Fall 2014

The Artistic Eye and the Radiologist
By Mark Hom, Interventional Radiologist

Radiology is an intellectual pursuit, requiring thorough knowledge of pathophysiology, anatomy, physics, and technology. Radiologists must also develop visual talent to be successful at interpreting images. Mark Hom, a radiologist, medical illustrator, author, and digital artist, explains why radiologists need to develop their artistic eye.

With the tremendous technical advances in medical imaging and understanding the disease processes, it is easy to forget that the most basic and important quality of a good radiologist is observation. We teach our radiology residents to use logic, analysis, and language to interpret and convey radiological findings. These are left-brain functions that are relatively easy to teach and measure. However, some other skills that radiologists must develop are much harder to impart and quantify. Much of the radiologist’s work involves visualization, conceptualization, and pattern recognition, which are right-brain functions. With multiplanar modalities, the number of images that radiologists must decipher has skyrocketed. This much visual information is really too much for the left side of the brain to handle. To make sense of it all, it helps to develop the more artistic right side of the brain.

As the child of an artist/art dealer father and a biochemist mother, I was fortunate to develop my artistic eye long before becoming a radiologist. We generally had two types of reading material lying around the house: issues of *Scientific American* and old master art catalogues. More than just being exposed to art, appreciating art rewired my brain and changed the way I approached learning. Whereas my classmates would try to memorize the details and have difficulty grasping the big picture, I would always try to visualize the big picture first; then the little details would simply fall into place. Be it history, shop class, organic chemistry, or physics problems, mental visualization was always the starting point. In my first year of medical school, I learned human anatomy by sketching the muscles and neural pathways in my notes, which worked wonderfully. I credit this visual method of learning anatomy with my success on the anatomy practical final exam, where I was the only medical student to score 100%. The professor noticed my ink sketches and, with a Dean’s Grant and Holderness Fellowship, I illustrated the anatomy lab manual between my first and second years of medical school (sacrificing the last summer vacation of my entire career!). My early and

Fig. 1—Wilhelm Roentgen holding a cathode ray tube. Digital sketch by Mark Hom.
unwavering choice of medical specialty was radiology because it was so visual.

When scrolling through a high-resolution CT scan, it is not enough to expect the pathology to jump out at you. For the more subtle findings, one needs both a systematic approach to thoroughly examine each organ structure and an artistic eye to reveal subtle differences in symmetry, contrast, exposure, and patterns. In my older patient population, I estimate that a high-resolution body CT scan has as many findings as the age of the patient. To read a modern CT scan in a timely fashion, the radiologist needs to train the artistic right side of the brain.

Well into my radiology career, I came up with an idea to explain exercise and fitness under the umbrella of mitochondrial cell energy (a big-picture concept). I was extremely fortunate to be teamed with Greg LeMond (three-time Tour de France champion) and Elsevier (which contracted us to write two books—one version for athletes and the other for scientists). In addition to writing the scientific content, I was also tasked with illustrating the books with artwork that had to both meet Elsevier’s high artistic standards and appear exclusively in one book or the other (i.e., not shared between the two books). Illustrating two books with traditional art would take too long, would make editorial corrections difficult, and would require starting from scratch for each version. The solution was digital art.

A digital interface allows the artist to draw either on a graphics tablet or directly on a touch-sensitive screen, using a stylus to create perfect lines, shapes, and digital brush strokes. Because the input is stored data, the artwork can be easily corrected or modified, greatly speeding up production time.

The portrait of Wilhelm Roentgen (Fig. 1) began as a practice sketch so I could develop hand-eye coordination with my new tablet and graphics software. I used only one simple line-drawing tool from the many dozens of digital art tools available. The Roentgen digital drawing is composed of many thousands of hand-drawn lines. Each line is vector data, whose shape, thickness, color, taper, and position can be edited. With traditional ink, one bad line or smear can ruin a drawing. With digital art, even huge mistakes are easily reversed. The black-and-white technique in this sketch was inspired by Roentgen, himself, who performed most of his laboratory work in darkness as he discovered a new form of light. Thus, a portrait of Wilhelm Roentgen emerging from the darkness perfectly captured this duality of light and dark. I was also inspired by what I perceived as a lack of historical reference among my radiology residents—I was disappointed to find that only a few of my residents recognized Roentgen from this portrait, whereas all of my radiology technologists recognized him immediately. Wilhelm Roentgen was, after all, the first “rad tech”—and he certainly knew how to handle x-ray machines and film cassettes.

Fig. 2—Theodore Roosevelt, 26th president of the United States. Digital sketch by Mark Hom.

Fig. 3—Mitochondrial evolution diagram using vector graphics software. Digital image by Mark Hom.
While most artists draw areas of shadow and darkness, my technique allows the artist to draw areas of light. With delicate application of line thickness and curves, one can portray texture, mood, and emotion. The technique is especially effective in depicting historical figures, such as Teddy Roosevelt (Fig. 2), because the black-and-white woodcut effect is in keeping with older printing styles. Overdrawing the white lines results in loss of texture, just as a “whited-out” (or overexposed) chest radiograph has less information. With this art technique, less is definitely more. The secret is in knowing when to stop.

With fairly inexpensive digital art equipment and software, scientific journal authors can illustrate their own articles. The diagram of mitochondrial evolution (Fig. 3) uses layers that separate the illustration into various components, any of which can be edited later. The faded background is a base layer, the branches and leaves (each editable) are the next layer, and the annotations are the top layer. When the layers are combined, the total effect is seamless. Each item can be changed on a whim without needing to start over.

Digital art is not restricted to line drawings and diagrams. In The Human Eye (Fig. 4), photorealism was achieved with consumer sketching software on a conventional tablet. To create the illustration, only a few virtual tools were needed: a color palette, an airbrush for the skin tones and lighting effects, a fine pencil tool for the iris muscle detail, and a “noisy” brush for the skin texture and gloppy mascara effect.

Suggested Reading:


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### OCTOBER
- In Greek mythology, fall was supposed to be the time when Persephone rejoined Hades in the underworld.
- October has become famous as “Red October,” due to the Russian October Revolution of 1917, although in the modern Gregorian calendar, the revolution started in November.
- The last week in October is the only time of the year when all four major North American Sports league schedule games—the NBA generally starts in that last week, while the MLB postseason is just ending.

**October is...**
- Eat Country Ham Month
- International Drum Month
- Sarcasm Month (oh, really?)
- Seafood Month
- Apple Jack Month
- National Pizza Month
- National Stamp Collecting Month

### NOVEMBER
- November starts on the same day of the week as February in common years. November ends on the same day of the week as August every year.
- It’s quite common for some males in Australia (especially in the city of Melbourne) and New Zealand to sport a moustache during November. The custom is known as Movember (November is a portmanteau of the words “Moustache” and “November”) and is a fundraising event for men’s health issues.

**November is...**
- Peanut Butter Lovers Month
- Real Jewelry Month
- Manatee Awareness Month
- National Pomegranate Month
- World Sponge Month
- Adopt A Senior Pet Month
- National Diabetes Awareness Month

### DECEMBER
- December starts on the same day of the week as September every year. December ends on the same day of the week as April every year.
- December was originally the 10th month in the Roman calendar. The period of January and February didn’t really count as months, and the Roman calendar was based on a 304-day year, based on the approximate lunar month of 29.5 days.
- We celebrate Christmas on December 25th because in the fourth century, Pope Julius I announced that Christ’s official birthday would be December 25.

**December is...**
- National Bingo Month
- Write a Friend Month
- Read a New Book Month
- National Egg Nog Month
- National Write a Business Plan Month
- Tomato and Winter Squash Month
- Love Your Neighbor Month

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**It must be true – I read it on the Internet!**

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**Upcoming ARRS Annual Meetings**

**April 19–24, 2015**
- Toronto, ON, Canada
- Metro Toronto Convention Centre

**April 17–22, 2016**
- Los Angeles, CA
- Los Angeles Convention Center

**April 30–May 5, 2017**
- New Orleans, LA
- Hyatt Regency New Orleans
Strengthening the foundation of radiology is critical; however, so too is ensuring that the trajectory of the entire discipline continues to trace an arc along a curve defined by innovation and unparalleled expertise. It’s a curve that will ensure radiology continues to play a vital role in patient care—not just today, but well into the future.

*We can achieve this goal, but only with your help.*

We invite you to join your colleagues this year in making a tax-deductible gift to The Roentgen Fund, and help strengthen the foundation today and—more importantly—build a bridge to the profession of tomorrow.

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**SRS Committee 2014–15**

Bruce McClennan, Chair  
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Jonathan Dehner  
William Thompson  
Robert Campbell  
Lee Rogers  
Kay Vydareny  
Terry Ovitt  
James Youker  
Erik Paulson  
(Liaison to the Executive Council)

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**SRS Birthdays**

We wish these SRS members a very happy birthday:

**October**

1. Norman Kronacher  
4. James R. Custer  
5. Peter R. Miller  
7. Chein-Fang Yang  
11. Andrew K. Pozanski  
12. Robert E. Campbell, James E. Reinhardt  
16. Richard J. R. Byrne  
20. Joel E. Lichtenstein, William M. Thompson  
22. David C. Levin  
25. Ellen L. Wolf  
29. Sarah G. Pope  
31. Claremont F. Carter

**November**

2. Michael A. Noon  
4. Geoffrey A. Gardiner, Edward L. Miller  
9. Yoshihiro Hiramatsu, Amt A. Fischelick, Melvin L. Turner  
10. Anthony P. Garricano  
15. Rufus W. Head  
17. Sung-Woo Lee, William J. Casarella  
19. Albert Hale  
20. Raymond Gagliardi  
21. Jonathan Stolt, Anton Van Der Klis  
26. Kay H. Vydareny  
28. Richard S. Colvin

**December**

3. John Meehan, Stuart B. Paster  
5. Harry J. Barr  
6. Stephen F. Albert  
9. Terrence C. Demos, James Whiting  
10. Frank T. Daly, Jr.  
11. William F. Lindsey  
15. Barry H. Kart  
17. Charles Walter Snyder, Rajeshwar K. Luther  
26. Herbert F. Gramm  
28. Paul J. Drury  
29. Barbara L. Carter  
30. John Harley

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**SRS Notes**

**THE ROENTGEN FUND**

Don’t miss William Casarella’s talk, “Interventional Radiology: From Curiosity to Mainstream.”

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**ARRS Annual Meeting**

Toronto  
April 19–24, 2015

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