As a lab manager, how can you boost vitality, promote collaboration and engender inspiration among your staff? Here, Gregory Weddle describes how lab design can enhance the creative process while Bill Devorick proposes that personal mindfulness and an understanding of motivation theory will improve teamwork.

Combine these to create your own ‘Maximum Lab’.
While the range of equipment has expanded dramatically over the years, the laboratory’s raison d’être is the same as it was in the days of Gregor Mendel (1822-1884), Thomas Edison (1847-1931) and Alexander Fleming (1881-1955): experimentation. The lab provides the setting for scientists to observe the world and test the postulates of inspired minds in a repeatable manner. Walking through Thomas Edison’s lab in Michigan a few years ago, I wondered how he repeated anything at all. His main tools were his eyes, sketchpad, scales, and calipers; and most measurements were taken by devices invented by Edison or his technicians, leveraging math and science. Yet the basic structure required of his and other illustrious researchers’ workspaces is mirrored today (see sidebar, “Laboratory use”).

The in-silico lab equivalent in Mendel’s time was his desk: an oil lamp, paper, quill, and ink well. Bookcases were filled with every written reference he could get his hands on. His mind was the only computer he had at his disposal to decipher, in minute detail, his expectations and observations. For his free-thinking lab, Mendel had pots, calipers, a scalpel, some dirt and peas to test and prove his theories or, in some cases, to convert a chance or tangential observation into a new concept. In his campaign lab, Fleming worked on increasing mold harvests, proving and reproving concepts, and improving safety, purity and effect.

Mendel, Edison and Fleming were inspired to wonder: “What if?”. How do we nurture that spirit today, and can the lab configuration contribute to it? My role is to work with clients to discern the needs or goals for a space, then to influence the design to most effectively support those goals. Whether the target is volume output, or an environment to capture perception, expression, or conception of thought that can lead to the creative processes (see Figure 1), we need to understand the impact of space on people.

Understanding the creative process
Lab space, historically and today, is fashioned by the room available and what scientists had at their disposal: instruments, hand tools, assistants, desks, chemical and biological materials, power, gases, water, and so on. Safety was, at first, an individual responsibility; today we have engineers, architects, and environmental health and safety professionals looking out for our well-being.

The traditional lab of today was conceptually designed in the 1950s and 60s following academically-guided constructs. It provides us with the familiar stark environments and cramped storage, often with no thought for optimized or integrated technologies. Avi Hofstein and Vincent N. Lunetta’s work points to the lack of innovation in laboratory design in the academic
environment and how those designs drove commercial lab spaces for the next 50 years (1). The pharmaceutical boom of the 1980s and 90s delivered millions of square feet of lab space following these outdated precepts.

Sadly, the creative process is imperiled in such environments. It is somewhat ironic that Big Pharma actually contributed to the lack of facility innovation as they attempted to create their own campuses and labs to reflect academic campus and labs, all with the idea of attracting new scientists to a familiar environment…

So, how do we design an environment to better support the creative process? Well, lab layouts and work areas must provide places to engage in each of the three phases of creativity: environments that support perception, conception and expression. That means providing the opportunity to draw on existing technologies, connect with other researchers and access information so that we don’t have to start from scratch; leveraging previous research; and offering a new view of the challenge. Therefore, work environments need to include the “wet lab” as well as “collaborative” and “contemplative” spaces.

Categorizing and designing
Just as the lab suite needs to support the creative process, we must also understand the design requirements of the wet and in-silico lab components. Much of the need here is defined by the phase and nature of the research. Chemical, biochemical, tissue culture, analytical and development research needs

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Table 1. Lab Categorization. See sidebars “Laboratory Use” and “Laboratory Configurations” for definitions.
must all be clearly defined and documented. Further considerations include any need for open access and flex labs, and the requirements of workflows and instrumentation. Documentation of these needs, provided by scientists, the processes themselves, and instrument manufacturers must be integrated to achieve the optimal solution. Instrument providers tend to sell a single instrument and its capabilities; however, it is rarely a single instrument that determines the output or success of research. We must consider the impact of all instruments, technologies, and consumables within the workflow.

Table 1 categorizes various types of lab space. By adding area or percentage of total space, lab planners can begin to understand how a lab functions with respect to lab activities, needs, and current organization. This table can also be used to assign available space to the types of science that would be best suited to it.

Communicating the value, features and limits of a new lab to those who will use it is all-important. For example, the flex lab may be perceived as being “adjustable to every need” but in reality it is simply designed to deliver flexibility for a targeted set of conditions. A scientist who believes they can move fume hoods around to meet their need for the day may be disappointed or even put in danger if the “flex” is limited to power and location of gases and drops.

We ask scientists to document their design targets and test them against user needs. This requires that they fully understand the new technology, collaborative tools, instruments, and features that they need. We discuss the intent of the entire suite, and relate each space to the creative process. Finally, we make sure that they know that it has been done to enable them to get the most out of their research efforts – and to be inspired!

**References**

developed the concept that there were three ‘grand theories’ in the early study of motivation. The first, the theory of will, dates back to Socrates, Plato and Aristotle. The will intervenes in decisions related to wants and needs, guiding the decision to either do or not do something. The second, the theory of instinct, has its basis in the ideas of Charles Darwin. In this view, biologically-based instincts, like those for food and comfort, direct behavior. The third, the theory of drive, has a focus on urges and their fulfillment, and found a supporter in Sigmund Freud.

Interesting as they are, these grand theories have been relegated to the back-burner as they are insufficient to address the practical realities of motivation.

A wealth of new theories arose in the second half of the 20th century that provided insights applicable to the workplace, such as achievement motivation theory, goal setting, flow theory and self-determination theory (SDT). To illustrate the practical utility of these concepts, I will give a synopsis of each theory and an example of its application.

**Achievement motivation**
Having both classic and contemporary interpretations, achievement motivation research shows that people in teams act with greater intention when they perceive their role as central to success (4). Similarly, each individual’s orientation toward success, for example expecting to succeed or expecting to fail, influences his or her choice of tasks. So – and this is a common theme and starting place – careful consideration of each individual in the team is critical. Know yourself and your analytical team members, and your tasks and task complexity, then consider the team makeup and the perspective of each team-member on the tasks at hand.

**Goal setting**
A ubiquitous activity in businesses today, people seem to better accomplish tasks when they have goals and when the goals and tasks are properly challenging for each individual. Watch out for overly-ambitious goals, as these may indicate, counter-intuitively, a fear of failure.

**Flow theory**
Getting in the flow of activities and maintaining focus is an experience that most analytical scientists have while working in an area of competence on just the right challenge. Notice flow and energy levels in the laboratory, as these provide clues for successful adjustments.

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### Quick six to improve motivation

- **Develop mindfulness:** Explore tools/techniques to improve mental function. A good start is Zinn’s Wherever You Go, There You Are (6). Continue or start a meditation practice. Know personal limits and patterns of clear and less-than-clear thinking.

- **Know yourself:** Observe the self. Use meditation and other tools, and know your own skills, strengths, and weaknesses. Improve competence and stay current with technical and interpersonal skills.

- **Know others:** Discover the ‘career’ goals and skills of each individual. Work with others and maintain relatedness. Create a skills matrix. Trust each person to achieve his or her goals. Pay attention to verify progress and help out, as appropriate, to develop the competencies needed for the individual to continue to be a valuable contributor.

- **Know the team:** Focus on the work at hand and listen to the sub-text. Pay attention to the level of confidence and expectations of each member. Consider mini-teams of two or three (for example, match a good teacher with someone lagging behind). Consider the cumulative capabilities of the team and match them to the challenge at hand. Foster communication.

- **Prime for success:** Help others learn how to be successful. Be the one to clear obstacles or point the way forward. Appreciate the work being done. Understand the value of success, and failure. Monitor progress and make adjustments. Communicate.

- **Be fair and honest:** Act with mindfulness and integrity. Fairness does not mean identical treatment of each person. Be honest by relating helpful information and sharing skills, techniques, and understanding. Blend mindful awareness with analysis.
Self-Determination Theory

With the advent of the multiplicity of theories, a need for integration emerged. SDT seeks to integrate a variety of perspectives; Deci and Ryan (5) describe it as a macro-theory. In brief, STD posits two primary and two secondary categories of motivation. The primary categories are autonomous and controlled; autonomous motivation has the characteristic of ‘self-endorsement’ while controlled motivation is essentially extrinsic, either depending on rewards or punishments or on internalized schemas. The secondary components are relatedness and competence, highlighting the importance of knowing team member goals and individual outlooks to properly align these with the team’s challenges. Luckily, in the analytical lab there are plenty of opportunities to be challenged and to enjoy making decisions. Aligning tasks so that each team member is intrinsically motivated, appropriately challenged and in the ‘zone’, can strengthen team collaboration and bring energy to the workplace.

I encourage managers to investigate motivation theory. A personal synthesis of theoretical ideas is a valuable tool for getting the best performance from yourself and your staff.

Mindfulness and inspired motivation

Zinn (6) describes mindfulness as ‘having to do with being in touch’. A person’s ability to improve his or her own mind, simply by attending to the mind as a functioning object in its own right, can be something of an eye-opener! This mental improvement is not just a felt sense, it also correlates to real neurological changes. Bringing active attention to the mind, that is, meditation, is the main way people develop mindfulness (see Figure 1). Direct observation of our physical experiences, feelings, and thoughts, fosters direct insight into the nature of our sense of self, releasing vitality, and supporting a stronger sense of our place in the world – and in the analytical laboratory.

The initial ‘strangeness’ of mindfulness has waned considerably in recent years. Conferences such as Wisdom 2.0 and the work of US Congressman Tim Ryan, for example, demonstrate the widespread interest in mindfulness as a way to improve health and effectiveness in the workplace and in society at large. With wide-ranging benefits chronicled in hundreds of articles, mindfulness is truly becoming a mainstream perspective and can be just the meta-skill needed to mobilize the right actions for improving the workplace.

Personal development is at the heart of mindfulness. Gaining personal understanding is the starting point and it can be introduced into teams, for example through group mindfulness training. This approach can instill a sense of community but it should be introduced on a voluntary basis, with no coercion of any kind. A casual, off-site group may be formed, spanning several departments of the workplace or multiple workplaces. A short set of four one-hour workshops, for example, can provide a starting-point.

The challenges of the analytical lab will not disappear. But with appropriate focus and attitude you and your team can perform better, with more vitality and greater enjoyment.

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References