My ABR Exam Experience

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Disclosure: I have no financial interests in any products or services described herein.

Part 1
- Basic Physics:
  - First third of Kahn
  - Schaum’s Physics Review
  - Imaging and Nuclear physics
- Clinical
  - Radiobiology for Radiologist, Hall
  - Review A&P, particularly diagnostic images
  - Fetal Dose effects, Radiation Syndrome, health physics

Part 2
- Handcalcs: Kahn and Bentel
- Raphex questions
- MDCB review guide
- TG-51, TG-43
- McGinley Shielding Techniques
Similar study material to Part 2, but need to know at the level so that you can teach/explain
- TG reports.
- NRC/your agreement state regulations
- Dose limits
- RSO requirements (you may be an RSO someday)
- DOT/IATA RAM shipping regulations
- How’s it’s done in your clinic. Your equipment, shielding for your vault, your QA, how you take measurements, how you do treatment planning, your treatment planning system, your Policies & Procedures.
- OK to say we don’t do ___ procedure in my clinic, but must be able to describe the fundamentals.
- Memorize constants and equations (trivia)

Part 3 tips
- Equipment is very commonly failed.
  - Study ion chambers, survey meters, electrometers, accelerators, diagnostic imaging devices (x-ray, CT, MRI, ultrasound)
- Examiner could be shaking his head “no” just to through you off
- Be conservative. Always Safety and ALARA
- Be able to do “back of the envelope calculations.” You will not use/need a calculator.

My Study Schedule
- Part 1 (August 21, 2012)
  - Mock Part 1 exam taken in May in Grad. School
  - ABR prep course at AAPM in July
- Part 2 (August 28, 2012)
  - Needed 36 months clinical experience
  - Started studying ~6 months prior. Studied several hours several days a week.
  - ARC written review course mid-July (at AAPM)
- Part 3 (May 20-23, 2012)
  - Break for Sept-Oct, resumed studying in November
  - ARC oral review course in January
  - ARPI review course in March, Mock Orals in April and May
  - WePassed.com subscription March-May
Pearson Vue

- Sign up for preferred location as early as possible
- Do their practice exam to familiarize yourself with the interface (practice questions are not ABR practice questions)
- Practice with Windows calculator: e^x, ln(x)
- Go early in case there's traffic/weather. Have reliable transportation. Do not be late.
- Know PearsonVue rules: bring ID, nothing allowed in testing room, no chewing gum, given laminated paper and a marker to work out math

Exam Day

- Part 1: 5.5 hours, General + Clinical
- Part 2: 4 hours, Simple + Complex
- Part 3: ½ day, 5 examiners, 5 questions each, 30 min slots (5 min per question), may have a 30 min "break"
- Arrive by Part 3 a day early. Business attire not required.
- Do Not Bring your phone or review material with you to exam. Can bring suitcase and store it.

5 Question categories:
- Radiation Protection and Patient Safety
- Patient-Related Measurements
- Image Acquisition, Processing and Display
- Calibration, Quality Control and Quality Assurance
- Equipment

- Orals Scoring: allowed to fail 1 question per category and still pass. Fail 2 questions in a category and you fail that category. Fail 3 or more questions in any category and you fail Part 1. Fail 4 or more questions in the same category and you fail Part 3. Fail only one category and you conditionally pass… Could fail 4 ques. and pass, fail 4 ques. and conditional pass, or fail 4 ques. and completely fail (fail 2 ques. times 2 categories).
- But during the oral, you can't really tell what category a question is in when you're being asked. Get pass/fail results a couple days after the exam (posted online).
- Must wait several weeks for certificate (and for certification letter if needed for HDR QMP).

Financial Breakdown

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<tr>
<th>Cost</th>
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<tr>
<td>Part 1 registration</td>
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Where to get books

- http://www.advancedmedicalpublishing.com/
- http://www.medicalphysics.org/
Disclaimers

- I am not affiliated with the ABR.
- I do not write exam questions for the ABR.
- I am not familiar with the details of current exam content.
- Sample questions presented in this talk are my own creations and do not include copyrighted ABR material (to the best of my knowledge).
- Lists of recommended study materials are suggestions only, and are not meant to be all-inclusive!

Part 1: General Exam

Topics covered:

- Undergrad material:
  - Basic physics (mechanics, E&M)
  - Relativity
  - Simple calculus
  - Simple circuits
  - Optics
  - Statistics
  - Basic computer science

- Grad school material:
  - Radioactivity
  - Radiation interactions
  - Radiation biology
  - Radiation detection
  - Radiation safety
  - Basic concepts of therapy, diagnostic, and NM physics

Most questions require some calculation

Sample Questions

- If a cannonball is launched with a velocity of 30 m/s and an angle of 50 degrees, what is its range?
- A futuristic spaceship has an observed length of 100 m when stationary but an observed length of 20 m when travelling at full speed. If a clock on the spaceship indicates that the ship travelled at full speed for 1 hour, how long was the trip for an observer watching from earth?
- An image file is 4096x3420 pixels with a 14-bit gray scale. How many of these images can be stored in a 1 TB hard drive?
- What interaction is most likely for a 2 MeV photon in soft tissue?
- If a 100 keV photon undergoes Compton scattering and changes direction by 53 degrees, how much kinetic energy is transferred to the electron?

Study Material Recommendations

- Your favorite undergrad physics textbook, or a review book such as Schaum’s Outline of College Physics by Hecht et al.
- The Essential Physics of Medical Imaging by Bushberg et al.
- Radiation Detection and Measurement by Knoll
- Radiating Safety in Nuclear Medicine by Lombardi (good source of practice questions)
- Review of Radiologic Physics by Huda and Slone (another good source of questions)
- RAPHEX exams (General section)
- Sample questions on ABR website

Tips

- Know common constants like speed of light, gravity, rest mass of an electron, etc.
- Less commonly used constants will be given to you.
- Equations need to be memorized.
- Know the difference between radiation units and be able to convert quickly (R, Gy, rad, Sv, rem, Ci, Bq).
- Know other common conversions (ft/m, °F/°C, Gauss/Tesla, etc).
- Pay attention to the units used in each question and the units requested for the answer.
- Practice using the Windows calculator!
- Conserve time – if a question is taking you longer than 1-2 minutes, flag it and move on.
Part 1: Clinical Exam

**Topics covered:**

- General anatomy & physiology
- Radiation biology
- Fetal effects
- Cancers
- Imaging exams appropriate for specified anatomy or conditions
- Recognition of anatomy on clinical images (CT, MRI, x-ray, US)

Sample Questions

- Where is the internal iliac artery?
- What imaging exam is capable of providing the best contrast between white and gray matter in the brain?
- A fetus is exposed to 2 Gy of x-ray radiation 30 days after conception. If a biological effect is seen, what effect is most likely?

Study Material Recommendations

- An A&P review book such as *Schaum's Outline of Human Anatomy and Physiology* by Alcamo and Van De Graaff
- A book on radiological anatomy
- *Radiobiology for the Radiologist* by Hall and Gladdia
- *The Essential Physics of Medical Imaging* by Bushberg et al. (Rad bio chapter)

Tips

- Memorization, memorization, memorization.
- You are not in medical school. Don’t focus on minutiae.
- A&P questions are not restricted to items “obviously” related to radiology or radiation oncology.
- Study radiological anatomy for both planar and cross-sectional images. Focus on major structures such as organs, bones, and large vessels.
- You will not know every imaging exam used for every condition. Have an idea about the strengths and weaknesses of different modalities so you can make an educated guess.

Part 2: Written Specialty Exam

**Topics covered:**

- Physics, QC testing, typical doses, and artifacts for all modalities:
  - Radiography (CR, DR, and film)
  - Fluoroscopy (Flat panel and II)
  - CT
  - MRI
  - US (incl. Doppler)
  - Mammography and stereotactic breast biopsy
- Shielding
- Radiation protection
- Workstation QC
- Image quality measures
- Image processing
- Dose calculations (skin dose, fetal dose, effective dose)
- Biological effects
- Basic radiation physics

Questions are still calculation-heavy, but not as much as Part 1

Sample Questions

- What fraction of the longitudinal relaxation has recovered after 1000 ms if T1=2400 ms?
- For screen-film mammography, what is the minimum optical density allowed for the ACR phantom background?
- What would be the effect of multiplying an image in K-space with a Gaussian filter?
- What is the calculated blood velocity using a 5 MHz transducer if the Doppler angle is 45° and the frequency shift is 2 kHz?
Study Material Recommendations

- The Essential Physics of Medical Imaging by Bushberg et al.
- Review of Radiologic Physics by Huda and Slone
- NCRP Report 147
- AAPM TG-18 Report: Assessment of Display Performance for Medical Imaging Systems
- ACR testing manuals
- AAPM/RSNA Physics Tutorials for Residents (in Radiographics)
- RAPHEX exams
- Sample questions on ABR website
- Diagnostic Ultrasound: Physics and Equipment by Hoskins
- MRI from Picture to Proton by McRobbie

Tips

- Memorize equations.
- Focus mostly on current technology, but do not completely neglect older technologies such as film and image intensifiers.
- Do not worry about state-of-the-art or very specialized technologies or techniques.
- Brush up on the Part 1 material related to radiation physics, radiation biology, etc.
- If you are not familiar with ACR or TG-18 testing, study the manuals.

Part 3: Oral Specialty Exam

Topics covered:

- Physics, QC testing, typical doses, and artifacts for all modalities:
  - Radiography (CR, DR, and film)
  - Fluoroscopy (Flat panel and II)
  - CT
  - MRI
  - US (incl. Doppler)
  - Mammography and stereotactic breast biopsy

- Shielding
- Radiation protection
- Workstation QC
- Image quality measures
- Image processing
- Dose calculations (skin dose, fetal dose, effective dose)
- Biological effects
- Basic radiation physics

Few if any calculations. Be able to answer questions and have an intelligent conversation about these topics.

Sample Question

- What test is being performed on the unit in Figure A? What is the purpose of this test?
- What other tests would you perform on this type of unit?
- How would a stereotactic biopsy unit differ in design from the unit in Figure A?
- The image in Figure B is from a stereotactic biopsy unit. What is the artifact shown? How could it be corrected?
- Is it possible for a similar artifact to occur on the unit in Figure A?

Study Material Recommendations

- The Essential Physics of Medical Imaging by Bushberg et al.
- NCRP Report 147
- AAPM TG-18 Report: Assessment of Display Performance for Medical Imaging Systems
- ACR testing manuals
- AAPM/RSNA Physics Tutorials for Residents (in Radiographics)
- Review of Radiologic Physics by Huda and Slone
- Diagnostic Ultrasound: Physics and Equipment by Hoskins
- MRI from Picture to Proton by McRobbie

More Study Recommendations

- As you are out testing equipment:
  - Imagine you are teaching what you are doing to a new grad student. What tests are performed? How and why do you do them? What are the passing criteria? What are the limitations of your test equipment?
  - Describe the unit to yourself. Ask yourself questions about it and imagine where they might lead. (Ex: What type of detector does it have? How does that type of detector work? What artifacts might you expect to see?)
  - Describe the typical use of the unit. What types of studies is it used for? What are common techniques, doses, and image processing? What safety precautions are used with this equipment?
More Study Recommendations

- Make sure you are not too dependent on technology:
  - If you normally use a commercial program to do shielding calculations, can you do them by hand?
  - When testing equipment, would you be completely lost without your laptop and protocols?
  - If you have a detector that gives a one-shot HVL, do you remember how to test HVL with Al?

- Go through Bushberg and other relevant books. Study the figures. Would you recognize them out of context, without figure captions? Pick random figures and practice explaining them.

Tips

- Keep your studying focused on understanding concepts and clinical applications. Do not spend time memorizing equations.
- If you do not do a certain type of work, try to shadow someone who does (if not a physicist, then at least a tech). If possible, set up "shots" for yourself.
- You should know clinically relevant information such as occupancy factors, dose limits, common doses, QC tests performed, typical results of those tests, etc.
- If you don’t know the answer to something, say so. Explain where you would find the information. Don’t make stuff up.
- Be familiar with common phantoms.
- Be familiar with common artifacts and troubleshooting techniques.
- Know the names of important NCRP and AAPM documents.
- Dress professionally (most wear suits).
- I found that attending a mock oral exam was very helpful.
ABR UPDATE:

RECENT CHANGES AFFECTING INITIAL CERTIFICATION AND MAINTENANCE OF CERTIFICATION

Geoffrey S. Ibbott, Ph.D.
AAPM Spring Meeting
March 19, 2012

AMERICAN BOARD OF RADIOLOGY

- One of 24 member boards of the American Board of Medical Specialties
- Board of Trustees: 24 members from 8 sponsoring organizations
  15 Radiologists, 6 Radiation Oncologists,
  3 Physicists: Jerry Allison, Geoffrey Ibbott, Richard Morin
- Offices in Tucson, AZ
  - Executive Director: Gary Becker, MD
  - Associate Executive Director for Physics:
    Don Frey, PhD

ABR MISSION

“To serve patients, the public, and the medical profession...”

“. . .by certifying that its diplomates have acquired, demonstrated, and maintained a requisite standard of knowledge, skill, and understanding. . .”

Saturday, March 17, 12
New ABR Endeavors To Assist Diplomates

- The ABR must demonstrate accountability to its diplomates.
  - Without them the ABR cannot implement its mission.
- Relevance of ABMS/ABR certification must be demonstrated to the public, payers, and the government.
- Medicine is experiencing a fusion of economics, quality, safety, and reimbursement
  - Organizations must work together to effectively project and promote our specialty for the benefit of our patients.

Age of Transparency and Accountability

THE ABR 2012 REQUIREMENTS

- As announced in 2002:
- The candidate must be enrolled in or have graduated from a CAMPEP-accredited medical physics program
- Candidates who apply in 2011 to take the Part 1 examination in 2012 must meet this requirement
- Program must be accredited at, or soon after, graduation
REGISTRATION FORM

THE 2012 REQUIREMENTS

- Office to receive complete applications only
- Standard application period:
  - July 1 – October 31, 2011
- Notification of receipt/denial of registration:
  - November 30
- First notification of eligibility: Feb 28, 2012
- Final notification: April 30, 2012

AUDIT POSSIBILITY

- A portion of all new registrations will be audited to confirm that:
  - Graduate students satisfy requirement for undergraduate physics background
  - Residents satisfy requirement for medical physics coursework

Saturday, March 17, 12
WRITTEN EXAM
PART 1

- Written Exam
- Administered at Pearson VUE
- General and Clinical
- Must pass within 5 years of admission

WRITTEN EXAMS

75 Type A questions (multiple choice, one correct answer)
  - 50 Simple (limited calculations)
  - 25 Complex (calculator often required)
  - Computer-based
  - Pearson VUE
  - Requires MS Windows calculator

EXPERIENCE

You are currently working in a clinical medical physics environment under the supervision of a certified medical physicist.

Satisfied if enrolled in a CAMPEP-accredited program

Volunteer position may be accepted if formal structure

Saturday, March 17, 12
WRITTEN EXAM
PART 2

- Education - must have completed graduate degree
- Cannot be taken until passed Part 1 (2010)
- Experience - 36 mo.

EXPERIENCE - PART 2

You must have had at least 3 years (36 months) of full-time equivalent clinical experience in ... an approved department or practice in the area(s) in which certification is sought under the supervision of a certified medical physicist.

This requirement must be satisfied by June 30 of the year in which the Part 2 exam is to be taken.

A 24-month CAMPEP-accredited residency program satisfies this requirement

EXPERIENCE

- Clinical component of educational program:
  - MS ≤ 6 months, PhD ≤ 12 months
- Postgraduate internship or residency
- Postdoctoral research with clinical component
- Postgraduate employment
SUPERVISION

The certified medical physicist designated as the supervisor of clinical training must interact with the candidate (trainee) on a regular basis.

*For NRC recognition* (AMP or RSO) ≥ 24 months experience under supervision of an ABR certified radiologic physicist

“BOARD ELIGIBLE”

- ABR now recognizes the term “board eligible”
- Physicist candidate is “board eligible” after:
  - Passing Part 1, and
  - Being admitted to take Part 2 exam or completing residency (whichever occurs first)
- Permitted 6 years to pass Parts 2 & 3

WHAT HAPPENS IN 2014?

- The candidate must be enrolled in or have graduated from a CAMPEP-accredited residency program
- As determined by AAPM in ~2006, originally intended to go into effect in 2012
- Candidates applying in 2013 for Part 1 examination in 2014 must meet this requirement
requirements for oral exam

- Must have passed Parts 1 and 2
- Must travel to Louisville
- [May be a different location in future]

oral exam

5 Examiners

5 Areas
- Radiation Protection & Safety
- Patient Related Measurements
- Image Acquisition, Processing, & Display
- Calibration, Quality Control, & Quality Assurance
- Equipment

oral exam

- 3 Committees
  - Computer based
  - Executive West–Crowne Plaza,
  - Given in examiner’s room
  - Role of examiner
PASSING RATES: ORAL EXAMS

What is ABMS MOC™

WHO IS ABMS?

- ABMS sets the standards for the certification process to enable the delivery of safe, quality patient care
- ABMS is the authoritative resource and voice for issues surrounding physician certification
- The public can visit certificationmatters.org to determine if their doctor is board certified by an ABMS Member Board
WHAT IS ABMS MOC™?

- A process designed to document that physician specialists, certified by one of the Member Boards of ABMS, maintain the necessary competencies to provide quality patient care.
- ABMS MOC promotes continuous lifelong learning for better patient care.

6 COMPETENCIES OF MOC

- Professionalism
- Practice-Based Learning/Self Improvement
- Practice Knowledge
- Patient Care and Procedural Skills
- Interpersonal/Communication Skills
- System-Based Practice

4 COMPONENTS OF MOC

- Component 1: Professional Standing
  - Validity of the license to practice.
- Component 2: Lifelong Learning and Self-Assessment
  - The requirement to keep current in the field.
- Component 3: Cognitive Expertise
  - Examination process.
- Component 4: Assessment of Practice Performance
  - Practice Quality Improvement.
PERSONAL DATA BASE
(PDB)

ABR Headquarters
Tucson, Arizona

URL: http://theabr.org
On home page one finds: PDB Log in space

PDB LOG-IN

Welcome back Dr. Geoffrey Stephen Ebbott!
You last signed in on 2012-03-21 17:35:30.

MOC Enrollment: You are currently enrolled in; MOC in Diagnostic Radiologic Physics and MOC in Medical Nuclear Physics.
Licenses: Your TX state license expires on 3/31/2012.
Payments: Your current balance due is $0.00.
MOC Status: Your MOC Cycle in Diagnostic Radiologic Physics & MOC in Medical Nuclear Physics will complete in 2010.
Part 1: Professional Standing
Part 2: Lifelong Learning & Self Assessment 100-DR Category 1 Credits
Part 3: Cognitive Practice
Part 4: Practice Quality Improvement

ATTESTATION PROCESS:
ATTESTEE VIEW

Welcome Back page (MOC Home)

MOC Enrollment: You are currently enrolled in; MOC in Diagnostic Radiologic Physics and MOC in Medical Nuclear Physics.
Licenses: You do not have any state license on file with The ABR.
Payments: Your current balance due is $0.00.
MOC Status: Your MOC Cycle in Diagnostic Radiologic Physics will complete in 2012.
Part 1: Professional Standing 0 letters of atrribution on file, 0 pending.
Part 2: Lifelong Learning & Self Assessment 100-DR Category 1 Credits
45 DEEP Credits
Part 3: Cognitive Practice
Part 4: Practice Quality Improvement

News
COMPONENT 2: LIFE LONG LEARNING & SELF ASSESSMENT

Dr. Geoffrey Stephen Jibbs (ABR ID P0842)

Category 1 CME & Self Assessment Modules (SAMs)

OFFICIAL CME/SAM Attestation (Required)
Record your official Category 1 and SAM count here.

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<thead>
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<th>Category 1 CME Credits</th>
<th>SAM Credits</th>
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COMPONENT 3. COGNITIVE EXPERTISE

- Expected to
  - maintain the essentials of core knowledge fundamental to the practice of Radiologic Physics, and
  - to remain up-to date on evolving technologies, protocols, procedures and techniques involving applications of physics in medicine.

- Fulfillment of these expectations will occur by evaluation of cognitive expertise utilizing a multiple-choice examination in a secure testing center.

COMPONENT 4. EVALUATION OF PQI

- Diplomates must provide information regarding their active participation in the profession of Radiologic Physics over the 10-year period.

- The PQI program will be focused on the radiological physicist as a medical professional who contributes to and supports patient care, patient safety, and education.

- The PQI evaluation will be directed toward the diplomate's activities in fulfilling obligations in specific programs that have prescribed evidence-based standards and criteria.
CATEGORIES OF PQI PROGRAMS/PROJECTS

- Type 1 – Individual Based
- Type 2 – Society Based
- Professional and Regulatory Guidelines
- Safety for Patients, Employees and the Public
- Educational Activities

ABMS of the Future

- More robust
- More legislatively active
- Continuous MOC rather than 10 year cycles
- Involvement and promotion of institutional MOC
- Significant presence of primary care boards in ABMS governance
- Competition from rogue organizations for stature

PQI Projects and Templates Available from Several Organizations