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OMB CONTROL NO. 1910-1400

(R) 1

U.S DEPARTMENT OF ENERGY
UNIVERSITY RESEARCH INSTRUMENTATION PROGRAM

COVER PAGE
(THIS PAGE MUST BE THE FIRST PAGE OF THE APPLICATION)

712327

REPOSITORY Oak Ridge Operations Records Holding Area
COLLECTION Documents 1944-94

1. Name of Institution: The University of Chicago
2. Address: City Chicago 3. State Illinois 4. ZIP 60637
5. Principal Investigator: Robert N. Beck
6. Department: The Franklin McLean Memorial Research Inst./Dept. of Radiology
7. Telephone: Area Code 312 Office: 962-6271 Home: [redacted]
8. Title of Application: Proposal to Acquire a State-of-the-art Scintillation Camera System
9. Area of Proposed Research (Select ONE) D •

   A. Materials Characterization
   B. Catalysis
   C. Engineering Science
   D. Health & Environmental Effects
   E. Other

10. Research Subcategory (See Section II of DOE/URI FY86 Announcement) In vivo measurement of radiation
11. Total DOE Funding for Research in Selected Area, (During the last two fiscal years): $ 1,204,948
12. Estimated Purchase Price of Equipment: $ 400,967.00
13. Amount Requested from DOE: $ 399,967.00

List all Federal agencies which are currently considering proposals from the institution involving the same or similar equipment.

14. Agency: N/A Agency Proposal Number:
15. Agency: N/A Agency Proposal Number:

NOTE: The institution is responsible for informing DOE if a proposal involving the same or similar equipment is submitted to a federal agency prior to the announcement of DOE's URI awards.

16. List any federal agency which has provided funds to the institution during the past two years for the same or similar equipment.

Agency: N/A Amount of Funds:

17. Please check one of the following:

☒ I authorize outside peer review of this proposal.

☐ I do not authorize outside peer review of this proposal.**

Signature of Principal Investigator: Robert N Beck Date: Dec. 5, 1985

Name and Title of Institutional Official (President or Designee)

Donald S Sigal

Director, Office of Sponsored Programs

Signature: Donald S Sigal
Date: December 5, 1985

Name and Title of Financial Officer

Signature:
Date:

BOX No. B-41-4 Bldg. 3714-H
FOLDER 8602063

• Note - The application will be evaluated by reviewers in this field.
•• Note - May prevent full consideration of this application.

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PROPOSAL TO ACQUIRE A STATE-OF-THE-ART
SCINTILLATION CAMERA SYSTEM

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SUMMARY

Funds are requested to purchase a state-of-the-art scintillation camera system which employs a dedicated Micro VAX computer for multichannel, image-data acquisition, and special digital circuitry for real-time image processing.

The Anger-type scintillation camera, developed originally at Donner Laboratory under AEC support, is the most widely used instrument for imaging *in vivo* distributions of radiotracers in basic biomedical research and in clinical nuclear medicine. The instrument we propose to acquire incorporates certain proprietary features which provide the basis for the next generation of commercial scintillation camera systems, which will permit the implementation of advanced methods for quantitative imaging in the Single Photon Emission Computed Tomography (SPECT) mode. The basic concepts underlying these proprietary features and advanced methods of SPECT imaging have been developed (or are being developed) at this institution under DOE support. Details of these new methods are contained in the renewal application of DE-AC02-82ER60033, entitled "Instrumentation and Quantitative Methods of Evaluation," with Robert Beck as Principal Investigator. The successful implementation of these new methods promises to provide the means for measuring the distribution of radiotracers *in vivo* with accuracy and precision comparable to that obtained with Positron Emission Tomography (PET).

In addition, this instrument is critically needed for radiotracer distribution studies in laboratory animals and human research subjects within our radiopharmaceutical research program. Details of this research are contained in the renewal application of DE-AC02-80EV10359, entitled "Quantitative Studies in Radiopharmaceutical Science," with Malcolm Cooper, M.D., as Principal Investigator.

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Finally, this instrument will be used in the training of graduate students and postdoctoral fellows in our Medical Physics Program under NCI CA-09260 entitled "Post-Graduate Research Training in Medical Physics" with Franca Kuchnir, Ph.D., and Charles Metz, Ph.D., as Co-Principal Investigators. The number of students graduated from the Medical Physics Program is 17; 8 are presently enrolled. The number of postdoctoral fellows who have been trained in this program is 13; 2 are presently being trained.

Immediate applications will include:

a. multichannel, image-data acquisition to implement SPECT imaging with Ga-67;

b. animal distribution studies of long-chain fatty acids labeled with I-123 (by John Gatley, Ph.D., under NHLB Grant #1 RO1-HL36534); and

c. experiments on imaging characteristics of scintillation cameras by graduate students and postdoctoral fellows in medical physics.

An instrument capable of meeting these needs is not presently available at this institution.

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U.S. DEPARTMENT OF ENERGY
UNIVERSITY RESEARCH INSTRUMENTATION PROGRAM

BUDGET PAGE

ESTIMATED COSTS

Instrumentation	Requested of DOE	Institution's Cost Sharing *(1)*	Other Federal Funds *(2)*	TOTAL
A. Purchase Price *(3)*	$399,967.00	0	0	$399,967.00
Subtotal:	$399,967.00	0	0	$399,967.00
B. Other Allowable Costs				
1. Shipping/Handling	XXXXX	$1,000.00		$1,000.00
2. Installation	XXXXX			
3. Building/Laboratory Renovation	XXXXX			
Subtotal:				
C. TOTAL	$399,967.00	$1,000.00 *(4)*		$400,967.00

NOTES:

(1) Non-Federal funds only. (However, may be provided by a third party.)

(2) Estimate funds to be obtained from other Federal agencies for purchasing the instrument, etc.

(3) Only the purchase price of the instrumentation is eligible for DOE funding through this program.

(4) This amount represents allowable cost sharing. (See pages 7 and 8).

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A. Purchase Price (List components and unit prices.)

	Description	Quantity	Total Estimated Unit Price	Total
1.	ZLC 7500S WITH SV-SP, MICRODOT 3/8 INCH CRYSTAL	1	$182,104.00	$182,104.00
2.	PARALLEL HIGH SENSITIVITY INSERT 140KeV	1	4,290.00	4,290.00
3.	PARALLEL LEAP INSERT 140KeV	1	4,290.00	4,290.00
4.	PARALLEL ULTRA HIGH RESOLUTION INSERT 140KeV	1	5,200.00	5,200.00
5.	PARALLEL MEDIUM ENERGY	1	5,200.00	5,200.00
6.	COLLIMATOR CART	1	1,378.00	1,378.00
7.	I.I.T.R.I. INSPECTION	1	2,702.00	2,702.00
8.	SPECT PALLET	1	1,737.00	1,737.00
9.	HEAD HOLDER	1	765.00	765.00
10.	WEIGHTED ACQUISITION ELECTRONICS	1	15,000.00	15,000.00
11.	PROTOTYPE ASTIGAMATIC COLLIMATOR	1	10,000.00	10,000.00
12.	DEC MICRO VAX II	1	33,338.00	33,338.00
13.	HCOM Q BUS FROM SIEMENS	1	23,000.00	23,000.00
14.	SIEMENS MED CL SOFTWARE	1	23,000.00	23,000.00
15.	FORTRAN 77 FOR MAXDELTA 730	1	6,684.00	6,684.00

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A. Purchase Price (List components and unit prices.)

	Description	Quantity	Total Estimated Unit Price	Total
16.	1200/2400 BAUD MODEM	1	1,248.00	1,248.00
17.	PORTABLE TERMINAL STAND	1	995.00	995.00
18.	ECT SOFTWARE, LICENSE AND DOCUMENTATION	1	10,500.00	10,500.00
19.	MICRODELTA+/F-60 COLOR IMAGING TERMINAL	1	68,536.00	68,536.00
	Subtotal:		$399,967.00	$399,967.0

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Grant/Contract/Subcontract No.	Principal Investigator	Title	Contract Dates FM MO	FM YR	TO MO	TO YR	Total Award Value	$ AMT Awarded for FY Period 1983 to 1985	DOE Technical Monitor/Locat.
DE-AC02-82ER60033	Robert N. Beck	Instrumentation and Quantitative Methods of Evaluation	01	82	01	86	2,141,948	1,680,948	Gerald Goldstein, Gaithersburg, MD
DE-AC02-80EV10359	Malcolm Cooper	Quantitative Studies in Radiopharmaceutical Science	01	80	12	85	4,359,749	1,782,817	Donald Cole, Gaithersburg, MD

Only provide information on research projects which are directly related to the selected principal research area.

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RELATED FEDERAL AGENCY GRANTS AND CONTRACTS

Agency	Grant/Contract No.	Title	Grant/Contract Dates FROM MO YR	TO MO YR	Total Award Value
National Heart, Lung, and Blood Institute	RNM 1RO1-HL36534	Myocardial Fatty Acid Studies and Positron Tomography	09 85	09 88	$313,083.00
National Institutes of Mental Health	PHS 5RO1-MH37957	Regional Cerebral Physiology in Health and Disease	09 82	09 85	$1,115,750.00
National Institutes of Neurological & Communicative Diseases & Stroke	1RO1-NS16835	Non-Invasive Evaluation of CNS Dopaminergic Activity	11 83	11 86	$365,442.00
Public Health Service, National Cancer Institute	CA-09260	Post-Graduate Research Training in Medical Physics	08 79	07 86	$423,507.00
National Cancer Institute		UCCRC: Clinical-Lab Studies in Gynecologic Cancer	04 86	03 91	Pending

Only provide information on research projects which are directly related to the selected principal research area.

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PROPOSAL TO ACQUIRE A STATE-OF-THE-ART
SCINTILLATION CAMERA SYSTEM

The Franklin McLean Memorial Research Institute (FMI) of The University of Chicago Medical Center was established in 1953 by the Atomic Energy Commission as The Argonne Cancer Research Hospital, with the mission of conducting research on the use of radiotracers and radiation beams in the diagnosis and treatment of cancer. The current research program under DOE support includes:

DE-AC02-80EV10360 entitled "Correlation of Chromosome Patterns in Human Leukemic Cells with Exposure to Chemicals and/or Radiation" with Janet Rowley, M.D., as Principal Investigator;

DE-AC02-80EV10328 entitled "The Molecular Biology of Environmental Aromatic Hydrocarbons" with Samuel Weiss, Ph.D., as Principal Investigator; and

DE-AC02-80EV10359 entitled "Quantitative Studies in Radiopharmaceutical Science" and DE-AC02-82ER60033 entitled "Instrumentation and Quantitative Methods of Evaluation" with Robert Beck as Principal Investigator and Malcolm Cooper, M.D., as Co-Principal Investigator.

The objective of our Nuclear Medicine and Quantitative Imaging Research Program, currently supported by the latter two contracts, is to develop new imaging instruments, radiopharmaceuticals, and radiotracer methods for biomedical research and, ultimately, clinical applications.

Historically, this component of our research program has been very active and productive. Major early accomplishments of this program include:

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a. the first clinical applications of Tc-99m labeled compounds for tumor detection, including the design and construction of a brain scanner for this purpose;

b. the first use of radioisotopes of thallium for cardiac studies;

c. the development of the first whole-body scanner, utilizing an Anger-type scintillation camera; and

d. the development of the current method of production of I-125.

More recently, we have extended the theory of radionuclide imaging, utilizing the entire spectrum of detected gamma radiation,

a. to improve the signal-to-noise ratio in conventional imaging procedures;

b. to achieve on-line image processing (including sharpening and smoothing); and

c. to achieve improved quantitation in Single Photon Emission Computed Tomography (SPECT) imaging.

The scintillation camera system will be used to implement these theoretical advances.

Specifically, multichannel image-data will be acquired with this instrument from phantoms containing Ga-67 and Tc-99m. These data will be used by an existing PE-3254 computer in the Frank Center for Image Analysis (privately funded) to reconstruct SPECT images utilizing a fundamentally new algorithm developed by Donald Gunter (graduate student, The University of Chicago Physics Department). Our confidence in the feasibility of this approach is based upon previous experience with a unique prototype version of this scintillation camera which was on loan to us from Siemens Gammasonics during the latter half of 1984.

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Using this instrument, Kenneth Hoffmann, Ph.D. (Brandeis University, Department of Physics, 1984: Postdoctoral Training Fellow in Medical Physics, The University of Chicago) and Mr. Gunter carried out a series of experiments based on multichannel imaging concepts as well as a pilot series of clinical feasibility studies (under the supervision of Malcolm Cooper, M.D.). Continued access to such an instrument is required to further this research.

In addition, this instrument will have direct relevance and applicability to our radiopharmaceutical research and quantitative radiotracer studies.

The ability to acquire *in vivo* distribution data in experimental animals, and in human feasibility studies, will allow us to continue our on-going studies in SPECT and PET:

a. development of new radiopharmaceuticals;

b. generation of appropriate mathematical models of tracer kinetics;

c. calculation of absorbed radiation dose distributions; and

d. design and development of dynamic methods for quantitative tomographic studies.

For the generation of new pharmaceuticals that may be used in quantitative *in vivo* studies, the first steps are radionuclide production and radiopharmaceutical synthesis. Biodistribution studies with the equipment we are requesting is an important next stage. This applies whether positron or gamma-ray emitting radionuclides are employed since in either case the activity time curves of regional localization and excretion can be acquired.

From these data, combined with *a priori* information, *in vitro* studies, computer simulation, and mathematical models of the radiolabeled drugs can be devised. In

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association with this, dynamic methods can be developed and experimental designs devised for the quantitative tomographic studies.

In a similar fashion, the biodistribution studies allow for initial calculations of the radiation absorbed dose distribution. These are important for any human studies which are contemplated, in order to obtain Institutional Review Board approval for human experimentation. Perhaps more importantly, definition of target organ and radiation dose may be the factors determining whether <u>any</u> further studies can be combined in new radiopharmaceutical development. For example, a receptor binding ligand in the C.N.S. may provide a prohibitive radiation dose to the small intestine from hepato-biliary excretion. Another example with which we are familiar is observing that certain ligands, such as spiperone, have excretion and binding characteristics that require many hours of delay following injection before appropriate target-to-nontarget activities can be obtained.

The scope of our studies includes research in heart disease, cancer and brain function in health and disease. Current and recent programs funded for this work are listed on pages 7 and 8.

This instrument will be critically important for on-going and future studies in our radiopharmaceutical program at FMI.

Faculty associated with the principal research areas include:

Robert Beck, Professor of Radiology and Director of FMI, has been associated with the nuclear medicine research program at FMI since 1954. His principal area of interest and expertise is in the theory of radionuclide imaging instrumentation.

Malcolm Cooper, M.D., Associate Professor of Radiology, Associate Director of FMI, and Director of the PET Center for Brain Function Studies, has special expertise in radiopharmaceutical science and clinical nuclear medicine.

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John Gatley, Ph.D., Associate Professor of Radiology, has special expertise in radiochemistry, radiopharmaceutical synthesis, and modeling of radiotracers.

Charles Metz, Ph.D., Professor of Radiology, and until recently, Director of the Graduate Program in Medical Physics, has special expertise in the theory of radionuclide imaging and image reconstruction as well as the methodology of image evaluation through observer performance.

All of the above participate as faculty in the Graduate Program in Medical Physics.

This instrument will be available to the research staff indicated in the FMI table of organization as well as to research colleagues at The University of Chicago.

Maintenance costs beyond the one-year warranty will be covered by the FMI Director's Fund and unrestricted private donations.

Adequate laboratory space exists for this equipment. It is anticipated that this space will continue to be available during the lifetime of the equipment, which is expected to be at least seven years.

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Division of Biological Sciences
J. Ultmann, Dean for Research

THE FRANKLIN McLEAN MEMORIAL RESEARCH INSTITUTE
R. Beck, Director
M. Cooper, Assoc. Director

Research Programs

DOE: DE-AC02-80EV10359; M. Cooper, P.I., R. Beck, Co-P.I.
DOE: DE-AC02-82ER60033; R. Beck, P.I., M. Cooper, Co-P.I.
DOE: DE-AC02-80EV10328; S. Weiss, P.I.**
DOE: DE-AC02-80EV10360; J. Rowley, P.I.**
NIMH: 1-R01-MH37957; M. Cooper, P.I., R. Beck, Co-P.I.
NCI: 1-R01-CA33261; C. Metz, P.I.

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C. Peters, Secy.
W. Longgrear, Admin. Asst.

Editorial Office
E. Lanzl, Editor

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S. Murphy*(3)

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J. Wood
P. Prieto

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K. Hoffmann, Postdoc

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A. Friedman
O. DeJesus
G. VanHoffaert
P. Faulhaber

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M. Giger
H. Fujita
K. Ohara
C. Vyborny
M. Carlin

Image Evaluation Methodology Office
C. Metz, Dir.
J.-H. Shen

*STUDENTS
(1) Medical Physics
(2) Pre-Med
(3) Pharm/Phys.
(4) Structural Biol.
(5) Physics

**Space and Staff Not Shown

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FIVE-YEAR PROGRESS REPORT

During the past five years we have:

1. developed a comprehensive ray-tracing program for the characterization and design of collimators for scintillation cameras;

2. developed a Monte Carlo code to simulate the effects of scattered radiation on image quality;

3. developed a Generalized Collimator Transfer Function [GCTF(ν)] to describe the spatial frequency response of collimators with shift-variant response functions;

4. developed an electronic-analog image processing device;

5. constructed PET VI (funded by the Brain Research Foundation, $821,000) and established the PET Center for Brain Function Studies;

6. established the Frank Center for Image Analysis ($300,000 private donation);

7. developed new targets for the FMI cyclotron for the production of F-18, O-15, and Br-75; and

8. extended the development of statistical methodologies for the quantitative evaluation of image quality through observer performance.

In addition, for other federal agencies our research in the past two years has included:

1. Studies on regional cerebral physiology in health and disease (NIMH) in which we have examined regional metabolic responses of normal, schizophrenic, and narcoleptic subjects to cognitive challenges and in differing states of attention and awareness including varying stages of sleep. Studies concerning insulin control of neuronal metabolism have been performed in normal and diabetic subjects using new dynamic approaches for evaluating kinetic model parameters in glucose analog studies.

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2. Work funded by the National Heart, Lung and Blood Institute seeks to validate radiotracers and imaging methodologies for measuring the responses of myocardial metabolism of fatty acids and other substrates to heart diseases and their therapies.

3. Work on the dopamine receptor system has been extended to include synthesis, biodistribution, and imaging studies of a radiobrominated analog of a selective dopamine D_1 receptor antagonist (NINCDS). We have now completed synthesis and biodistribution studies of the C-11 analog and imaging studies in rhesus monkeys, with human studies to follow.

1076456

CURRICULUM VITAE

Name: Robert N. Beck

Birthdate: [redacted]

Education:

[redacted]

Professional Experience:

1957-64 Chief Scientist, The Argonne Cancer Research Hospital, The University of Chicago, Chicago, IL

1964-67 Research (Assistant Professor), Department of Medicine, The University of Chicago, Chicago, IL

1967-76 Associate Professor, Department of Radiology and The Argonne Cancer Research Hospital, The University of Chicago, Chicago, IL

1976- Professor, Section of Radiological Sciences, Department of Radiology, The University of Chicago, Chicago, IL

1977- Director, The Franklin McLean Memorial Research Institute (formerly The Argonne Cancer Research Hospital), The University of Chicago, Chicago, IL

Selected Publications:

Tsui, B.M.W., Beck, R.N., Metz, C.E. and Doi, K.: Transfer function analysis of the total image forming process in nuclear medicine. J. Applied Photo. Engr. 6(6):131-140, 1980.

Tsui, B.M.W., Beck, R.N., Doi, K. and Metz, C.E.: Analysis of recorded image noise in nuclear medicine. Phys. Med. Biol. 26(5):883-902, 1981.

Tsui, B.M.W., Metz, C.E. and Beck, R.N.: Optimum detector spatial resolution for discriminating between tumor uptake distributions in scintigraphy. Phys. Med. Biol. 28(7):775-788, 1983.

Beck, R.N. and Redtung, L.D.: Collimator design using ray-tracing techniques. Presented at the IEEE 1984 Nuclear Science Symposium, Orlando, Florida, October 31-November 4, 1984. IEEE Trans. Nucl. Sci. NS-32(1):865-869, 1985.

Beck, R.N. and Redtung, L.D.: Hole pattern analysis in collimator design. J. Nucl. Med. 26(5):P44, 1985. (Abstract)

CURRICULUM VITAE

Name: Malcolm Cooper

Birthdate: [redacted]

Education:

[redacted]

Professional Experience:

1965-66 Resident Medical Officer, Mineral Metabolism and Nuclear Medicine, Leeds General Infirmary

1966-69 Clinical Instructor, Department of Medicine, University of Rochester School of Medicine and Dentistry; Director, Cardiology Section, Department of Medicine, Genessee Hospital, Rochester School of Medicine and Dentistry; Director, Coronary Care Unit, Genessee Hospital, Rochester, New York; Member, Work Evaluation Unit, Monroe County Heart Association, Rochester, New York

1970-72 Instructor, Nuclear Medicine, Department of Radiology, Johns Hopkins Medical Institutions; Research Associate, Department of Epidemiology, School of Public Health and Hygiene, Johns Hopkins Medical Institutions

1972-76 Associate Professor, Department of Medicine, University of Maryland School of Medicine; Lecturer, Department of Radiological Sciences, Johns Hopkins Medical Institutions; Director, Division of Nuclear Medicine, Department of Radiology, University of Maryland School of Medicine; Director, Nuclear Medicine Unit, Loch Raven Veterans Administration Hospital, Baltimore, Maryland

1976-82 Director, Section of Nuclear Medicine, Department of Radiology, The University of Chicago Medical Center

1976- Associate Professor, Department of Radiology and The Franklin McLean Memorial Research Institute, The University of Chicago

1982- Director, Positron Emission Tomography Unit, The Franklin McLean Memorial Research Institute, The University of Chicago

1985- Associate Director, The Franklin McLean Memorial Research Institute, The University of Chicago

Selected Publications:

Rezai-Zedeh, K.R., Hall, T.J., Cooper, M.J., Moosa, A.R., Loberg, M., Baker, A.L. and Cooper, M.: ^{99m}Tc-HIDA in the differential diagnosis of jaundice: Exploration of the potential use of a kinetic model. J. Surg. Gastroenterol. 1:213-218, 1982.

Friedman, A.M., Huang, C.C., Kulmala, H.A., Dinerstein, R., Navone, J., Brunsden, B., Gawlas, D. and Cooper, M.: The use of radiobrominated p-bromospiroperidol for gamma-ray imaging of dopamine receptors. Int. J. Med. Biol. 9(1):57-61, 1982.

Loberg, M.D., Cooper, M., Harvey, E., et al.: Development of new radiopharmaceuticals based on N-substitution of iminodiacetic acid. (Republished as Historical Highlights from 1976.) J. Nucl. Med. 25(10):1144-1149, 1984.

Chen, C-T, Holden, J.E., Koeppe, R.A., Cooper, M. and Beck, R.N.: Evaluation and comparison of various strategies for estimating local cerebral glucose metabolic rate from brain images in positron emission tomography. In: Proceedings of International Symposium CAR '85, M.L. Rhodes, C.C. Jaffee and R. Felix, eds., pp. 716-720, 1985.

DeJesus, O.T., Martin, J.A., Yasillo, N.J., Gatley, S.J. and Cooper, M.: F-18-fluoride from a small cyclotron for the routine synthesis of F-18-2-fluoro-2 deoxy-D-glucose. Int. J. Appl. Radiat. Isotopes, 1985. (In press)

1076458

CURRICULUM VITAE

Name: Samuel J. Gatley

Birthdate: [redacted]

Education:

[redacted]

Professional Experience:

1971-75 Graduate Student and Postdoctoral Fellow, Department of Pharmacological Sciences, University of Newcastle-upon-Tyne, UK

1975-77 Project Associate with H.A. Lardy at the Institute for Enzyme Research, University of Wisconsin, Madison, WI

1977-79 Clinical Assistant Professor in Nuclear Medicine, University of Wisconsin, Madison, WI

1980-82 Assistant Professor, Department of Radiology, University of Wisconsin, Madison, WI

1982-85 Associate Professor of Medical Physics, University of Wisconsin, Madison, WI

1985- Associate Professor, Department of Radiology and The Franklin McLean Memorial Research Institute, The University of Chicago, Chicago, IL

Selected Publications:

Witter, J.P., Gatley, S.J. and Balish, E.: Distribution of nitrogen-13 from labeled nitrate ($^{13}NO^{3-}$) in humans and rats. Science 204:411-413, 1979.

Gatley, S.J. and Martin, J.L.: Some aspects of the pharmacology of diphenyleneiodonium, a bivalent iodine compound. Xenobiotica 9(9):539-546, 1979.

Lorton, S.P., Gatley, S.J., Lieberman, L.M. and First, N.L.: Radiolabeling of mammalian spermatozoa and their use to monitor sperm transport in females. Amer. J. Obs. and Gyn. 136(6):732-736, 1980.

Gatley, S.J., Shaughnessy, W.J., Inhorn, L. and Lieberman, L.M.: Studies with 17β(16α-[^{125}I]Iodo)-estradiol, an estrogen receptor-binding radiopharmaceutical, in rats bearing mammary tumors. J. Nucl. Med. 22(5):459-464, 1981.

Sherratt, H.S.A., Gatley, S.J., DeGrado, T.R., Ng, C.K. and Holden, J.E.: Effects of 2[5(4-chlorophenyl)pentyl]oxirane-2-carboxylate on fatty acid and glucose metabolism in perfused rat hearts determined using iodine-125 16-iodohexadecanoate. Biochem. Biophys. Res. Commun. 117(3):653-657, 1983.

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CURRICULUM VITAE

Name: Charles E. Metz

Birthdate: [redacted]

Education:

[redacted]

Professional Experience:

1969-71 Instructor, Department of Radiology, The University of Chicago, Chicago, IL
1971-75 Assistant Professor, Department of Radiology, The University of Chicago, Chicago, IL
1976-80 Associate Professor, Department of Radiology, The University of Chicago, Chicago, IL
1979-85 Director, Graduate Programs in Medical Physics, Department of Radiology, The University of Chicago, Chicago, IL
1980- Professor, Department of Radiology, The University of Chicago, Chicago, IL
1984- Professor, Committee on Structural Biology, The University of Chicago, Chicago, IL

Honors:

Phi Beta Kappa, 1963; B.A. in Physics awarded cum laude, Bowdoin College, 1964; Sigma Xi, 1970

Selected Publications:

Loo, L.-N., Doi, K. and Metz, C.E.: A comparison of physical image quality indices and observer performance in the radiographic detection of nylon beads. Phys. Med. Biol. 29:837-856, 1984.

MacMahon, H., Vyborny, C.J., Powell, G., Doi, K. and Metz, C.E.: The effect of pixel size on the detection rate of early pulmonary sarcoidosis in digital radiographic systems. Proc. SPIE 486:14-20, 1984.

Metz, C.E., Wang, P.-L. and Kronman, H.B.: A new approach for testing the significance of differences between ROC curves measured from correlated data. In: Information Processing in Medical Imaging (Deconinck, F., ed.), The Hague, Martinus Nijhoff, 1984, pp. 432-445.

Metz, C.E.: Basic imaging theory. In: Recent Developments in Digital Imaging (Doi, K., Lanzl, L. and Lin, P.-J., eds.), American Institute of Physics, New York, 1985, pp. 1-15.

Metz, C.E.: Statistical analysis of ROC data in evaluating diagnostic performance. In: Multiple Regression Analysis: Applications in the Health Sciences (Herbert, D., ed.), American Institute of Physics, New York, 1985 (in press).

1076460

OMB No. 1901-0247
Expires 1/31/85

U.S. Department of Energy

Assurance of Compliance

Nondiscrimination in Federally Assisted Programs

The University of Chicago (Hereinafter called the "Applicant") HEREBY AGREES to comply with Title VI of the Civil Rights Act of 1964 (Pub. L. 88-352), Section 16 of the Federal Energy Administration Act of 1974 (Pub. L. 93-275), Section 401 of the Energy Reorganization Act of 1974 (Pub. L. 93-438), Title IX of the Education Amendments of 1972, as amended, (Pub. L. 92-318, Pub. L. 93-568, and Pub. L. 94-482), Section 504 of the Rehabilitation Act of 1973 (Pub. L. 93-112), the Age Discrimination Act of 1975 (Pub. L. 94-135), Title VIII of the Civil Rights Act of 1968 (Pub. L. 90-284), the Department of Energy Organization Act of 1977 (Pub. L. 95-91), and the Energy Conservation and Production Act of 1976, as amended, (Pub. L. 94-385). In accordance with the above laws and regulations issued pursuant thereto, the Applicant agrees to assure that no person in the United States shall, on the ground of race, color, national origin, sex, age, or handicap, be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity in which the Applicant receives Federal assistance from the Department of Energy.

Applicability and Period of Obligation

In the case of any service, financial aid, covered employment, equipment, property, or structure provided, leased, or improved with Federal assistance extended to the Applicant by the Department of Energy, this assurance obligates the Applicant for the period during which Federal assistance is extended. In the case of any transfer of such service, financial aid, equipment, property, or structure, this assurance obligates the transferee for the period during which Federal assistance is extended. If any personal property is so provided, this assurance obligates the Applicant for the period during which it retains ownership or possession of the property. In all other cases, this assurance obligates the Applicant for the period during which the Federal assistance is extended to the Applicant by the Department of Energy.

Employment Practices

Where a primary objective of the Federal assistance is to provide employment or where the Applicant's employment practices affect the delivery of services in programs or activities resulting from Federal assistance extended by the Department, the Applicant agrees not to discriminate on the ground of race, color, national origin, sex, age, or handicap, in its employment practices. Such employment practices may include, but are not limited to, recruitment, recruitment advertising, hiring, layoff or termination, promotion, demotion, transfer, rates of pay, training and participation in upward mobility programs, or other forms of compensation and use of facilities.

Subrecipient Assurance

The Applicant shall require any individual, organization, or other entity with whom it subcontracts, subgrants, or subleases for the purpose of providing any service, financial aid, equipment, property, or structure to comply with laws cited above. To this end, the subrecipient shall be required to sign a written assurance form, however, the obligation of both recipient and subrecipient to ensure compliance is not relieved by the collection or submission of written assurance forms.

Data Collection and Access to Records

The Applicant agrees to compile and maintain information pertaining to programs or activities developed as a result of the Applicant's receipt of Federal assistance from the Department of Energy. Such information shall include, but is not limited to, the following: (1) the manner in which services are or will be provided and related data necessary for determining whether

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THE UNIVERSITY OF CHICAGO

OFFICE OF SPONSORED PROGRAMS · 5801 ELLIS AVENUE · CHICAGO, ILLINOIS 60637

Telephone: Area Code 312
962-8605

Ms. Kay Miller

December 5, 1985

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DOE University Research
Instrumentation Program
Energy Programs and Support Division
U.S. Department of Energy
Oak Ridge Operations Office
200 Administration Road
Oak Ridge, Tennessee 37830

Gentlemen:

Re: Program Announcement No.
DE-PS05-86-ER75237

Enclosed, pursuant to the above referenced announcement, is a proposal entitled "Proposal to Acquire a State of the Art Scintillation Camera System", submitted on behalf of Mr. Robert N. Beck, Professor, Franklin McLean Memorial Research Institute.

Your favorable consideration of this submission would be appreciated.

Sincerely,

Donald S. Sigal
Director
Office of Sponsored Programs

Enclosure

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any persons are or will be denied such services on the basis of prohibited discrimination; (2) the population eligible to be served by race, color, national origin, sex, age and handicap; (3) data regarding covered employment including use or planned use of bilingual public contact employees serving beneficiaries of the program where necessary to permit effective participation by beneficiaries unable to speak or understand English; (4) the location of existing or proposed facilities connected with the program and related information adequate for determining whether the location has or will have the effect of unnecessarily denying access to any person on the basis of prohibited discrimination; (5) the present or proposed membership by race, color, national origin, sex, age and handicap, in any planning or advisory body which is an integral part of the program; and (6) any additional written data determined by the Department of Energy to be relevant to its obligation to assure compliance by recipients with laws cited in the first paragraph of this assurance.

The Applicant agrees to submit requested data to the Department of Energy regarding programs and activities developed by the Applicant from the use of Federal assistance funds extended by the Department of Energy. Facilities of the Applicant (including the physical plants, buildings, or other structures) and all records, books, accounts, and other sources of information pertinent to the Applicant's compliance with the civil rights laws shall be made available for inspection during normal business hours on request of an officer or employee of the Department of Energy specifically authorized to make such inspections. Instructions in this regard will be provided by the Director, Office of Equal Opportunity, U.S. Department of Energy.

This assurance is given in consideration of and for the purpose of obtaining any and all Federal grants, loans, contracts (excluding procurement contracts), property, discounts or other Federal assistance extended after the date hereto, to the Applicant by the Department of Energy, including installment payments on account after such date of application for Federal assistance which are approved before such date. The Applicant recognizes and agrees that such Federal assistance will be extended in reliance upon the representations and agreements made in this assurance and that the United States shall have the right to seek judicial enforcement of this assurance. This assurance is binding on the Applicant, its successors, transferees, and assignees, as well as the person whose signature appears below and who is authorized to sign this assurance on behalf of the Applicant.

December 5, 1985
(Date)

The University of Chicago
(Name of Applicant)

5801 South Ellis Avenue
Chicago, Illinois 60637
(Address)

(Authorized Official)

(312) 962-8604
(Applicant's Telephone Number)

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