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Hans Reichenbach...on physics

"If one knows physics only from a distance, it may appear to be merely strange names and mathematical formulae, and one may come to believe that it is an affair of the learned alone, ingeniously and wisely constructed, but without significance for men of other interests and problems. And yet one could do no worse injustice to physics than to turn away, repelled by this hard shell of technical terms with which it has surrounded itself. Whoever succeeds in looking behind this wall . . . will find there a science full of living problems, full of inner motion, full of the intense endeavor to find answers to the questions of the truth-seeking spirit."

—Atom und Kosmos, 1930

Kodak reports on:

how to prevent a pile of fish from catching fire . . . allaying fears of deviation from reciprocity . . . electronics through joy

Kodak
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Defense from oxygen

A can of sardines provides excellent protein for a field hand's lunch in the cotton country and a livelihood for a Maine man who would rather work on a herring seiner than a gas station. The applecart, however, is tipping a little. The field hand's wife can now often afford to slip a chicken sandwich into the lunch pail.

While the herring seiners go looking for gourmets to eat their catch, other fishermen are setting their seines for *Brevoortia tyrannus*, the fish the Pilgrim saw the Indian drop into the hole with the corn kernels, the most abundant of Atlantic coast fishes, ignored by cookbooks, the menhaden. To get it into the field hand's lunch pail, it is converted into chicken muscle tissue.

This complex process requires cooking the menhaden at a temperature below 180°F (which will coagulate and separate the protein but not degrade it); then squeezing, drying, and grinding the stew, adding it to corn and other agricultural and mineral products, and feeding the mixture to chickens. The drying step is critical. If oxidation of the fish fat gets out of hand, not only may the protein and vitamins be destroyed, but fire may break out.

This we have set about to prevent. To assure ourselves of a good supply of photographic developer, we long ago set up to make phenolic reducing agents in large quantity. We made so much that we had to find other markets. The difference between a reducing agent and an antioxidant is a mere technicality. One of our antioxidants, butylated hydroxytoluene, has long been accepted by competent and critical authorities as safe even for direct human food, at the proper levels. As *Tenox BHT—Agricultural Grade*, we are now selling it to the fish meal people. It saves them money. Their 40-ton piles of fish scrap require less costly shifting to keep them cool. A week is reported to have been cut off the curing time.

Even if you have no 40-ton piles of fish in the sun, Eastman Chemical Products, Inc., Kingsport, Tenn. (Subsidiary of Eastman Kodak Company) would love to talk to you about deceleration of oxidation on the grand scale. Incidentally, the closely allied Gulf of Mexico menhaden, Brevoortia patronus, *poses less of a self-heating problem. We wonder why.*

Millimicroseconds to months

When you let light fall on film, you are running a photochemical reaction. Bunsen and Roscoe, a pair who didn't flinch in the face of the obvious, formalized the observation that the amount of product resulting from a photochemical reaction must be proportional to the amount of energy used—intensity of illumination times its duration.

Later other scientists in turn covered themselves with glory by discovering that for photographic exposure this was not strictly true, and still others won Ph.D.'s by explaining why not. Intensity and duration slip the shackles of reciprocity a little. Over the broad spectrum of durations from millimicroseconds to months, a certain optimum rate of feeding energy to a silver halide emulsion is encountered. The manufacturer can roll the optimum somewhat one way or the other.

Calls for shifting it to favor the effectiveness of very dim light come from astronomers, among others. From an observatory director's viewpoint, cutting hours off exposures is like having more telescopes.

Business is brisker, though, on the other end of the scale. To more and more users of photography a hundred-thousandth of a second sounds like a terribly long time. Well-read types, they fear the deviation from reciprocity. To allay those fears, we offer them something new to read, a free pamphlet bearing the title "Kodak Films for Short Exposure-Time Applications."

It is obtainable from Eastman Kodak Company, Special Sensitized Products Division, Rochester 4, N. Y.

TV—rugged and sophisticated

Loath to fight World War III in an ad (though this may not be a bad place to fight it, personal safety considered), we can only generalize from the concept that to place a living human eye at the payoff end of an intricate and talented optical device may be inconvenient and unwise. Where the environment is too violent for the eye, we have developed a knack for substituting a television camera.

This calls for cameras more sophisticated than those which read boxcar numbers in remote corners of railroad yards. We take pickup tubes (drinking deep draughts of the knowledge of their manufacturers, just as they are welcome to milk us when it comes to photography) and festoon the tubes with electronic circuitry, optical elegance, and precision-mechanical musculature—all neatly woven together. The whole we put in small packages. We can make the packages do their duty gracefully under 15 g's of shock and 145 db of acoustic energy in each octave to 20,000 cycles/sec for x minutes at 200°F or y hours at −65°F after z months of storage at −80°F.

How did we happen to get electronically involved? Well, the biggest part of our business has always been ways and means of presenting an image to the eye. Electronics engineers we have in goodly numbers on such projects as machines that take a very quick look at a Kodacolor negative and instantly reach a complicated decision on how to vary some colored light beams to bring the greatest joy to the lady calling for

her Kodacolor Prints. With what such machines cost, they have to work when you turn them on. Like virtue, reliability becomes its own reward. This viewpoint our electronics engineers must quickly acquire.

Another corps of Kodak electronics engineers bring to TV-systems development the experience of packaging radio transmitters and receivers to work inside artillery shells. This, too, we got into from catering to the public's photographic desires. The armed forces had figured that an outfit capable of flooding the world with accurately timed photographic shutters could do as well with artillery fuzes. Later, when fuzes came to be operated by radio echos instead of clockwork, what was more natural than that we make that kind?

If you have some business to discuss about rugged and sophisticated electronics, get in touch with Eastman Kodak Company, Apparatus and Optical Division, Rochester 4, N. Y.

This is another advertisement where Eastman Kodak Company probes at random for mutual interests and occasionally a little revenue from those whose work has something to do with science

Meetings

Facies Model Conference

A discussion concerning sedimentary rocks was held at the Illinois State Geological Survey on 4–5 Nov. 1958, for the purpose of pooling the knowledge and experience of the group concerning three topics: the existence and number of sedimentary associations; the possibility of establishing a model for each association that would emphasize the areal distribution of lithologic units within it; and the exploration of the spatial and sequential relations between the associations.

The participants included Albert V. Carozzi (University of Illinois); Francis J. Pettijohn (Johns Hopkins University); P. E. Potter (Illinois State Geological Survey); John Rodgers (Yale University); W. W. Rubey (U.S. Geological Survey); Raymond Siever (Harvard University); L. L. Sloss (Northwestern University); and E. L. Winterer (University of California, Los Angeles). Under the direction of a chairman, informal discussion was substituted for formal papers.

The first action of the group was to agree that recurring patterns of sedimentation give rise to a relatively small number of fundamental sedimentary associations rather than to an indefinite number of independent and unique patterns in space and time. This concept makes possible the broad application of a relatively small number of general principles to the identification and interpretation of the majority of sedimentary deposits.

The sedimentary association was defined as a collection of commonly associated sedimentary attributes. In the multidimensional space defined by the basic sedimentary attributes, a sedimentary association is simply a clustering of points. Subsequent discussion of the various sedimentary associations repeatedly emphasized the fact that no single variable or attribute is sufficient to define one of these clusters or associations, just as no single characteristic can be used by anthropologists to define a race or by psychologists to define personality. Although gradations between associations were recognized and emphasized at the very beginning, it was decided not to consider them until the basic associations had been defined.

The factors most often mentioned in the definition of a sedimentary association were gross geometry (thickness and areal extent); continuity and shape of lithologic units; rock types (maturity of the clastics and character of carbonates), sedimentary structures, and fauna (types and abundances). Five major associations were outlined.

Before discussion of facies models was initiated, the relations between the various associations were discussed briefly but were not exhaustively explored. Discussion made it immediately apparent, however, that not all transitions between the associations are possible and that some occur much more frequently than others.

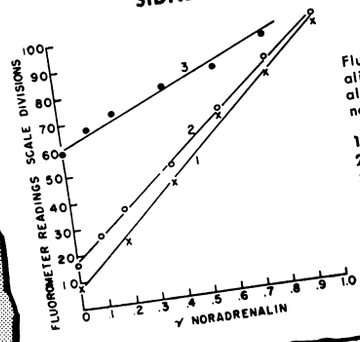
A facies model was defined as the distribution pattern or arrangement of lithologic units within any given association. In the early stages of geological exploration, the function of the model is to improve prediction of the distribution of lithologic types. Successful prediction, it was agreed, is the measure by which a geologist's understanding of a sedimentary association should be judged. Facies models were discussed under sandstone and carbonate subtypes.

Although general agreement was not reached concerning what should be included in a facies model, both basin architecture and the relationship of transport direction to depositional strike played prominent roles in the discussion. The mechanism of quartz and carbonate

A method for determining adrenalin and noradrenalin in aqueous solution has been developed which depends on differential transformation of adrenochrome and noradrenochrome to the corresponding fluorescent substances. This technique results in values for adrenalin much more independent of the noradrenalin present than obtained by previous methods, and vice versa, and has

HIGH SPECIFICITY AND SENSITIVITY *

*Ref: Fluorometric Determination of Adrenalin and Noradrenalin in Aqueous Solution
SIDNEY ROSTON, Anal. Chem. Vol. 30, Pg. 1363



Fluorescence vs. amount of noradrenalin with varying amounts of adrenalin present, obtained according to noradrenalin method

1. Adrenalin, 0 γ; water reading, 6
2. Adrenalin, 1 γ; water reading, 6
3. Adrenalin, 5 γ; water reading, 6

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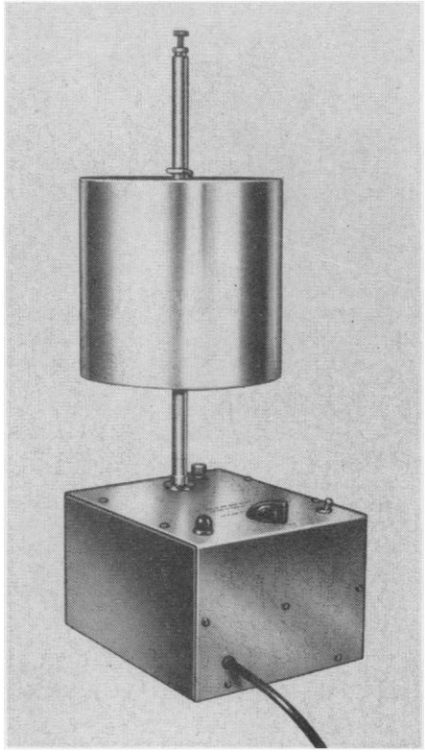

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441 ELECTRIC KYMOGRAPH LOW SPEED Identical to 440 except that all speeds are reduced by a factor of 10. (High speed 42 cm./min., low speed 0.5 cm./min.) Special models to meet other speed requirements can be made available at the same cost as the 441.

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sand dispersal, especially on shallow marine shelves, was a recurring topic of discussion. The fact that basins of markedly different size have similar distribution patterns of major lithologies was generally agreed to indicate that scale is not a critical factor. As discussion proceeded, the number of elements considered important tended to increase rather than decrease. Thus, it was suggested that the model should incorporate at least some elements of the regional tectonic setting. Although a distinction had already been made between local prediction, such as prediction of the direction of a washout in a coal mine, and regional prediction, concerned with subregions within a basin, this suggestion tended to embrace an even larger realm.

Judged in its entirety, the group discussion clearly pointed out those areas of knowledge that permit generalization, the areas in which problems are clearly recognized and stated but for which definitive answers are not available, and the areas in which the problems are not as yet clearly formulated. The sedimentary association, the mechanism of sand dispersal on a shallow marine shelf, and the facies model respectively illustrate each of these areas. Probably because discussion rather than achievement of fixed goals or conclusions was sought, the group was effective in all three areas. Meetings such as this should prove to be an effective supplement to more formal symposia and national meetings.

PAUL EDWIN POTTER
Illinois State Geological Survey, Urbana

Forthcoming Events

June

3–5. Physics of Precipitation, conf., Woods Hole, Mass. (H. Weickmann, Cloud Physics Committee, 1515 Massachusetts Ave., NW, Washington 5.

5–7. American College of Angiology, 5th annual, Atlantic City, N.J. (A. Halpern, 11 Hampton Court, Great Neck, N.Y.)

5–7. American Gastroenterological Assoc., and American Gastroscopic Soc., annual, Atlantic City, N.J. (H. M. Pollard, University Hospital, Ann Arbor, Mich.)

6. American Acad. of Tuberculosis Physicians, Atlantic City, N.J. (O. S. Levin, P.O. Box 7011, Denver 6, Colo.)

6. International Cardiovascular Soc. (North American Chapter), Atlantic City, N.J. (P. T. DeCamp, 3503 Prytania St., New Orleans, La.)

6–7. American Diabetes Assoc., Atlantic City, N.J. (E. Paul Sheridan, 1 E. 45 St., New York 17.)

6–7. Society of Investigative Dermatology, Inc., 20th annual, Atlantic City, N.J. (H. Beerman, 255 S. 17, Philadelphia 3, Pa.)

6, 20, and *27.* Recent Advances in Medical Technology, symp., Staten Island, N.Y. (N. Colosi, Wagner College, Staten Island, N.Y.)

7–11. American Soc. of Heating and Air Conditioning Engineers, semi-annual, Vancouver, B.C., Canada. (A. V. Hutchinson, ASHACE, 62 Worth St., New York 13.)

7–13. Fertility and Sterility, 3rd world cong., Amsterdam, Holland. (W. W. Williams, 20 Magnolia Terrace, Springfield, Mass.)

8–9. Isotope Effects in Chemistry and Biology, conf., Lemont, Ill. (Miss B. Litt. Isotope Effects Conference, Argonne Natl. Lab., P.O. Box 299, Lemont.)

8–12. American Medical Assoc., Atlantic City, N.J. (F. J. L. Blasingame, 535 N. Dearborn St., Chicago 10, Ill.)

8–12. Association for Research in Ophthalmology, Inc., Atlantic City, N.J. (L. V. Johnson, 10515 Carnegie Ave., Cleveland 6, Ohio.)

9–11. Canadian Federation of Biological Societies (Canadian Physiological Soc., Pharmacological Soc. of Canada, Canadian Assoc. of Anatomists, Canadian Biochemical Soc.), Toronto, Ontario, Canada. (E. H. Bensley, CFBS, Montreal General Hospital, 1650 Cedar Ave., Montreal 25, P.Q.)

9–11. Interferometry, intern. symp., Teddington, England. (Intern. Symp. on Interferometry, Natl. Physical Laboratory, Teddington.)

9–12. Health Technicians, 6th intern. cong., Paris, France. (Secrétariat Général du VI[e] Congrès-Exposition International des Techniciens de la Santé, 37, rue Montholon, Paris 9[e].)

10–12. Gas Chromatography, 2nd intern. symp., East Lansing, Mich. (H. S. Kindler, Technical and Educational Services, ISA, 313 Sixth Ave., Pittsburgh 22, Pa.)

10–12. International Union of Crystallography, Stockholm, Sweden. (W. Parrish, Apparatus Commission, Philips Laboratories, Irvington-on-Hudson, New York.)

11–12. Undiscovered Earth, annual research conf., Birmingham, Ala. (Southern Research Inst., 2000 Ninth Ave., S. Birmingham 5.)

11–13. Society for Study of Development and Growth, symp., Madison, Wis. (W. P. Jacobs, SSDG, Dept. of Biology, Princeton Univ., Princeton, N.J.)

11–14. American Electroencephalographic Soc., Atlantic City, N.J. (J. K. Merlis, University Hospital, Baltimore 1, Md.)

11–14. Wilson Ornithological Soc., Rockland, Maine. (A. Bagg, Farm St., Dover, Mass.)

13–22. Information Processing, 1st intern. conf., Paris, France. (U.S. Committee for the Intern. Conference on Information Processing, Box 4999, Washington 8.)

14–17. American Dairy Science Assoc., Urbana, Ill. (H. F. Judkins, 32 Ridgeway Circle, White Plains, N.Y.)

14–18. American Soc. of Mechanical Engineers, semi-annual, St. Louis, Mo. (O. B. Schier, II, ASME, 29 W. 39 St., New York 18.)

14–19. Society of Automotive Engineers, summer, Atlantic City, N.J. (Meetings Div., SAE, 29 W. 39 St., New York 18.)

(*See issue of 17 April for comprehensive list*)

Letters

Women Scientists

The editorial "Science for the misses" [*Science* **129**, 749 (1959)] leads me to believe that your readers will be interested in some data which I have assembled (with the help of Barbara Drew Atwood). Graduates of seven women's colleges who are included in *American Men of Science* were counted, and the numbers were expressed as percentages of total living graduates of the respective colleges. The results follow (the first percentage is for the physical sciences; the second, for the biological): Mt. Holyoke, 0.46, 0.75; Bryn Mawr, 0.48, 0.57; Goucher, 0.40, 0.53; Vassar, 0.34, 0.32; Wellesley, 0.24, 0.24; Smith, 0.14, 0.25; and Radcliffe, 0.14, 0.13. The total is 532/87,012, or 0.61 percent.

Less than 1 percent of the 87,012 alumnae who were living in 1956 are in *American Men of Science*. Is this an indication of lack of opportunity for women scientists, of less innate scientific ability in women, or of women's greater interest in home, children, and cultural activities other than scientific?

I believe that both men and women can be grouped into three categories: (i) those who must be scientists at any cost; (ii) those who are not interested and who would never be scientists; (iii) a group intermediate in size—those who, under the stimulus of economic necessity, prefer science to any other field. Most men in both categories (i) and (iii) become scientists. Women in group (i) persist in their study, but most women in group (iii) work as assistants, and so on, until marriage, children, or economic improvement releases them.

I sometimes wonder, after many years of teaching college science, if it is wise to urge or to tempt persons, men or women, in group (iii) to become scientists. To give all possible aid and encouragement to those in group (i) might, in the long run, accomplish more.

ANNA R. WHITING
University of Pennsylvania, Philadelphia

Supercooled or Subcooled?

Braham's article, "How does a raindrop grow?" [*Science* **129**, 123 (1959)], is an excellent survey of our knowledge on this subject. I would, however, like to raise a question about the use of the word *subcooled* to indicate cooling of water below 0°C. To the cloud physicist and other scientists, *subcooled* and *supercooled* are generally regarded as interchangeable. It seems, however, a little unwise and completely unnecessary for scientists to use two words, which, it would seem from their structure, ought to have opposite meanings, to indicate