. Contract No. W-7405-eng-48: "Experimental Medicine Clinical Diagnostics"; $217,800 (Labor, supplies, travel, and other support) -- 53%, Prin. Invest.
NCI Contract No. CB 50304: "Algorithm For Computerized Transaxial Nuclide Reconstruction" $64,731 (Supplies, travel, and other support) -- 10% (no $) (7/1/78-6/30/79)no cost ti extension, Prin. Invest.
IH Grant No. CA 17566-03: "Positron Emission Camera For Transverse Section Tomography"; $77,095, (Supplies and other support) -- 10% (no $) (7/1/78-6/30/79)no cost time ext'n.
NIH Grant No. HL 21697-01: $103,500, (Supplies, travel, and other support)--10% (no $), P
NIH Grant No. T32 HL07367-01: $80,395, (Labor and other support)--10% ($), Prin. Investiga

RESEARCH AND/OR PROFESSIONAL EXPERIENCE (Starting with present position, list training and experience relevant to area of project. List a or most representative publications. Do not exceed 3 pages for each individual.)

| | |
|---|---|
| 1976 - present | Head, Department of Research Medicine, Donner Laboratory and Lawrence Berkeley Laboratory |
| 1976 - present | Henry Miller Professor of Medical Research, Donner Laboratory, University of California at Berkeley |
| 1976 - present | Professor of Bioinstrumentation, Department of Electrical Engineering and Computer Sciences, University of California at Berkeley |
| 1968 - 1976 | Director, Medical Services, Lawrence Berkeley Laboratory |
| 1968 - present | Research Physician, Donner Laboratory |
| 1973 - present | Advisory Executive Committee, Donner Laboratory |
| 1973 - 1975 | Principal Investigator: Liquid Xenon Multiwire Gamma Camera (NIH) |
| 1973 - 1975 | Principal Investigator: Apollo-Soyuz Light Flash Experiment |
| 1975 - 1978 | Principal Investigator: Positron Emission Camera (NCI) |
| 1975 - 1979 | Principal Investigator: Algorithms for 3D Reconstruction (NCI) |
| February 1974 | Visiting Professor, University of Cincinnati |
| 1966 - 1968 | Physicist, Lawrence Livermore Laboratory |
| 1964 - 1965 | Medical Intern, Peter Bent Brigham Hospital, Boston |
| 1960 - 1964 | Senior Oceanographer, University of Washington |
| 1958 - 1960 | Science Officer (USCG) International Ice Patrol |
| 1957 | Oceanographic and Meteorology Officer (USCG) |
| 1954 | Analytical Chemist, Industrial Laboratories, Denver |
| 1971 | Ph.D Thesis: Transfer Function Theory and Image Evaluation in Biology |

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T.F. Budinger

Early Work in Geophysics

1. Gould, H.R. and T.F. Budinger, Control of sedimentation and bottom configuration by convection currents, Lake Washington, Washington. J. Marine Res. 17, 183-198, 1958.
2. Budinger, T.F., Cobb Seamount. Deep Sea Res. 14, 191-201, 1967.
3. Budinger, T.F., Icebergs and Pack Ice. In Encyclopaedia Britannica, Vol. 9, pp. 154-161, 1974.

Medicine and Biophysics - Selected Publications

1. Budinger, T.F. and R.J. Howerton, Characterization of the time variations of reproductive processes in biologic cells. Nature 214, 397, 1967.
2. Yano, Y., D. Van Dyke, T.F. Budinger, H.O. Anger and P. Chu, Myocardial uptake studies with $^{129}$Cs and the scintillation camera. J. Nucl. Med. 11, 663-668, 1970.
3. Budinger, T.F., R.J. Howerton, and E.F. Plechaty, Neutron radiography and dosimetry in humans: theoretical studies. Phys. Med. Biol. 16, 439-450, 1971.
4. Budinger, T.F., H. Bichsel, and C.A. Tobias, Visual phenomena noted by human subjects on exposure to neutrons of energies less than 25 MeV. Science 172, 868, 1971.
5. Budinger, T.F., J.T. Lyman and C.A. Tobias, Visual perception of accelerated nitrogen nuclei interacting with the human retina. Nature 239, 209, 1972.
6. Budinger, T.F., Clinical and research quantitative nuclear medicine system. In Medical Radioisotope Scintigraphy 1972, Vol. 1 (IAEA, Vienna, 1973) pp 501-555.
7. Budinger, T.F. and G.T. Gullberg, Three-dimensional reconstruction in nuclear medicine by iterative least squares and Fourier transform techniques. Lawrence Berkeley Laboratory Report LBL-2146, 1973; also IEEE Trans. Nucl. Sci. NS-21(3), 2-20, 1974.
8. Budinger, T.F., Quantitative nuclear medicine imaging: Application of computers to the gamma camera and whole-body scanner. In Recent Advances in Nuclear Medicine (J.H. Lawrence, ed.) (New York, Grune & Stratton, 1974) Chapter 2, pp 41-130.
9. Budinger, T.F., Computer assisted imaging procedures and techniques in nuclear medicine. In Nuclear Medicine in Clinical Pediatrics (H. Handmaker and J.M. Lowenstein, eds.) (New York, Society of Nuclear Medicine, 1975) pp 243-260.
10. Budinger, T.F., Y Yano, and J. McRae, Rubidium-81 used as a myocardium imaging agent. Gesellschaft für Nuklearmedizin (Stuttgart, F.K. Schattauer-Verlag, 1974) pp 187-192.
11. Mathieu, Lucien and T.F. Budinger, Pinhole digital tomography. First World Congress of Nuclear Medicine, Tokyo, 1974, pp 1264-1266.
12. Budinger, T.F. and J. Harpootlian, Developments in digital computer implementation in nuclear medicine imaging. Computers and Biomedical Research 8, 26, 1975.
13. Budinger, T.F. and B. Macdonald, Reconstruction of the Fresnel coded gamma camera image by digital computer. J. Nucl. Med. 16, 309-313, 1975.
14. Budinger, T.F., Y. Yano, and B. Hoop, Jr., A comparison of $^{82}Rb^{+}$ and $^{13}NH_3$ for myocardial positron scintigraphy. J. Nucl. Med. 16, 429-431, 1975.
15. Budinger, T.F., F.H. DeLand, H.E. Duggan, J.J. Bouz, W.T. McLaughlin, and P.M. Weber, Dynamic time-dependent analysis and static three-dimensional imaging procedures for computer assisted CNS studies. In Past, Present and Future of Brain Imaging Using Noninvasive Techniques (H. DeBlanc and J.A. Sorenson, eds.)(New York, Society of Nuclear Medicine, 1975) pp 45-66.
16. Derenzo, S.E., H. Zaklad, and T.F. Budinger, Analytical study of a high resolution positron ring detector system for transaxial reconstruction tomography. J. Nucl. Med. 16, 1166-1173, 1975.



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Medicine and Biophysics - Selected Publications (cont.)

17. Yano, Y., Chu, P., Budinger, T.F., et al., Rubidium-82 generators for imaging studies. J. Nucl. Med. 18, 46-50, 1977.

18. Budinger, T.F. and G.T. Gullberg, Transverse section reconstruction of gamma-ray emitting radionuclides in patients. In Reconstruction Tomography in Diagnostic Radiology and Nuclear Medicine (University Park Press, 1977) pp 315-342.

19. Derenzo, S.E., T.F. Budinger, J.L. Cahoon, R.H. Huesman, and H.G. Jackson, High resolution computed tomography of positron emitters. IEEE Trans. Nucl. Sci. NS 24(1): 544-558, 1977.

20. Budinger, T.F., S.E. Derenzo, G.T. Gullberg, W.L. Greenberg, and R.H. Huesman, Emission computer assisted tomography with single-photon and positron annihilation photon emitters. J. Computer Assisted Tomography, 1(1): 131-145, 1977.

21. Atkins, H.L., T.F. Budinger, E. Lebowitz, A.N. Ansari, M.W. Green, and R. Fairchild, Thallium-201 for medical use III. Human distribution and physical imaging properties. J. Nucl. Med. 18(2): 133-140, 1977.

22. Budinger, T.F. and F.D. Rollo, Physics and Instrumentation. In Progress in Cardiovascular Diseases Nuclear Medicine (B.L. Holman, ed.), XX(1): 19-53, 1977.

23. Budinger, T.F. and R.M. Glaeser, Measurement of focus and spherical aberration of an electron microscope objective lens. Ultramicroscopy 2, 1977.

24. Budinger, T.F., J.L. Cahoon, S.E. Derenzo, G.T. Gullberg, B.R. Moyer, Y. Yano, Three dimensional imaging of the myocardium with radionuclides. Radiology 125: 433-439, 1977.

25. Budinger, T.F., Digital image processing for medical diagnosis using gamma radionuclides and heavy ions from cyclotrons. In Digital Porcessing of Biomedical Images (ed. K. Preston, Jr. and M. Onoe) Plenum Publishing Company, 1976.

26. Yano, Y., T.F. Budinger, Cyclotron-produced zinc-62: a possible prostate and pancreas scanning agent as a $^{62}Zn$ amino acid chelate. J. Nucl. Med. 18(8): 815-821, 1977.

27. Budinger, T.F., W.L. Greenberg, S.E. Derenzo, G.G. Gullberg, and R.H. Huesman, Quantitative potentials of dynamic emission of computed tomography, J. Nuc. Med. 19: 309-315, 1978.

28. Budinger, T.F., Instrumentation trends in nuclear medicine. In Seminars in Nuclear Medicine, 7: 285-297, October, 1977.

29. Tsui, E. and T.F. Budinger, Transverse section imaging of mean clearance time. Phys. Med. Biol. 23(4): 644-653, 1978.

30. T.F. Budinger, G.T. Gullberg and R.H. Huesman: "Emission Computed Tomography" in Image Reconstruction from Projections: Implementation and Applications, ed. by G. Herman. Springer-Verlag, New York (in press).

31. Thomas Budinger, Priscilla Wong, and Chi-Kwan Yen, "Magnetic Field Effects on Humans: Epidemiological Study Design". LBL Report No. 8319, October 1978.

32. T.F. Budinger,"Physics and Physiology of Nuclear Cardiology", Cardiovascular Clinics, ed. by A.N. Brest. 1978, (in press)

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SECTION II – PRIVILEGED COMMUNICATION

## BIOGRAPHICAL SKETCH

*(Give the following information for all professional personnel listed on page 3, beginning with the Principal Investigator. Use continuation pages and follow the same general format for each person.)*

| NAME | TITLE | BIRTHDATE (Mo., Day, |
|---|---|---|
| Thomas Budinger | Research Physician | |
| PLACE OF BIRTH (City, State, Country) Evanston, Illinois, U.S.A. | PRESENT NATIONALITY (If non-U.S. citizen, indicate kind of visa and expiration date) U.S.A. | SEX ☒ Male ☐ Fe |

EDUCATION (Begin with baccalaureate training and include postdoctoral)

| INSTITUTION AND LOCATION | DEGREE | YEAR CONFERRED | SCIENTIFIC FIELD |
|---|---|---|---|
| Regis College, Denver, Colorado | B.S. | 1954 | Chemistry & Physi |
| University of Washington, Seattle, Wash. | M.S. | 1957 | Oceanography |
| University of Colorado, Denver, Colorado | M.D. | 1964 | Medicine |
| University of California, Berkeley, CA. | Ph.D. | 1971 | Medical Physics |

HONORS

Alpha Omega Alpha
Magna cum laude
Top-man Award, U.S.C.G.
Gold-headed Cane Award
Scholarships (3), University of Colorado School of Medicine

| MAJOR RESEARCH INTEREST | ROLE IN PROPOSED PROJECT |
|---|---|
| Medical Physics & Nuclear Medicine | Clinical Evaluation/Digital Data Manipulat Camera Comparison |

RESEARCH SUPPORT (See instructions)

University of California AEC Contract 48 support for Lawrence Berkeley Laboratory Medical Services.

RESEARCH AND/OR PROFESSIONAL EXPERIENCE (Starting with present position, list training and experience relevant to area of project or most representative publications. Do not exceed 3 pages for each individual.)

Research Physician - Donner Laboratory, University of California

Nuclear Medicine: Clinical studies in myocardial uptake of Cs-129, K-43, Rb-82;
Clinical studies in pancreas imaging using $^{99m}$Tc-sulfur collc and $^{75}$Se-methionine;
Quantitative renography using $^{82}$Rb, $^{99m}$Tc, and other isotopes
Quantitative nuclear medicine computer science studies as coordinator for interfacing whole-body scanner and high spe scintillation camera.

Image theory: Electron microscopy studies of image formation, radiation damage, and mammalia retinae;
Transfer function theory applied to nuclear medicine and microscopy.

Operational Medical Director: 1968 to present.
Radiation protection for employees.
Clinical industrial medicine.

Physicist - Lawrence Livermore Laboratory;

Mathematical physics applied to clinical medical problems.
Computer science techniques of large data array manipulatior

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(Research and/or Professional Experience--continued)

Internal Medicine: Peter Bent Brigham Hospital, Intern 1964-1965.

Senior Oceanographer: University of Washington, 1964-1969. Distribution of Columbia River effluent pertinent to radioactive waste dispersion in the open ocean.

Science Officer: International Ice Patrol--U.S. Coast Guard, 1958-1960. Physical forces accounting for iceberg movement. Radar detection and imaging icebergs from ships and aircraft.

Pertinent Papers in Medicine + Biophysics.

Nuclear Medicine & Imaging

Rapid manipulation and display of counts vs. time curves by hardware and software. 2nd Symposium on Sharing of Computer Programs and Technology in Nuclear Medicine, April 1972. AEC ~~ORNL (to be published)~~. CONF 720730

Myocardial function evaluation by uptake of Cs-129. T. F. Budinger and Y. Yano. J. Nucl. Med., 13, 767, 1972.

High speed data acquisition and processing of scintillation camera output by digital systems. T. F. Budinger, V. P. Elischer and W. D. Hogan. Lawrence Berkeley Laboratory Report LBL-532, 1971.

Limitations in data manipulation and presentation of scintillation camera images. J. Nucl. Med., 13, 418, 1972.

Human tissue trace-element detection by neutron activation without chemical separation. T. F. Budinger, J. R. Farwell, A. R. Smith and H. Bichsel. Int. J. Appl. Radiat. Isotop., 23, 49-56, 1972.

Myocardial uptake studies with $^{129}$Cs and the scintillation camera. Y. Yano, D. Van Dyke, T. F. Budinger, H. O. Anger and P. Chu. J. Nucl. Med., 11, 663, 1970.

Transfer function theory and image evaluation in biology: Applications in electron microscopy and nuclear medicine. (Ph.D. Thesis) Lawrence Berkeley Laboratory Report LBL-565, 1971.

Neutron radiography and dosimetry in humans: Theoretical studies. T. F. Budinger, R. J. Howerton, and E. F. Plechaty. Phys. Med. Biol., 16, 439-450. 1971.

Radiation damage in biological specimens. R. M. Glaeser, T. F. Budinger, P. M. Aebersold and G. Thomas. Proceedings of the International Congress of Electron Microscopy, Grenoble, 1970.

Method for processing of periodic images at reduced levels of electron irradiation. R. M. Glaeser, I. Kuo and T. F. Budinger. 29th Ann. Proc. Electron Microscopy Soc. Amer, Boston, Mass., 1971 (Ed. C. J. Arceneaux).

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Computer-simulated Fourier images in related to biological electron microscopy. R. M. Glaeser and T. F. Budinger. J. Ultrastructure Res., 30, 238, 1970.

Indirect electrical stimulation of the visual apparatus. Lawrence Berkeley Laboratory Report No. UCRL-18347, 1968.

Characterization of the time variations of reproductive processes in biological cells. T. F. Budinger and R. J. Howerton. Nature, 214, 397, 1967.

Visual phenomena noted by human subjects on exposure to neutrons of energies less than 25 MeV. T. F. Budinger, H. Bichsel and C. A. Tobias. Science, 172, 868, 1971.

Observations by human subjects on radiation-induced light flashes in fast-neutron, X-ray, and positive-pion beams. C. A. Tobias, T. F. Budinger, and J. T. Lyman. Nature, 230, 596, 1971.

Selected references from work in geophysics and oceanography

A late tertiary date from the East Pacific Rise. T. F. Budinger and B. J. Enbysk. J. Geophys. Res., 72(8), 227, 1967.

Cobb Seamount. Deep Sea Res., 14, 191-201, 1967.

Description of the Columbia River plume and certain aspects of the mixing of river water in the sea. T. F. Budinger, L. K. Coachman and C. A. Barnes. Trans. Amer. Geophys. U., 44, 208-209, 1963.

Ice detection by radar. Proc. Merchant Marine Council, 17(9), 152-156, 1960.

International ice observation and ice patrol service in the North Atlantic Ocean. T. F. Budinger, R. P. Dinsmore, P. Morrill and F. M. Soule. U. S. Coast Guard Bulletin No. 45, 1-154, 1959.

Iceberg detection by radar. U. S. Coast Guard Bulletin No. 45, 49-97, 1959. Also Contribution No. 1093 Collected Reprints of the Woods Hole Oceanographic Institution.

Control of sedimentation and bottom configuration by convection currents, Lake Washington, Washington. H. R. Gould and T. F. Budinger. J. Marine Res., 17, 183-198, 1958.

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