

# The Elegant Record

Dedicated to Hebbel E. Hoff

Étienne Jules Marey said that the graphic record constitutes a universal means of communication among physiologists and is free from the barriers of language. In this role it has served the needs of physiologists and others in science admirably for more than a century, documenting phenomena and usually providing explanations for them. The graphic record is also an excellent teaching tool, which can be used to instruct students in learning how to think and to solve problems. Hebbel Hoff, retired Benjamin Hambelton Professor of Physiology at Baylor Medical College, introduced the term "the elegant record" and used this tool effectively in teaching for the 22 years the author had the honor of being his student, then colleague.

What is an "elegant record" and why is it useful in teaching? This short report aims to provide answers to these questions with a view of encouraging teachers of physiology to use it as a teaching tool.

Like a work of art, the elegant record provides a message, being both subtle yet commanding. It is usually well framed by the total picture. To illustrate the point, examine Fig. 1, which is a simple record of the electrocardiogram (ECG) and blood pressure of the dog. A short period of vagal stimulation provided slowing of the heart rate. On the first glance, there is nothing remarkable in the record; look again. The ECG is clearly labeled and a calibration has been provided, as is the case for the blood pressure tracing. Time marks calibrate the  $x$ -axis of the record. In all elegant records there are calibrations for the  $y$ -axes of each tracing.

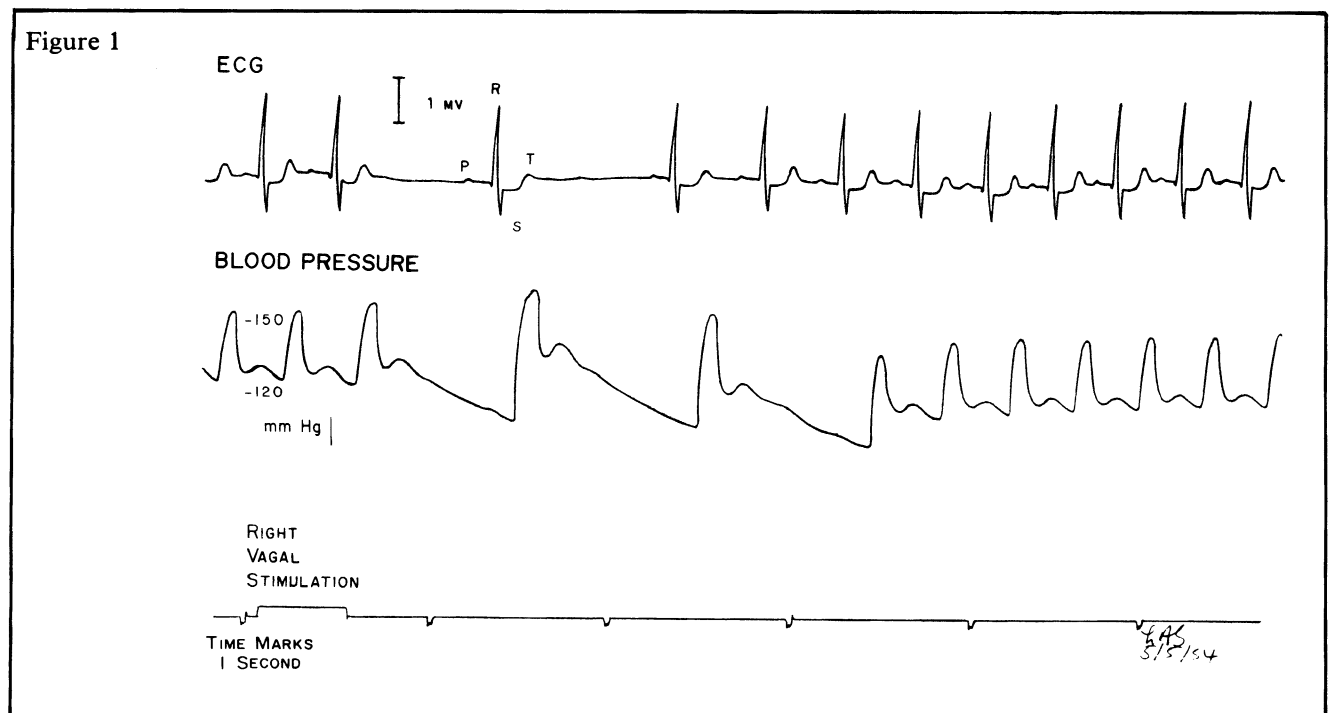
The first step in using the elegant record as a teaching tool is to have a student rise and simply describe it to his/her classmates. This trivial task is almost impossible for students, who misinterpret the instruction "describe." Usually they hasten to offer complex explanations for what is portrayed by the recording. An

approximate description for Fig. 1 is simply, "This is a two-channel record of the electrocardiogram and blood pressure with a time-and-event channel appearing at the bottom. There are calibrations for the ECG and blood pressure tracings. Near the center of the record the heart rate was reduced by vagal stimulation." As yet, no explanation has been given for what is in the record, and absolutely no knowledge of physiology was needed. There is much to be gained by careful description as we will soon see.

The second step in using the elegant record involves stating the obvious, which merely requires a simple physiological description of the portrayed events. For example, "In the ECG there are P waves preceding the QRS-T complexes, indicating normal sinus rhythm. There is a small S-T segment depression, indicating myocardial ischemia. The T waves are upright, which is expected in lead II. There is a QRS complex preceding the blood pressure pulses. During cardiac slowing there appears to be a P wave preceding the QRS complex, indicating that the slowing was not due to atrioventricular block. The diastolic runoff is revealed, and the diastolic pressure is lowered. However, the pulse pressure is higher, probably due to increased diastolic filling. The delay between the onset of vagal stimulation and cardiac slowing is probably due to the time taken for acetylcholine to be released and act on the pacemaker.

So far so good—but the first describer of the record and the second stater of the obvious had taken time to observe carefully during the presentations, it would have been absolutely obvious that there is a single QRS-T complex, identical to the others, but without an ensuing blood pressure pulse. This is the elegance in the elegant record, and the obvious teaching message is that the ECG cannot report on dynamic events.

The next step in using the elegant record as a teaching tool involves speculation on the cause of the event that makes the record noteworthy and elegant. In the present case, it is likely that there was ventricular overemptying by the preceding beat and inadequate filling and inadequate myocardial stretch to result in a pressure high



enough to open the aortic valve. One would then ask how this could be proved and await suggestions for a decisive experiment, which would, of course, have been to measure left ventricular pressure.

The four steps in using an elegant record as a teaching tool are pure description, stating the obvious, finding the unusual or unexpected event, and discussing experiments that could be performed to support (or destroy) the explanation offered.

Physiology teaching, especially in the laboratory, abounds with opportunities to collect elegant records and use them as focal points for teaching, which, in addition to purveying facts, cannot be considered successful unless thinking and reasoning are included as essential components.

Finally, like all works of art, the elegant record should be signed by its author and dated for posterity, for who knows—the record may be publishable.

L. A. Geddes  
Purdue University

### Practice of Liquid Scintillation Counting

The Nuclear Engineering Department of North Carolina State University and the Division of Continuing Education announce a three-day course entitled "The Practice of Liquid Scintillation Counting." The course will be offered August 23-25, 1982, at Burlington Engineering Laboratories and Gardner Hall on the North Carolina State University campus. Through lectures and laboratories, participants will learn to understand and to properly use liquid scintillation counters. *For additional information and an application contact:* Rosemary Jones, Division of Continuing Education, North Carolina State University, P.O. Box 5125, Raleigh, NC 27650. Telephone: (919) 737-2261.

### Correction

*Physiologist* 25(2): 104-110, 1982. L. I. Kleinman. "Developmental Renal Physiology."

Page 106: Figure 3 shows the GFR in a neonate dog; Figure 4 shows the GFR in a fetal lamb.

Page 106: column 2, line 2 should read: In the presence of filtration equilibrium, changes in  $K_F$  have little effect, and GPF is a very important determinant of GFR.

*Physiologist* 25(2): 111-117, 1982. D. A. Miller and W. M. Granger. "A Block Diagram, Graphical and Microcomputer Analysis of the  $O_2$  Transport System."


Page 111: line 3 of the Abstract should read: *Physiologist* 25(2): 111-117, 1982.

Page 113: column 1, the last two sentences before "Graphical Analysis" should read: However,  $\dot{V}_{O_2}$  also appears in block 1 of the diagram and has a major influence on  $P_{A_{O_2}}$  and  $C_{A_{O_2}}$  and hence on  $P_{A_{O_2}}$  under these conditions. In contrast  $Q_T$  affects  $C_{A_{O_2}}$  only in block 4 and therefore has a minimal influence when  $F_s$  is small.


Page 114: the legends for Figures 4 and 5 should be exchanged.

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