

Quote of the Month:

"About ten months ago a report reached my ears that a Dutchman had constructed a telescope, by the aid of which visible objects, although at a great distance from the eye of the observer, were seen distinctly as if near....A few days after, I received confirmation of the report in a letter written from Paris by a noble Frenchman, Jaques Badovere, which finally determined me to give myself up first to inquire into the principle of the telescope.... in a little while....through deep study of the theory of Refraction...I prepared a tube, at first of lead, in the ends of which I fitted two glass lenses, both plane on one side, but on the other side one spherically convex, and the other concave. Then bringing my eye to the concave lens I saw objects satisfactorily large and near, for they appeared one-third of the distance off and nine times larger than when they are seen with natural eye alone....At length, by sparing neither labour nor expense, I succeeded in constructing for myself an instrument so superior that objects seen through it appear magnified nearly a thousand times, and more than thirty times nearer than if viewed by the natural powers of sight alone...Without paying attention to its use for terrestrial objects, I betook myself to observations of the heavenly bodies...I viewed the moon...fixed stars and planets, with incredible delight."

Galileo Galilei in *The Starry Messenger*
(John Carey - Galileo and the Telescope)

1. Meeting commenced at 11:30 am and adjourned at 2:00 pm.
2. Members present: Bergschneider, Carney, Cherington, Collier, Foley, Gustafson, Kimberling, Lammertse, Langford, LeBlang, Wachtel, Yarnell.
3. New member: Phil Yarnell introduced Alfred S. Leblang. Alfred works with Magnetic Source Imaging and SQUIDS (Superconducting Quantum Image Detection devices). This technology was originally designed to detect submarines. It is used now to localize intracerebral lesions such as seizure focii. Alfred stated that MEG (magneto-electrogram) signals can be positive even when EEG and MRI are not diagnostic. Alfred will present us with a brief formal review of this topic at a future meeting.
4. I distributed an article in the July 27, 1996 issue of New Scientist by Kurt Kleiner. The article relates that "Scientists from NCAR in Boulder, Colorado are currently in Mexico "seeding" rain clouds by flying beneath them in an aircraft mounted with flares.

"Then new method is designed to extract rain from warmer clouds by providing particles around which water vapour will condense into drops. It was pioneered in South Africa by Graeme Mather...Mather originally noticed that clouds which gathered above a paper mill seemed to release unusually large amounts of rain....Typically, a cloud releases only about 30 per cent of its moisture as rain. Mather says that his technique can coax the cloud into dropping up to 70 per cent of its moisture."

Dan Breed of NCAR and a member of our Lightning Data Center is in Mexico now and, I believe, is a participant in this project.

I received an Email message from Jim Felix who works for Larimer County in wildfire suppression. He was referred to us by Pam Daale, meteorologist at Channel 7. He was seeking information on daily lightning strikes in Northern Colorado. His Email address is jfelix@frii.com. I replied to him that I would bring his message to our meeting. I also referred him to Rich Keen and to the

articles of Lopez and Holle. Ken Langford and Michael Foley suggested that Mr. Felix may want to contact Global Atmospherics at 1-800-283-4557. Michael will contact Mr. Felix via Email.

The LDC office received a call from Janet Jones of 'Unsolved Mysteries' TV program. She is interested in acquiring material about a lightning strike that would be of interest to their audience. We discussed this. One suggestion was that the patient, who was struck several times and who had family members struck at other sites, might chose to be a subject for a television program.

Several of us met in July to discuss a project to collect data on outpatient and in the field patients to augment our earlier publication on lightning injuries and fatalities in Colorado. Since our publication in 1993 (Bulletin of American Meteorological Society), outpatient coding procedures have been improved. Our committee includes: Melissa Carney, George Hodge, Julie Kimberling and me. Julie is the SAC Data Quality Coordinator of the Clinical Information Management (CIM) Department. Julie recently met with Michael Boyson and others at the Colorado Hospital Association regarding the importance of E-codes (External). I distributed a draft of a letter to be sent to hospital CEOs and medical directors to ask for their help in our acquiring data on outpatient lightning casualties.

I just received the program for the October meeting of the *Society for Physical Regulation in Biology and Medicine* in Chicago. Seven members of LDC will be presenting papers (Cherington, Cooper, Foley, Holle, Kithil, Lopez, Yarnell) at the Lightning Injuries Section. Mary Ann Cooper will be the moderator for that section.

I distributed a program of the 12th Annual Colorado Trauma Symposium presented by the Colorado Trauma Institute in Breckenridge, Colorado last week. I spoke at the meeting on 1) lightning injuries and 2) the Lightning Data Center.

5. Melissa Carney distributed our Directory for review before we send it with the next mailing. Melissa reported that we now have about 80 people on our mailing list. She prepared a questionnaire to be we send out with this mailing to learn how many people still want to receive our minutes. The group agreed that we continue to send minutes to all who respond to the questionnaire in the affirmative.

Melissa and Rich Kithil have been working on the Lightning Safety Education Seminar which will be held at St. Anthony Hospital Central on August 21 from 9 to 11am. She has already received 15 respondents who will attend this program. One hundred announcements were sent out. LDC members are invited to attend at no cost.

Unfortunately for us, Melissa has taken a new position (with an increase in salary.) We all applauded her for the exemplary work she has done for the LDC.

6. Howard Wachtel discussed induction modelling and lightning injuries. Howard, Phil Yarnell and I have wondered if inductive coupling could explain those cases of lightning injury where there were no tell-tale external signs of lightning strikes (e.g. burns or ruptured tympanic membranes). Howard stated that the magnetic field at 1 meter from a lightning bolt is about 2×10^{-2} Tesla where the current is circa 100,000 amps. This magnetic field is of the same order as one might find during and MRI procedure. The magnetic field at 1 meter from a powerline is

only about 0.2 microTesla units. The earth's magnetic field is 50 microTesla.

He raised the question: can the magnetic field associated with lightning, which induces current around the body, be enough to cause a change in cardiac rhythm and possibly damage? There is some evidence that if the exposure to the induced current occurred at the beginning of the QRS interval (or cardiac cycle) it may cause the heart to fibrillate. He mentioned, parenthetically, that a very large direct shock to the heart may cause a cardiac arrest with subsequent spontaneous return to a normal rhythm. Contrariwise, a smaller shock could result in a fibrillating heart which would require a second shock before a normal rhythm ensue.

Phil Yarnell reminded us of the patient on Pikes Peak who was fatally injured by lightning yet had not external evidence of a lightning strike. Phil, also, recited the events in Youngstown, Ohio where 4 golfers were standing in the vicinity of a lightning strike. Two of them had brief periods of loss of consciousness; one had minor changes in his ECG; and one had a cardiac arrest with no external signs (no burns or ruptured tympanic membranes).

Howard pointed out that, although one is protected from electric current when inside an closed automobile, he/she is still exposed to changes in the magnetic field. Alfred told us that metals that are used to shield MRI equipment from magnetic fields are aluminum and nickel.

- 7. Michael Foley reported that he and Richard Kithil are expert witnesses in a property damage lawsuit. A water treatment plant in the southeast suffered electrical equipment damage during a winter lightning storm.

Michael suggested that Global Atmospheric may agree to help us with some on site investigative endeavors at the site of lightning accidents. He also brought two Rocky Mountain News reports: 1) Walter Petersen of Colorado State University estimated the dimensions of lightning to be in the order off 4 feet by 10,000 feet; 2) 22 cattle near a tree were killed in Montrose, Colorado.

- 8. Rich Collier reported that NASA has developed a device, the size of a shoe box, which measures magnetic field wave forms. These devices are now being used at launch pad sites to measure the magnetic field penetration of space vehicles and payloads. Rich pointed out that because of the phenomenon of resonance, magnetic fields might resonate for up to a millisecond in metal objects or the human body, even though the lightning strike may be a matter of microseconds.

- 9. Ken Langford informed us that he currently has two photographic displays: 1) National Institute of Standards and Technology, and 2) Fiske Planetorium at Colorado University. Ken, Howard and I speculated about the path of current in a body of water such as a lake or pool. Howard wondered if a person was at a lower risk of injury from lightning if he were submerged as opposed to standing in the pool. Rich Collier pointed out that, although current would probably dissipate in all directions along the surface of the water, lightning has been known to "channel" in water or sand (e.g. fulgurites).

- 10. Kevin Bergschneider returned from Atlanta where he attended the Olympic games. He reports that there was much rain but he saw no lightning during the games. He told us that the Olympic Stadium resembles Coors Field in Denver, but he did not see any early streamer terminals or lightning rods. Kevin distributed a flyer

published by the American Red Cross entitled, "Lightning Safety Tips."

11. Next meeting: Friday the thirteenth of September, 1996 at St. Anthony Hospital Central in the Main Auditorium.

Respectfully submitted,



Michael Cherington, MD
Chair, LDC