RADIOLOGY RESIDENCY PROGRAM

1. INTRODUCTION

The Department of Environmental and Radiological Health Sciences at Colorado State University offers a combined Residency/Master’s program in Veterinary Diagnostic Imaging, with the objective of meeting the eligibility requirements of the American College of Veterinary Radiology to sit for the certifying board examination. The program offers clinical training in all aspects of diagnostic imaging under the guidance of six board certified faculty radiologists. Three to four residents are being trained who have started their programs one year apart. The radiology faculty has imaging expertise which encompasses large and small animal radiology, ultrasound, nuclear medicine, computed tomography, and magnetic resonance imaging.

The residency is a three year program combined with a Master’s degree that typically begins in July. The Master’s degree is earned in conjunction with the residency by completing a non-thesis graduate program of study. This program consists of 32 hours of graduate coursework, completion of both retrospective and prospective research projects, and successfully passing a final oral graduate examination. Results of these research projects are to be presented during resident seminars at CSU and one project will be presented at the annual ACVR scientific meeting.

The combined Residency/Master’s degree program does not differ significantly from a standalone radiology residency program. The major content differences are the completion and submission of two manuscripts for publication and successful completion of an oral examination. Residents will also gain teaching experience by presenting a limited number of didactic lectures and seminars, but also more extensively through less formal clinical teaching sessions with veterinary students. A stipend is provided, tuition and fees are paid, and two weeks of vacation per year are allowed. There are no other fringe benefits.
II. Objectives

The residency training program is designed to provide supervised training in diagnostic imaging in an atmosphere conducive to learning clinical diagnostic imaging with an introduction to clinical investigation. The residency is also designed to prepare the trainee for certification by the American College of Veterinary Radiology. The residency is designed to provide thorough training in small and large animal radiology and ultrasound. More limited training is also provided in nuclear scintigraphy, computed tomography, and magnetic resonance imaging.

III. Training Period

The residency program requires 3 years (36 months) of training in veterinary diagnostic imaging of which at least 30 months is supervised clinical experience. See Appendix B for a schedule of clinical experience.

IV. Direction and Supervision

The program director has a 60% commitment to the diagnostic imaging service and is involved in radiology, CT, MRI, PET/CT, nuclear medicine and ultrasound. The program director is also involved in clinical instruction to residents as well as resident rounds, journal club, and known case conference. ACVR Diplomates are assigned to diagnostic radiology, ultrasound, nuclear medicine, CT, and MRI services at all times.

V. Faculty

The following faculty are involved in the residency training program. The primary clinical training responsibility is listed after each name.

Head, Department of Environmental and Radiological Health Sciences: J. Nickoloff, PhD
Residency Director A. J. Marolf, Diplomate ACVR, DVM
R. D. Park, Diplomate ACVR, DVM, PhD, Radiology/CT, MRI, 35 yrs
S.L. Kraft, Diplomate ACVR, DVM, PhD, Radiology/MRI, CT, Radiation Therapy, 17 yrs
A. J. Marolf, Diplomate ACVR, DVM
D. S. Gibbons, Diplomate ACVR, DVM, M.S.
E. K. Randall, Diplomate ACVR, DVM, M.S.
A. Valdes-Martinez, ACVR, DVM

See Appendix A for abbreviated biographies that provide more detail on faculty in the residency training program.
Formal teaching of didactic lectures to professional veterinary students and graduate students are distributed equally among faculty. Radiology resident/graduate research projects are supervised primarily by one selected radiology faculty member, but the other radiologists serve on the graduate committee and thus play a supervisory role as well. Diagnostic imaging faculty equally share clinical rotations and resident lectures, clinical case rounds, known case conference rounds, and average 60% time on clinical duty, 30% time teaching and 10% time research.

Specialists in Veterinary Teaching Hospital include:
American College of Veterinary Radiology 7
American College of Veterinary Internal Medicine 20
American College of Veterinary Theriogenology 5
American College of Veterinary Surgery 17
American College of Veterinary Ophthalmology 2
American College of Veterinary Anesthesiology 4
American Association of Zoological Medicine 2
American College of Veterinary Emergency Critical Care 2
American College of Veterinary Pathology 12

VI. Affiliation Agreement

The residency program does not require affiliations with other institutions or training programs.

VII. Facilities

The facilities at the CSU Veterinary Teaching Hospital reflect state-of-the-art diagnostic imaging. Diagnostic imaging has the following assigned rooms:

Radiology:
- Large Animal 1 Examination room
- Small Animal 4 Examinations rooms
- Ultrasound 3 Examination rooms
- CT 1 Examination room, 1 control room, and 2 equipment rooms
- MRI 1 Examination room, 1 control room, 1 reading room and 1 equipment room
- Nuclear Medicine 2 Rooms Diagnostic, 2 wards, 1 radiopharmaceutical lab
- I-131 Facility 1 ward, 1 ante-room
**Small Animal Room 1:**
800 mA Siemens Multix Top/Vertix Solitaire machine, with four way float top elevator table, Eklin RadipStart Clinical Digital Radiography System.
Dicom compliance achieved through interface with Philips iSite PACS and Fuji RIS.

**Small Animal Radiography/Fluoroscopy Room 2**
800 mA multi-pulse high voltage waveform generator
Siemens Polydoros SX 65 generator with 150 kV X-ray tube
Siemens Sireskop CX ceiling free spot film device and permanently attached digital PC based imaging chain with tilting and floating table top. The spot film device has a front loading cassette arrangement with automatically programmed field subdivision.
An overhead suspended X-ray tube of 1509 kV capacity can interlock with a fine bucky grid.
Three photocells are available in the cassette holder to calculate and to terminate the exposures at a predetermined film density.
Dicom Compliance achieved with Siemens fluoroscopy software interfaced with Philips iSite PACS and Fuji RIS. Fluoroscopy Dicom compatibility to be achieved through an add on TIMS unit Fall 2010.

**Small Animal Radiography/fluoroscopy Room 3**
Toshiba KXD-80F, 800 mA, 180 KW, microprocessor controlled generator
Ceiling free spot film device and permanently attached image intensifier television chain with a tilting and floating table top. The spot film device has a front loading cassette arrangement with automatically programmed field subdivision.
An overhead suspended X-ray tube of 150 kV capacity interlocking capability with a fine bucky grid. Eklin RadieStart Clinical Digital Radiography System.
Fluoroscopy is incorporated with a digital imaging system (Infimed) Platinum RF fluoroscopic imaging computer.
TIMS live video recorder and CD/DVD burner.
Dicom Compliance achieved with addon TIMS and Infimed units interfaced with Philips iSite PACS and Fuji RIS.

**Small Animal Special Procedure Room 4**
Seimens Polydoros 805-80 KW generator
Camera mounted on a C (arcoscope arm) for fluoroscopy examinations and image intensification, and digital imaging X-ray tube mounted on a telescopic ceiling suspended crane for magnification studies
One pressure injector: Liebel-Flarsheim Angiomat 3000
Koordinate Kombi table with floating top
Fluoroscopy is incorporated with a (Infimed) Platinum One DSA digital system.
TIMS live video recorder and CD/DVD burner.
Dicom compliance achieved with addon TIMS and Infimed units interfaced with Philips iSite PACS and Fuji RIS.
Large Animal Examination Room
Two overhead ceiling-suspended longitudinal and transverse rail systems to support three telescoping cranes for high powered Philips X-ray tubes and a DR detector with interlocking capability at set distances and move as a unit or independently.
Eklin EDR3 Clinical Digital Radiography System with Cesium Iodide 17x17 active capture panel. High powered ultra high heat capacity Philips X-ray tubes
Philips Super CP 100-100 kw generator
Specialized exam table for anesthetized (myelograms, pelvis exams, etc.)
Dicom compatibility as interfaced with Philips iSite PACS and Fuji RIS.

Combination teaching/research examination room:
Dell Medical/Simon DR 400MA/125KVP system
Dicom-

AGFA Computed Radiography System
Dicom Compliance achieved through interface with Philips iSite PACS

In addition:
Two Minray 80+port with Eklin Mark III Digital System
Dicom compatibility as integrated with Philips iSite PACS and Fuji RIS.

Ultrasound Room:
Siemens Antares Acuson
Dicom compliant with VEPRO server and integrated with Philips iSite PACS
Siemens Antares Sonoline,
Dicom complaint with Vepro server and integrated with Philips iSite PACS
Vepro Server
Dicom compliant

Computer Tomography/PET
Philips PET/CT
Extended Brilliance workstation

Magnetic Resonance
GE 1.5 Tesla 9.0 LX MRI scanner with Multinuclear spectroscopy
Advantage Windows workstation

Nuclear Medicine:
Digital Omega Gamma Camera with Mirage Acquisition/Processing Station for large animal.
Dicom compliance
GE Millenium SPECT system for small animal planar, whole body and SPECT imaging
Dicom compliance

Dark Room
Hand processor tanks, Kodak Processor x 2, X-ray film duplicator-subtraction unit
VIII. Clinical Resources

The diagnostic imaging service at the CSU VTH sees approximately 6,200 small animal radiology cases and 1,700 large animal radiology examinations per year, including exotic animals and food animal patients. Approximately 2,400 ultrasound, 400 CT, 300 MRI, 300 diagnostic nuclear medicine, and 40 I-131 cases are performed annually. The exotic animal service at the CSU VTH is run by 2 full time clinicians. The food animal program includes dairy, beef, and camelids. The equine and small animal clinics at the CSU VTH are staffed by a full complement of surgeons and other medical specialists.

**DETAILED PLAN OF TRAINING YEARLY CASELOAD**

The residency schedule is outlined in Appendix B. The average case load and resident case experience are as follows:

<table>
<thead>
<tr>
<th>Cases per year</th>
<th>Case load over 30 months for 3 residents</th>
<th>Case load over 30 months for single resident</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radiology Small Animal</td>
<td>6,200</td>
<td>15,500</td>
</tr>
<tr>
<td>Radiology Large Animal</td>
<td>1,700</td>
<td>4,250</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cases per year</th>
<th>1 Year/Resident</th>
<th>Case load over 30 months for single resident</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ultrasound</td>
<td>2,400</td>
<td>5,000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cases per year</th>
<th>4 Months/Resident</th>
<th>Case load over 30 months for single resident</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computed Tomography</td>
<td>300</td>
<td>100</td>
</tr>
<tr>
<td>Magnetic Resonance Imaging</td>
<td>300</td>
<td>100</td>
</tr>
<tr>
<td>Nuclear Medicine (diagnostic)</td>
<td>300</td>
<td>100</td>
</tr>
<tr>
<td>Nuclear Medicine (I-131 patients)</td>
<td>40</td>
<td>15</td>
</tr>
</tbody>
</table>
Residents are assigned to diagnostic radiology for 12 months, ultrasound for 6 months, nuclear medicine for 4 months, CT/MRI for 4 months, and an elective rotation for 4 months. Rotations overlap; for example, a resident might be on ultrasound and radiology simultaneously.

Residents rotate through the Nuclear Medicine Service for one semester during which time approximately 1/3 of their effort is dedicated to diagnostic radiology. During their CT/MRI rotation (one semester) 4/5 of their time is in CT/MRI and 1/5 in diagnostic radiology.

While on diagnostic radiology rotations, residents spend approximately two-thirds of their time in small animal and one-third of their time in large animal radiology. Approximately 120 food animal cases (bovine, ovine, caprine, and camelids) are seen per year. In the small animal diagnostic radiology rotation, about 300 exotic animal species are radiographed. Eighty percent of theses (exotic species) are avian (mostly raptors). The balance is evenly divided between reptiles and exotic mammal species.

IX. Training Content

Clinical training: Residents have clinical rotations in diagnostic radiology and ancillary imaging areas. A summary of the radiology resident Plan of Study is located in Appendix B. Under supervision of an assigned radiologist residents work with and dictate cases on a daily basis. All reports are reviewed orally in morning rounds and corrected with the supervising radiologist. Each resident keeps a personal log of all special procedures performed, so that deficiencies can be corrected before the residency is completed. Residents also have night and weekend radiology duty in the second and third years of training.

Clinical radiology rounds: Residents will attend radiology rounds each morning. Other imaging related discussion sessions are held weekly, including Known Case Conference and Journal Club. Assignments will be made to residents for participation in Known Case Conferences and the Journal Club. Residents are encouraged to attend pathology rounds each week. Radiographs may be presented by the resident at these rounds. Other medical, surgical and grand rounds within the VTH are available and should be attended when the schedule allows. Residents also attend weekly graduate seminars and present two seminars during their program.
**Didactic classes**: Residents enroll in graduate school during the course of their residency program. Both plan A (thesis) and plan B (non-thesis) MS degrees are offered. Residents in training programs pursuing an MS degree are required to enroll in a plan B program and to meet the minimum credit hour requirement listed below. Should an individual begin the combined resident/MS program and decide not to complete the residency, 32 credit hours would still be required to fulfill the MS requirements (Appendix C).

A resident with a pre-existing MS degree who decides he or she does not wish to pursue the MS degree must notify and make arrangements with his or her advisor/committee. In such cases, the resident will register for the minimum credit requirements to complete the outlined Residency Training Program approved by the American College of Veterinary Radiology.

**Clinical teaching responsibilities**: Residents participate in teaching diagnostic imaging to third and fourth year veterinary students. Presentation of at least 2 didactic lectures or seminars and participation in continuing education courses and/or anatomy instruction is also expected.

The following core courses are required:

<table>
<thead>
<tr>
<th>Course #</th>
<th>Credits</th>
<th>Course name</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT307</td>
<td>3</td>
<td>Introduction to Biostatistics or equivalent (only needed if no other statistics course has been taken)</td>
</tr>
<tr>
<td>ERHS550</td>
<td>5</td>
<td>Principles of Radiation Biology</td>
</tr>
<tr>
<td>ERHS701</td>
<td>VAR</td>
<td>Alternate Imaging (Offered in odd years, Spring semester)</td>
</tr>
<tr>
<td>ERHS711</td>
<td>VAR</td>
<td>Advanced Radiological Interpretation (Offered in even years, Spring semester)</td>
</tr>
<tr>
<td>ERHS712</td>
<td>3</td>
<td>Radiation Therapy Physics (Offered in odd years, Fall semester)</td>
</tr>
<tr>
<td>VS792</td>
<td>VAR</td>
<td>Seminar/Graduate</td>
</tr>
<tr>
<td>VS602</td>
<td>2</td>
<td>Critical Evaluation of Scientific Literature (Offered in Fall semester)</td>
</tr>
<tr>
<td>VS/ERHS 662</td>
<td>3</td>
<td>Applied Research: Planning, Design and Analysis (Offered in Spring semester)</td>
</tr>
</tbody>
</table>
The following Elective Courses are available:

<table>
<thead>
<tr>
<th>Course #</th>
<th>Credits</th>
<th>Course name</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERHS400</td>
<td>3</td>
<td>Radioisotope Techniques (Offered in Fall semester)</td>
</tr>
<tr>
<td>ERHS721</td>
<td>(1-3)</td>
<td>Radiation Oncology</td>
</tr>
<tr>
<td>ERHS795</td>
<td>VAR</td>
<td>Independent Study</td>
</tr>
<tr>
<td>ERHS770</td>
<td>(1-3)</td>
<td>Radiation Biology Basic to Tumor Therapy</td>
</tr>
<tr>
<td>VS 660</td>
<td>3</td>
<td>Neurology and Neurosurgery (Offered in Spring semester)</td>
</tr>
<tr>
<td>VS701-704</td>
<td>VAR</td>
<td>Postgraduate Medicine I-IV (requires Residency Director approval)</td>
</tr>
</tbody>
</table>

The clinical imaging duties will comprise at least 30 months of the 36 month residency program, to be scheduled by the radiology resident director. Off clinic time will be distributed as follows: 10 days in the first year, approximately 18 days in the second year and approximately 43 days in the third year. Off clinic time is spent on clinical investigation projects, and board exam preparation. In addition, residents are allowed 10 days of vacation per year. Some of the vacation time may be assigned during Christmas and Thanksgiving breaks.

X. Research Environment

Two investigation projects are required. A retrospective study should be started during the first year of study and completed by September of the second year. A prospective study should be started during the second year of study and finished by December of the third year. Research projects must be reviewed and approved by the resident's advisor and graduate committee. A faculty person must be chosen by the resident to be a primary consultant on each investigational project. The results of these investigational projects will be presented in the Graduate Seminar Course, and one project should be presented at the annual ACVR meeting. Application for any research money must be made to the appropriate funding agency through the faculty consultant who assumes responsibility for performance of the work.

XI. Education Environment

An education environment is fostered in the training program. The residency program is combined with a Master’s Degree. Courses required and the educational environment is detailed in the description of the training program.
XII. Evaluation

Residents will meet with the Radiology faculty and/or the director of the resident program at least yearly. At these annual reviews (usually conducted at 9, 21 and 33 months of the program), the following will be discussed:

- A summary of the resident's program to date; this must be provided in written form by the resident at least two weeks prior to the interview.
- Faculty evaluations of the resident's performance to date.
- Progress toward research and publication completion.

If progress towards completion of the Master’s degree/Residency Program is deemed unsatisfactory by the Radiology faculty, a statement to this effect, including reasons for the unsatisfactory evaluation and suggested methods for correction of deficits will be provided to the resident, the resident's advisor, graduate committee, and to the Department Head. Deficiencies must be corrected within 3 months of the date of the statement of unsatisfactory progress. If deficiencies are not corrected, a recommendation to terminate the resident's program will be made.

Periodic Examinations/Evaluations

An examination is given to a resident at various times during the clinical training. The written examinations are given in six sections in the Summer Semester. Residents have to pass with a 70% score before passing on to the next test. These tests provide a self-assessment tool for the residents and also provide information for performance review.

First Year Resident
   Anatomy
   Radiobiology Radiation Physics
   Physics of Diagnostic Radiology

Second Year Resident
   Physics and Applications of Alternate Imaging
   Special Procedures
   Physiology/Pathophysiology
Graduate School
Examinations for the completion of the Master's program are determined by the Colorado State University Graduate School. Successful completion of the entire combined Residency/Master’s program will fulfill the eligibility for examination by the American College of Veterinary Radiology. However, it must be re-emphasized that completion of anything short of the full three-year program (36 months) will prevent the resident from being credited with having completed an approved program.

XIII. Teaching File

Radiology, ultrasound, CT, MR, and nuclear medicine cases are available for resident training. These teaching files are kept current and updated regularly with material from the known case conference rounds. These contributions are provided by the supervising faculty radiologists (who share KCC responsibilities equally) and by the residents who have rotating duties towards finding KCC cases.

There is also a file of articles compiled for reading that are selected to assist knowledge of the ACVR objective list. This is kept up to date by the residents who contribute articles to the file.

XIV. Conferences

Radiology resident rounds are conducted daily. Known case conference and journal club are held weekly. Pathology rounds are available and held weekly. Clinical seminars are presented weekly for all clinical faculty and residents in the veterinary teaching hospital.

XV. Literature Resources

The Colorado State University Clinical Sciences Library is situated in the VTH building. This library is well stocked with books and journals covering both veterinary and human medicine. The main library on campus (1 mile north of the VTH) is also available. Internet access is available from several sites at the VTH. A journal article archive for radiology residents is also available at the VTH. This archive has been compiled and maintained by previous and current radiology residents.
APPENDIX A

BIOGRAPHICAL SKETCHES

Faculty Radiologists
Richard D. Park
Susan L. Kraft
Angela J. Marolf
Elissa K. Randall
Alex Valdes-Martinez
BIOGRAPHICAL SKETCH

Give the following information for the key personnel and consultants and collaborators. Begin with the principal investigator/program director. Photocopy this page for each person.

<table>
<thead>
<tr>
<th>NAME</th>
<th>POSITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Richard D. Park</td>
<td>Professor</td>
</tr>
</tbody>
</table>

EDUCATION (Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)

<table>
<thead>
<tr>
<th>INSTITUTION AND LOCATION</th>
<th>DEGREE</th>
<th>YEAR CONFERRED</th>
<th>FIELD OF STUDY</th>
</tr>
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<tbody>
<tr>
<td>Utah State University, Logan UT</td>
<td>B.S.</td>
<td>1965</td>
<td>Veterinary Medicine</td>
</tr>
<tr>
<td>Colorado State University, Ft. Collins CO</td>
<td>D.V.M.</td>
<td>1968</td>
<td>Veterinary Radiology</td>
</tr>
<tr>
<td>University of California, Davis CA</td>
<td>Ph.D.</td>
<td>1971</td>
<td></td>
</tr>
<tr>
<td>Diplomate, American College of Veterinary Radiology</td>
<td></td>
<td>1971</td>
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</table>

RESEARCH AND PROFESSIONAL EXPERIENCE: Concluding with present position, list, in chronological order, previous employment, experience, and honors. Key personnel include the principal investigator and any other individuals who participate in the scientific development or execution of the project. Key personnel typically will include all individuals with doctoral or other professional degrees, but in some projects will include individuals at the masters or baccalaureate level provided they contribute in a substantive way to the scientific development or execution of the project. Include present membership on any Federal Government public advisory committee. List, in chronological order, the titles, all authors, and complete references to all publications during the past three years and to representative earlier publications pertinent to this application. DO NOT EXCEED TWO PAGES.

EMPLOYMENT/EXPERIENCE

1971-1974 Assistant Professor, Veterinary Clinical Medicine and Head, Radiology Section, University of Illinois, Urbana IL
1974-1975 Assistant Professor of Radiology, Department of Radiological Sciences, University of California, Davis CA
1975-1980 Associate Professor, Department of Radiology & Radiation Biology, Colorado State University, Fort Collins CO
1979-88,94-- Head, Radiology Section, Veterinary Teaching Hospital, Colorado State University, Fort Collins CO
1980-Date Professor, Department of Radiology and Radiation Biology, Colorado State University, Fort Collins CO

PROFESSIONAL SOCIETIES

Phi Zeta; Phi Kappa Phi; American Veterinary Medical Association; American College of Veterinary Radiology, Board Certified 1971; Sigma Xi; American Association of Veterinary Clinicians; International Veterinary Radiology Society

PUBLICATIONS - Selected


# BIOGRAPHICAL SKETCH

<table>
<thead>
<tr>
<th>NAME</th>
<th>POSITION TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Susan L. Kraft</td>
<td>Associate Professor, Veterinary Radiology</td>
</tr>
</tbody>
</table>

**EDUCATION/TRAINING** (Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training).

<table>
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<th>INSTITUTION AND LOCATION</th>
<th>DEGREE</th>
<th>YEAR(S)</th>
<th>FIELD OF STUDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>University of Alaska, Anchorage AK</td>
<td>B.S.</td>
<td>1981</td>
<td>Biology</td>
</tr>
<tr>
<td>Washington State University, Pullman WA</td>
<td>DVM</td>
<td>1985</td>
<td>Veterinary Medicine</td>
</tr>
<tr>
<td>Washington State University, Pullman WA</td>
<td>Ph.D.</td>
<td>1991</td>
<td>Veterinary Sciences</td>
</tr>
</tbody>
</table>

**RESEARCH AND PROFESSIONAL EXPERIENCE:** Concluding with present position, list in chronological order, previous employment, experience, and honors. Include present membership on any Federal Government public advisory committee. List in chronological order the titles, all authors, and complete references to all publications during the past 3 years and to representative earlier publications pertinent to this application. If the list of publications in the last 3 years exceeds 2 pages, select the most pertinent publications. PAGE LIMITATIONS APPLY. DO NOT EXCEED 4 PAGES FOR THE ENTIRE BIOGRAPHICAL SKETCH PER INDIVIDUAL.

**Positions and Employment**
- 1987 - 1991 Radiology resident and PhD graduate candidate, Washington State University
- 1991 – 1997 Assistant Professor Veterinary Radiology, Kansas State University
- 1997 – 1999 Associate Professor with tenure, Kansas State University
- 1999 – Present Associate Professor with tenure, Colorado State University

**Other Experience and Professional Memberships**
- 1993 Diplomate of American College of Veterinary Radiology, Diagnostic Imaging
- 1995-2001 Associate Editor Veterinary Radiology and Ultrasound Journal
- 1999 – Present Director Robert and Eva Knight MRI Facility, Animal Cancer Center
- 1999 – Present Member Animal Cancer Center, and ACC Research Committee, Colorado State University
- 2001 Diplomate of ACVR – Radiation Oncology
- 2001 Member, MRI Safety Committee, Colorado State University
- 2003 Member, International Society of Magnetic Resonance in Medicine
- 2004 Member, University of Colorado Cancer Consortium, Health Sciences Center, University of Colorado
- 2005 – present Co-Director Small Animal Imaging Core, University of Colorado Cancer Consortium, University of Colorado Health Sciences Center

**Honors**
- 1996, 1995 Sloan Fellowship Award, Kansas State University
- 1995 MSD Agvet Award for Creativity in Teaching, Kansas State University
- 2005 Innovative instructional methodology Award in Professional Veterinary Medical Education, College of Veterinary Medicine, Colorado State University
Selected peer-reviewed publications (in chronological order).


Selected first-author book chapters (in chronological order).


NAME
Marolf, Angela J.

POSITION TITLE
Assistant Professor of Radiology

EDUCATION/TRAINING (Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)

<table>
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<tr>
<th>INSTITUTION AND LOCATION</th>
<th>DEGREE (if applicable)</th>
<th>YEAR(s)</th>
<th>FIELD OF STUDY</th>
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</thead>
<tbody>
<tr>
<td>University of Colorado at Boulder</td>
<td>B.A.</td>
<td>1996</td>
<td>Biology</td>
</tr>
<tr>
<td>Colorado State University</td>
<td>D.V.M.</td>
<td>2002</td>
<td>Veterinary Medicine</td>
</tr>
<tr>
<td>University of Florida</td>
<td>Residency</td>
<td>2007</td>
<td>Diagnostic Imaging</td>
</tr>
</tbody>
</table>

A. Positions and Honors.

Positions and Employment
2002-2003 Rotating Small Animal Internship, University of Georgia Teaching Hospital, Athens, GA
2003- Associate Veterinarian, Polo Springs Veterinary Hospital, Colorado Springs, CO
2004-2006 Radiology and Diagnostic Imaging Resident, University of Florida Veterinary Medical Center, Gainesville, FL
2006-2007 Radiology and Diagnostic Imaging Resident Transfer, Colorado State University, Fort Collins, CO
2007- Associate Professor, Dept of Environmental and Radiological Health Sciences, Colorado State University, Fort Collins, CO

Professional Memberships
2007- American college of Veterinary Radiology, Diplomate
American Veterinary Medical Association, Member
Colorado Veterinary Medical Association, Member

Honors
1995 Phi Beta Kappa Honor Society
2001 Phi Zeta National Honor Society

B. Selected peer-reviewed publications (in chronological order).
BIOGRAPHICAL SKETCH
Provide the following information for the key personnel in the order listed for Form Page 2. Follow the sample format for each person. DO NOT EXCEED FOUR PAGES.

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<th>NAME</th>
<th>POSITION TITLE</th>
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<tr>
<td>Randall, Elissa K</td>
<td>Assistant Professor, Diagnostic Imaging</td>
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EDUCATION/TRAINING  (Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)

<table>
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<tr>
<th>INSTITUTION AND LOCATION</th>
<th>DEGREE (if applicable)</th>
<th>YEAR(s)</th>
<th>FIELD OF STUDY</th>
</tr>
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<tr>
<td>University of North Carolina, Chapel Hill</td>
<td>BA</td>
<td>1993</td>
<td>History, Minor in Chemistry</td>
</tr>
<tr>
<td>Virginia-Maryland Regional College of</td>
<td>DVM</td>
<td>2001</td>
<td>Veterinary Medicine</td>
</tr>
<tr>
<td>Veterinary Medicine, Blacksburg, VA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Colorado State University, Fort Collins, CO</td>
<td>MS</td>
<td>2005</td>
<td>Environmental and Radiological Health Sciences</td>
</tr>
</tbody>
</table>

NOTE: The Biographical Sketch may not exceed four pages. Items A and B (together) may not exceed two of the four-page limit. Follow the formats and instructions on the attached sample.

A. Positions and Honors. List in chronological order previous positions, concluding with your present position. List any honors. Include present membership on any Federal Government public advisory committee.

Positions

2002-2005 Resident, Diagnostic Imaging, Colorado State University
2005-2008 Assistant Professor of Diagnostic Imaging, Michigan State University
2008-present Assistant Professor of Diagnostic Imaging, Colorado State University

Other Experience

2006 - 2008 Faculty Advisor, Michigan State University College of Veterinary Medicine Class of 2010
2006 - 2008 Committee on Student Admissions, Michigan State University CVM
2006 - 2008 Internship Committee, Michigan State University CVM
2006 - 2008 Residency Program Director, Diagnostic Imaging Section, MSU CVM
2007 – 2008 Principal Investigator/Radiation Safety Officer for Diagnostic Imaging
B. **Selected peer-reviewed publications (in chronological order).** Do not include publications submitted or in preparation.

**Abstracts**


**Manuscripts**


C. **Research Support.** List selected ongoing or completed (during the last three years) research projects (federal and non-federal support). Begin with the projects that are most relevant to the research proposed in this application. Briefly indicate the overall goals of the projects and your role (e.g. PI, Co-Investigator, Consultant) in the research project. Do not list award amounts or percent effort in projects.
Alex Valdés-Martínez
Assistant Professor

EDUCATION/TRAINING (Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)

<table>
<thead>
<tr>
<th>INSTITUTION AND LOCATION</th>
<th>DEGREE</th>
<th>YEAR(s)</th>
<th>FIELD OF STUDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Universidad Autónoma de Nuevo León</td>
<td>MVZ (DVM)</td>
<td>2000</td>
<td>Veterinary Medicine</td>
</tr>
</tbody>
</table>

NOTE: The Biographical Sketch may not exceed four pages. Items A and B (together) may not exceed two of the four-page limit. Follow the formats and instructions on the attached sample.

A. Positions and Honors. List in chronological order previous positions, concluding with your present position. List any honors. Include present membership on any Federal Government public advisory committee.

Positions and Employment

- 2001-2003 Equine Medicine and Surgery Internship, San Luis Rey Equine Hospital
- 2003-2004 Equine Medicine and Surgery Internship, Louisiana State University
- 2004-2005 Equine Medicine and Surgery clinical training, Louisiana State University
- 2005-2008 Radiology Residency, University of Pennsylvania
- 2008-Present Assistant Professor, Department of Environmental and Radiological Health Sciences, Colorado State University

Board Certification

American College of Veterinary Radiology (2008)

B. Selected peer-reviewed publications (in chronological order). Do not include publications submitted or in preparation.


## APPENDIX B

### RADIOLOGY RESIDENCY - PLAN OF STUDY

#### FIRST YEAR

<table>
<thead>
<tr>
<th>Summer Trimester</th>
<th>Fall Trimester</th>
<th>Spring Trimester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical training radiology (submit routine radiographic examinations for formal approval by radiologist, large and small animal)</td>
<td>Clinical radiology rotation with a radiologist</td>
<td>Clinical radiology rotation with a radiologist</td>
</tr>
<tr>
<td>Clinical radiology rotation with a radiologist (4 Months Radiology)</td>
<td>STAT307 Introduction to Biostatistics or equivalent (if no previous statistics class)</td>
<td>US rotation</td>
</tr>
<tr>
<td></td>
<td>ERHS 721 Radiation Oncology (Elective)</td>
<td>ERHS 701 - Alternate Imaging (Odd # years)</td>
</tr>
<tr>
<td></td>
<td>ERHS 712 Physics of Diagnostic Imaging (Odd # Years in Fall only)</td>
<td>ERHS 711- Advanced Radiological Interpretation (Even # years)</td>
</tr>
<tr>
<td></td>
<td>VS602 - Critical eval. of scientific literature (Fall only)</td>
<td>VS/ ERHS 662 - Applied research</td>
</tr>
<tr>
<td></td>
<td>ERHS 795O - US - independent study 2 credits (4 Months Radiology)</td>
<td>Retrospective study proposal due (1 Month Rad., 2 Months US)</td>
</tr>
</tbody>
</table>
## SECOND YEAR

<table>
<thead>
<tr>
<th>Summer Trimester</th>
<th>Fall Trimester</th>
<th>Spring Trimester</th>
</tr>
</thead>
<tbody>
<tr>
<td>VTH - clinical radiology rotation</td>
<td>VTH - clinical radiology rotation</td>
<td>VTH - clinical radiology rotation</td>
</tr>
<tr>
<td>US rotation</td>
<td>Computed Tomography/Magnetic Resonance Imaging rotation</td>
<td>ERHS 550 – Principles of Radiation biology</td>
</tr>
<tr>
<td>Retrospective study</td>
<td>ERHS 721 Radiation oncology (Elective)</td>
<td>ERHS 701 - Alternate Imaging (Odd # years)</td>
</tr>
<tr>
<td>Finish retrospective study</td>
<td>ERHS 712 Physics of Diagnostic Imaging (Odd # years, Fall semester)</td>
<td>ERHS 711 – Advanced Radiological Interpretation (Even # years)</td>
</tr>
<tr>
<td>(2 Months Rad., 2 Months US)</td>
<td>Write proposal for prospective research project</td>
<td>Begin research prospective study</td>
</tr>
<tr>
<td></td>
<td>Complete paper for retrospective study (3 Months CT/MRI)</td>
<td>(3 Month Rad.)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nuclear Medicine rotation</td>
</tr>
</tbody>
</table>
THIRD YEAR

<table>
<thead>
<tr>
<th>Summer Trimester</th>
<th>Fall Trimester</th>
<th>Spring Trimester</th>
</tr>
</thead>
<tbody>
<tr>
<td>VTH - Clinical radiology Rotation</td>
<td>VTH - Clinical radiology rotation</td>
<td>VTH - Elective diagnostic imaging rotation</td>
</tr>
<tr>
<td>Nuclear medicine rotation</td>
<td>Ultrasound rotation</td>
<td>Masters oral exam</td>
</tr>
<tr>
<td>Continue research on prospective study</td>
<td>Radiation therapy rotation (2 weeks)</td>
<td>Study for ACVR board certifying examination (1 Month Rad., 2 Months Elective)</td>
</tr>
<tr>
<td>Submit application for ACVR examination by July 1 (2 Months Rad., 1 Month NM)</td>
<td>Finish prospective study</td>
<td></td>
</tr>
<tr>
<td>Study for ACVR Preliminary Written Exam</td>
<td>Papers written for publication (1 Month Rad., 2 Months US)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sit Written Exam</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Seminar Presentation (VS 792)</td>
<td></td>
</tr>
</tbody>
</table>

Months of Service Training

<table>
<thead>
<tr>
<th>Year</th>
<th>Radiology</th>
<th>Ultrasound</th>
<th>CT/MRI</th>
<th>NM</th>
<th>Elective</th>
<th>Off Clinic + Vacation (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>First</td>
<td>9</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>10 + 10</td>
</tr>
<tr>
<td>Second</td>
<td>5</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>18 + 10</td>
</tr>
<tr>
<td>Third</td>
<td>4</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>43 + 10</td>
</tr>
<tr>
<td>Total</td>
<td>18</td>
<td>6</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

1. Additional Elective course may be added in consultation with Graduate Advisor (See accompanying list in syllabus)
2. Present cases in Known Case Conferences and review assigned journals in Journal Club

Proposed outline for guidance: Because of some courses being taught every other year and scheduling requirements in this hospital, the schedule above may need to be altered; however, the total content will be completed in the outlined 3 years.
APPENDIX C

COURSE OUTLINES

Required Courses:

STAT 307 03(3-0-0). Introduction to Biostatistics.
F, S. Prerequisite: M 121. Credit allowed for only one course: ST 301, ST 307/EH 307, ST 309, ST 311. Biostatistical methods: confidence intervals, hypothesis tests, simple correlation and regression, one-way analysis of variance. This course is only required if the resident has no prior statistics course.

ERHS 595B-K Var. Independent Study.

ERHS 550 05(5-0-0). Principles of Radiation Biology.
S. Prerequisite: BY 310; R 300 or R 530. Dose-response relationships; physical, chemical, and biological modification of radiation damage; radiation oncology; radiation genetics and oncogenesis.

ERHS 701 Radiographic Techniques (Alternate Imaging)
S. Prerequisite: VM 786A or B or C or D. Diagnosis and interpretation principles with ultrasound, nuclear scintigraphy, computed tomography and magnetic resonance imaging.

ERHS 711 Var. Radiographic Interpretation.
S. Prerequisite: VM 786A or B or C or D. Radiographic interpretation of disease processes of all major systems in large and small animals including contrast examinations.

ERHS712 Physics of Diagnostic Imaging.
The physics of imaging with radiography, digital radiography, ultrasound, nuclear scintigraphy, computed tomography and magnetic resonance imaging. Offered Fall semester only of odd # years.

VS 792 Var. Seminar.

VS 602 02(1-0-1). Critical Evaluation of Scientific Literature.
F. Prerequisite: EH 307/ST 307 or ST 301. Method of evaluating scientific literature. Students present critiques of papers they have chosen.
Elective Courses:

**ERHS 400 03(2-3-0). Radioisotope Techniques.**
F, S. Prerequisite: C 112, PH 122. Properties of radioactivity and radiations, radiochemistry, radiobiology, dosimetry; use of radiotracers in experiments.

**ERHS 721 Var [1-3]. Radiation Oncology.**
F, S, SS. Management of spontaneous and experimental tumors with emphasis on radiation therapy.

**ERHS 770 01(0-0-1). Radiation Biology Basic to Tumor Therapy.**
F, S, SS. Prerequisite: Written consent of instructor. Current aspects of radiation biology pertinent to improvements in radiation therapy.

**ERHS 795 Var. Independent Study.**

**VS 660 03(3-0-0). Neurology and Neurosurgery.**
S. Diagnostic and surgical techniques for the nervous system.

**VS 701 Var [1-3]. Postgraduate Medicine I.**
F. Prerequisite: D.V.M. or written consent of department head. Comprehensive review, update of immunology, emergency medicine, dermatology, and endocrinology.

**VS 702 Var [1-3]. Postgraduate Medicine II.**
S. Prerequisite: D.V.M. or written consent of department head. Comprehensive review, update of neurology, gastroenterology, and ophthalmology.

**VS 703 Var [1-3]. Postgraduate Medicine III.**
F. Prerequisite: D.V.M. or written consent of department head. Comprehensive review, update of oncology, cardiology, reproduction, ophthalmology, and radiology.

**VS 704 Var [1-3]. Postgraduate Medicine IV.**
S. Prerequisite: D.V.M. or written consent of department head. Comprehensive review, update of hematology, nephrology, urology, respiratory, hepatic, and pancreatic.