Chopping has numerous advantages as described throughout this book, particularly with regard to decreasing the amount of ultrasound energy required for cataract removal. However, despite the technique’s longevity of over a decade, as well as the intense interest in the topic evidenced by the high attendance at the authors’ phaco chop courses, chopping continues to be practiced routinely by only a minority of surgeons. Many other surgeons may have abandoned the technique in frustration without having the benefit of the meticulous description of key components of the technique as included in this book. In particular, their phaco machines were likely not optimized for chopping, and they may even have been set in such a way as to inhibit effective chopping. The study of the fundamental principles underlying not only the machine technology, but also the individual microsurgical maneuvers, is called phacodynamics, and it provides a logical context of reasoning to guide the setting of machine parameters. Phacodynamics further allows the surgeon to readily adapt to anatomical and procedural variations as they present by logical reasoning as opposed to rote memorization of a set of steps or settings.

Phacodynamic goals in chopping may be roughly grouped into three categories. First, the surgeon must achieve an adequate grip of the nucleus in order to facilitate impaling and splitting by the chopping instrument. This goal is achieved by correlating applied vacuum to the nuclear density as assessed intraoperatively and also by optimizing the vacuum seal on the phaco tip’s aspiration port. The second goal is to control postocclusion surge when using high vacuum by proper use of machine parameters as well as hardware options such as fluidic resistors and dual linear pedal control. The third goal is the maximization of mechanical advantage for all surgical maneuvers by utilizing proper instrument placement, as well as movement.

In understanding the machines that we will be using, we need to first ascertain whether we are using a flow pump or a vacuum pump; all current and likely future machines may be clinically classified into one of these two categories. Furthermore, the clinical roles of flow and vacuum must be defined. Flow, or aspiration outflow, is the volume of fluid per unit time that exits the anterior chamber through the phaco tip’s aspiration port. It is measured in cubic centimeters (cc) or milliliters (mL) per minute, and is compensated by an adequate bottle height that ensures chamber stability. The clinical role of flow is to attract lens material to the aspiration port and to remove it from the eye if that material can deform sufficiently to fit through the phaco needle. For material that cannot readily deform sufficiently to be removed from the eye by aspiration outflow, vacuum provides the necessary deformational force, usually augmented by ultrasound energy. Vacuum, measured in millimeters of mercury (mmHg), provides the grip