The development and acceptance of new technology in ophthalmology is in some respects a marriage between the physician and his or her tools: “Do you take these tools to share your diagnostic struggles, for better or for worse...”. We rarely get divorced, even though some techniques (like tonography) lose their youthful beauty and make rare appearances in the social scene of modern medicine. As new diagnostic tools are developed, there is often a period of courtship until the uses (and abuses) of the new technique are fully understood, so that the marriage can be consummated with confidence as well as love.

If I may be excused for stretching analogies in the preceding paragraph, my purpose is to offer perspective on the new technique of multifocal electroretinography (mfERG) and comment on an example of its usage, in the current issue, for the evaluation of neovascular maculopathy. The mfERG is a remarkable clinical and research tool which provides a direct topographic map of retinal function in the posterior pole [3,5]. But there are limitations to its resolution and sensitivity, and technical problems can affect the interpretation of responses. The study on neovascular maculopathy by Jurklies et al. [4] shows many of these limitations, which may discourage some readers from using mfERG. I would argue, however, that the recognition of problems in this one application of mfERG makes even clearer the enormous potential of the technique in clinical ophthalmology.

The mfERG was developed roughly a decade ago by Erich Sutter [11]. Instead of stimulating the retina with a gross flash of light as for the conventional ERG, subjects look at a monitor screen on which cells of a hexagonal pattern seem to flicker randomly on and off. However, the flicker follows a mathematical sequence, and a computer program correlates fluctuations in the voltage across the eye with the time when each stimulus cell is in the ‘on’ state or the ‘off’ state. The resulting analysis yields an array of small derived waveforms which correspond to the areas of retina stimulated by each of the hexagonal cells. Like every clinical test, the quality of mfERG records depends upon a number of technical details. Variations in ocular fixation, in ambient electrical noise, in stability of the corneal electrodes, in dark or light adaptation, and in other factors as well can lead to altered amplitudes or instability of responses. Signals are reliable within an order of magnitude, but even under the best conditions two successive recordings can show 10–20% variation in amplitude. The mfERG is very precise in showing a focal dropout of signal relative to neig-

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boring areas, such as might correspond to a discrete macular lesion. However, it is less reliable in comparing the amplitude of responses from one day to the next, or from one patient to another, unless normative values have been carefully established or a number of recordings have been done to average out (or show the range of) variability.

The report by Jurklies et al. [4] hints at the power of the mfERG in analyzing macular disease, but also illustrates cautions that should be exercised in interpreting the test. The authors set out to monitor retinal function in patients with subfoveal choroidal neovascularization (CNV), because it would be useful to objectively correlate local retinal function with the evolution of CNV. However, the paper does not entirely achieve this goal, and it is instructive to ask why. This paper generated some controversy in the editorial review process, but the issues in this writer’s opinion are not so much whether the results are “correct” but whether they are even interpretable. Others have reported already [1, 9], to no-one’s surprise, that the mfERG shows poor photoreceptor function in the central macula of patients with age-related macular degeneration (ARMD) and CNV. To go beyond this basic observation, it is necessary to exploit the topographic specificity of the mfERG and relate focal ERG changes to anatomic findings and to local subjective sensitivity. However, the Jurklies study does not show any topographic correlations (e.g., by overlaying angiograms with trace arrays of mfERG signals), and much of the topographic information is lost by averaging rings of responses. And there is no attempt to see whether the mfERG would differ from, or add to, subjective sensitivity mapping (e.g., by scanning laser ophthalmoscope microscotometry). Ring averages are a useful tool for studying diseases that affect the retina in a circular manner about the fovea, but are not so appropriate when the disease process is irregular in its location, or is not expected to affect most of the rings. As presented, the paper tells us little more than what we could learn by conventional diagnostic techniques.

The Jurklies et al. paper [4] also tries laudably to document the natural history and progression of functional damage in CNV. It is obscure, however, why these four patients (and only four patients) were selected, and the curious lumping of ARMD along with high myopia (which can have other ERG effects) may relate to origins of this work as part of a larger study of photodynamic therapy (which is not described in the text). A major problem, which is not adequately addressed, is that the natural variability of the mfERG is sufficient to produce or negate the rather subtle findings reported in the paper. For all their good efforts, Jurklies et al. had too few subjects to gain the information they sought. The mfERG can be very accurate in showing local areas of relative dysfunction, but longitudinal changes cannot be reliably detected unless the effects are large (or larger numbers of patients are studied so that data can be averaged). One cannot judge the degree of “normal” variability in this study since the controls had only baseline recordings and were not followed longitudinally or repeatedly (as were the patients) to show the consistency of responses in this laboratory. Thus, the finding of small and variable changes over time is largely uninterpretable. The statistical analyses only give a false sense of security since the fundamental data are weak and the number of subjects is small. This paper raises interest and questions, but gives few answers.

These concerns notwithstanding, this study helps us to understand what the mfERG really can do for both clinical evaluation and research. Maps of mfERG dysfunction have been correlated quite precisely with subjective deficits in retinitis pigmentosa [2], and the mfERG has been used as a critical tool in recognizing hidden or occult photoreceptor pathology in cone dystrophy [10]. It may become a useful test for the early recognition of subtle toxicity from drugs such as hydroxychloroquine. It has been used to recognize unsuspected bilateral involvement in central serous chorioretinopathy, which might otherwise be viewed as a disease of a focal leakage site [7]. It has the potential, used properly, to follow objectively the course of a maculopathy and to differentiate between organic and functional disability. At present, the mfERG is not needed for the direct management of neovascular ARMD or vasculopathies such as diabetic retinopathy. But this does not preclude use of the mfERG as a powerful tool for studying how and why retinal dysfunction occurs. If good normative data sets can be established, the mfERG may also be useful to stage and follow the early stages of macular disease when the degree of damage is hard to assess anatomically [6]. The goals of the Jurklies et al. paper in following neovascular maculopathy with mfERG were not inappropriate.

Most ophthalmologic diagnostic techniques provide anatomic rather than functional data. However, the ultimate measure of a patient’s satisfaction is how he or she can see, not how the eye looks. Objective data on function, such as from the mfERG, has obvious advantages over subjective observations and one may anticipate that clinical roles for the mfERG will increase as the test becomes more reliable and standardized [8]. Yes, doctor, you should accept the mfERG for better or for worse – and may the marriage have success and prosper!