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Science + Technology Perspectives

Seven Trends Shaping the Future of Modern Lab Designs

Hixson Project Architect Shuting Zhao and Interior Designer Lauren Michaels recently took part in the 2024 Lab Design Conference, held this year in Phoenix, Arizona. While there, Shuting and Lauren attended an array of sessions, hearing from their fellow industry professionals on the latest trends shaping laboratory design, such as:

- 1. Consolidating collaboration spaces.** Collaboration across disciplines can be critically important in research facilities; yet finding opportunities and spaces for lab personnel to interact can sometimes be a challenge. "Some of the possibilities discussed include sharing hoods and other lab equipment (when possible), and placing coffee stations or green spaces near labs to foster spontaneous discussion," said Lauren.
- 2. Keeping lab spaces flexible.** The pace of change and adaptations in today's scientific research is fast...much faster than the typical lab designs of the past have been able to accommodate. New lab designs may be called on to address this fast-paced turnaround, incorporating adaptability through movable workstations, flexible casework, and other concepts. "Of course," says Shuting, "such flexibility may have greater up front costs to consider."
- 3. Smaller lab footprints, more amenities.** The FDA Lab Modernization Act has spurred a wave in technology innovation within the lab space, which successfully reduced lab footprints needed by animal testing. This, plus the fact technology progress in general has enabled equipment to get smaller and smarter, means that there is more space available for other uses. "One beneficial result," says Shuting, "is that this may allow more space to add amenities at the facility, which can help attract and retain highly qualified lab personnel."
- 4. Goodbye vestibule interlocks?** Interlocks in vestibules are commonly used in high-security environments, cleanrooms, and laboratories to control access and maintain environmental conditions. While they offer significant benefits, there are also several potential drawbacks, e.g., inconvenience to staff, potential malfunctions, etc. According to Shuting, some labs are moving towards the use of engineered leaks or "pressure design," to perform the same function, providing scientists with a quicker way in and out. In addition to simplifying entry, "engineered leaks provide greater flexibility for the facility," says Shuting. "In certain situations, it can make it easier to change the use (e.g., BSL2, BSL3) between different lab spaces."

5. **The growing importance of ESG.** Many companies today are recognizing the importance of meeting Environmental, Social, and Governance (ESG) criteria. “From a lab design perspective,” said Lauren, “the growth of ESG means you may see different construction materials in use, e.g., mass timber construction, and changes in lab design to accommodate more sustainable and human practices in animal testing.”
6. **The rise of co-bots.** Collaborative robots, aka, “co-bots,” may become a more regular feature in the lab. “These robots work alongside humans in the lab, conducting more mundane tasks, such as material management, or cleaning beakers,” says Lauren. “The use of co-bots can enable scientists and other lab personnel to focus more of their energy on research and testing, and may reduce the amount of space required in the lab itself (since the robot will consume less space than a human.)”
7. **Artificial Intelligence (AI) is here.** The use of AI applications are becoming increasingly prevalent within the architecture and design industry. These tools are supplementing the Building Information Modeling (BIM) tools already in place, allowing designers to do things like:
 - a. Quickly create interior/exterior design/renderings based on keyword prompts.
 - b. Create preliminary Mechanical, Electrical, Plumbing (MEP) and structural systems designs for a given building floor plan and program.
 - c. Assist in construction management and project management.

However, Shuting cautions that, “as we’re seeing in other industries, the use of AI in lab designs may raise both legal and ethical concerns, such as liability, reliability, intellectual properties protection, security, and privacy. Addressing these issues requires careful consideration, robust ethical guidelines, and ongoing research and development to ensure that AI applications are beneficial and safe for society.

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