a

b

**FIGURE 14-9**
**Visual simulations of unbuilt architectural projects, produced by Takehiko Nagakura and his students at MIT.**

a. Le Corbusier's Palace of the Soviets
b. Terragni's Danteum

precise simulation and visualization of both natural and artificial airflows within spaces, and hence more effective design for human comfort and safety. These techniques are particularly effective for tasks such as the design of complex atrium spaces, where airflows may be complex and difficult to predict by conventional means, where comfort conditions are difficult to control, and where safety issues such as smoke propagation are of crucial importance.

The possibilities for computer measurement, analysis, and simulation of designs are almost endless. As the necessary research is done, and as software vendors make increasingly comprehensive and sophisticated software toolkits available to interior designers, the capacity to produce accurate and compelling predictions of an interior's performance in all its important dimensions will become an increasingly important competitive factor. Clients and regulating authorities will know that this is possible, and they will demand it.

As three-dimensional digital models increasingly support visual simulation, other forms of analysis and simulation, rapid-prototyping, and CAD/CAM, the benefits resulting from construction and use of these models will increase. At the same time, better interfaces, more powerful computational facilities, and more sophisticated software will drive down the costs of constructing, editing, and maintaining these models. As a result, they will increasingly displace two-dimensional "drafting system" digital models in everyday practice.

Where plans, sections, and elevations are needed, these two-dimensional representations will automatically be produced as specialized graphic reports from the three-dimensional model.

## INTEGRATION OF CAD, INFORMATION MANAGEMENT, AND ELECTRONIC COMMERCE

As CAD data become increasingly crucial in design and construction, efficient management of CAD project and library databases is becoming a critical practice task. Approaches to this task have evolved a great deal over the years.

In the early days of CAD in architecture and interiors, the idea was to maintain a definitive, centralized project database on a mainframe or a minicomputer. Members of the design and construction team accessed that database whenever they needed information about the current state of the project, and they entered the results of their work back into that database. The idea was simple and elegant, but its comprehensive and effective implementation proved very difficult–particularly on the relatively puny computers of the time.

With the personal computer and engineering workstation revolution of the 1980s, CAD users began to work with locally resident software rather than by logging into a central machine, and they tended to manage their own files on their own PCs. This was effective for small projects, but it created a management nightmare on large-scale, long-running projects involving many designers and consultants. It was difficult to keep versions straight, to keep multiple representations of a project consistent, to ensure that everyone had the most current information, and so on. Strong standards and conventions and strict management controls were needed to prevent chaos.

Now, in the network era, with increasing use of local-area networks within organizations and the Internet for long-distance linkage, members of a design team can be electronically interconnected. Design databases can be maintained on servers, and can be managed–with appropriate access controls–with the aid of sophisticated software. Some design and construction management organizations have implemented such systems on their own, and