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The New Face of Lab Design: Creating Original Environments

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The business of science in Research & Development hinges on carefully controlled experimentation. The lab atmosphere must also be highly controlled in order for it to be a truly successful stage for study. The paradigm of design for generations was based on the mandate that the laboratory must be specific to the research, tightly engineered mechanically, and virtually indestructible. The designer's attention has always been exclusively devoted to the individual activities that occur on the bench, and most often tailored to the specific science or scientist. The design of laboratories was focused on the explicit research to be conducted in the space, and on helping the scientist achieve a defined set of experimental results.

Today however, companies are beginning to realize that, as their business initiatives change and grow, their research labs must be equally adaptable and dynamic. The archetype of labs that are single-study, research specific is now undesirable, and in some cases, detrimental to meeting changing market demands. This design concept is being reconsidered from both a cultural and financial perspective. And so, the science of lab design has been undergoing a radical retooling as the demand for flexibility and community-building heightens.

Scientists are social beings and thrive on interaction. With the possible exception of biomedical research—with its intense competition for cure discovery—most researchers are collegial in their thinking. They understand and appreciate the power of shared knowledge, especially when it comes to launching a new product. Their willingness to collaborate was stymied by isolated research environments that stunted the opportunity for team-based innovation.

This design constraint has been identified, and the architecture and design community has been responding. The classic prototype model of 'closed' lab design has gradually shifted within the last ten years to more open, flexible labs. The research environment is no longer developed around a series of cloistered rooms, but now, as a universal setting where infinite studies and explorations can take shape. Today's laboratory is designed for flexibility and adaptation. The space is staged with both fixed and mobile elements so that as project demands change, so too can the interpretations of the laboratory setting. In this version of laboratory space, scientists and researchers can elect to work in groups collectively, or singularly as needed. The open community lab sets the stage for exchange of ideas and information and in many cases, expedites the study process.

Changing Needs

Tracy Accardi, vice president of Research & Development for Covidien Healthcare has recently taken initiatives to advance the universal lab design model for her research team.

"For Covidien, innovation in the products we produce and the services we offer is key to our competitive advantage. Creating working laboratory space that is flexible to the changing needs of our customers and conducive to collaboration by our engineers and scientists is of paramount importance. Our lab spaces need to be environments where creativity and collaboration flourish."

As it has in many industries, technology has played a dynamic role in the new interpretation of labs. Technology-supported research is as ubiquitous as the beaker and the microscope. Architects and engineers who once concerned themselves primarily with the placement and location of services—DI water, vacuum, gasses, etc.—must now also integrate the essential tool of data into research environments. As more knowledge based systems are integrated into the lab environment, the demand for data access heightens. Distributing data connectivity throughout a laboratory is

critical to providing maximum flexibility for a variety of experiments.

Because computer-oriented equipment comes in a wide variety of sizes and configurations, it is important to support this changing demand with lab benches that are not only mobile, but easily adapted for height and overhead storage as well. Today, we see a standard combination of fixed lab casework supported by easily reconfigured benches. This change reinforces the flexibility of the lab environment and gives researches the opportunity to easily adapt their space as the nature of their investigation and study changes. By integrating a relatively high degree of access to power, data, and traditional lab services, and furnishing the space with easily manipulated storage and surface elements, a truly adaptable environment is achieved.

Of important note is the diminishing difference between traditional "wet" and "dry" labs. Once thought to be mutually exclusive in their design configuration, the new thinking is that the ideal lab should create the possibility for both activities to occur within the same environment. Wet labs are perceived to be intensely controlled environments where piped gasses, fume hoods and waste management solutions prevail. These spaces require substantial mechanical infrastructure to maintain fresh air exchange and control of exhaust. Dry spaces, on the other hand, are identified as areas that are more specific to computer-aided research and not as dependent on heating, ventilation and air conditioning (HVAC) or plumbing for support. Labs also need to be designed specific to the biohazard level of the research and these guidelines are carefully established. But in lower level research facilities, where the overall cost of mechanical infrastructure is not as prohibitive, it is optimal to design all spaces so that both wet and dry research can occur throughout. The clear advantage for the researcher is that access to hoods, sinks, fixed gasses and computer equipment is distributed evenly in the space, not in one zone. By lifting the geographic restrictions of what can be accomplished, where, more "free-address" research can thrive. In designing with this goal however, architects and engineers should strongly consider designing above the applicable codes and guidelines when possible. It is significantly less costly to provide expanded infrastructure when constructing the original build-out of a lab than it is post occupancy. If the system is designed to accommodate expansion or flexibility above the ceiling in advance, the lab environment will be better suited for change and growth in the future.

The research environment does not, however, occur solely in the laboratory confines. Historically, the office space has been perceived as a necessary adjunct to the real work occurring within the labs. In fact, the office environment that researchers occupy is equally vital in setting the tone for study and exploration. Expanding the spirit of the laboratory collaboration into the adjacent work/office area is also key in fostering the notion of a team. The ideal office space for researchers should provide for adequate private, task-intensive, "heads down" analysis space, but also grant several communal areas in which to meet, converse and gather for strategy oriented development. Traditional conference spaces, along with research lounges, libraries and "think tank" areas for brainstorming all become integral elements to further nurturing the research spirit. Ideas flourish both in and out of the laboratory and should be supported by a highly-creative and interactive space.

The business community is charged with not only keeping pace with product development, but in bringing forth the innovations of tomorrow. Today's R&D labs are being designed with an eye toward the future. Designing a dynamic environment for creation has never been more important than it is right now.

About the author

Joe Flynn is a senior associate with Margulies & Associates, one of Boston's most innovative architectural and interior design firms.