

## Office for Visual Interaction (OVI)

By Audrey Doyle

Proper lighting is an art and a science. And the lighting consultants at the Office for Visual Interaction (OVI) are masters when it comes to providing expert consultation, planning, and design for artificial lighting, natural day-lighting, broadcast/TV lighting, and master planning for interior and exterior environments, regardless of their design complexity and sophistication.

### 3ds max software shines as lighting design tool for this New York-based lighting consultancy

In many of its projects, OVI is presented with unique challenges requiring advanced modeling of lighting effects and techniques. For these one-of-a-kind projects, OVI relies on the robust lighting capabilities of Discreet **3ds max®** software.

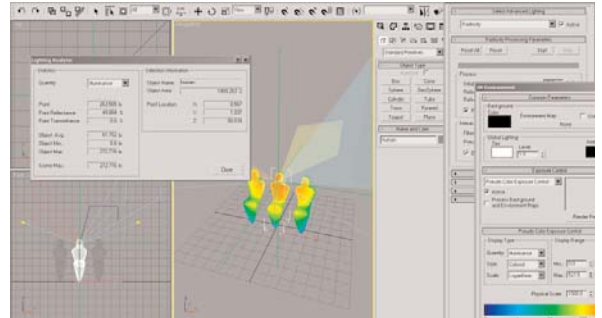
"People come to us to solve their difficult lighting challenges," says Jean Sundin, a principal, along with Enrique Peiniger, of the New York-based company. "For projects that present special lighting problems, we find **3ds max** to be a big help."

A prime example of one such project concerned lighting consultation and design for the new Scottish Parliament, a collection of buildings located on the UNESCO World Heritage site at the foot of Edinburgh's Royal Mile, in Holyrood. The last time the Scottish Parliament met was some 300 years ago. In September 1997, the people of Scotland voted to reinstate its Parliament, and Holyrood was selected as the site for the new Parliament complex later that year.

A \$600 million project, the Scottish Parliament comprises the MSB Building, a five-storey building where Members of Scottish Parliament work and study; Queensbury House, a renovation of an historic structure, originally built in the 1600s, that includes a library and offices; a press building to house members of the press; the actual Debating Chamber, with seating for 130 parliamentarians; and four leaf-shaped Assembly Towers that house dining facilities, offices, and six committee rooms. The project's architectural team—Spain's Enric Miralles and Benedetta Tagliabue, who served as the design architects, and Scotland's RMJM Ltd., which served as the construction architects—chose OVI from among a host of international lighting consultants to light all the interior, exterior, and park/landscape areas.

According to Sundin and Peiniger, **3ds max** software played a crucial role in terms of meeting the broadcast lighting requirements of the Debating Chamber and the six committee rooms in the Assembly Towers. As Peiniger explains, the BBC broadcasts Scotland's parliamentary meetings on television so that viewers at home can stay abreast of government goings-on. But the architects were adamant that the Debating Chamber and

### Validation



Screengrab of the validation tests showing the lighting analysis tool reporting light levels on the characters.

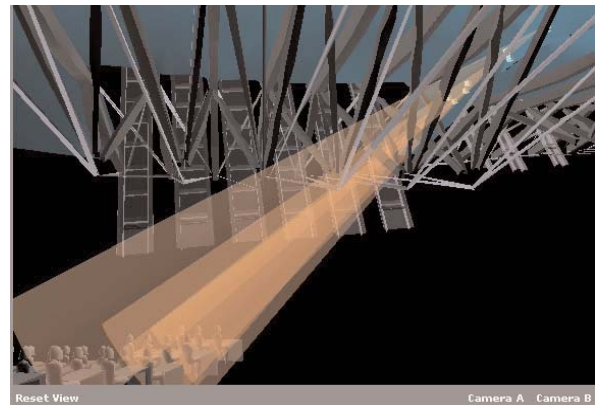


Illustration of lights being occluded by structural elements of the ceiling. Initial design assumptions made without 3d graphics) proved to be wrong.

committee rooms—the locations from which the BBC would be broadcasting—provide proper broadcast lighting conditions without interfering with the rooms' aesthetic designs. "They didn't want people sitting in these rooms to feel like they were in a TV studio," Peiniger says.

"This was a unique challenge for us because these rooms feature asymmetric vaulted ceilings and visible structural elements, including trusses and suspension cables, which needed to be taken into account in terms of lighting layout," adds Sundin.

To accomplish their goal, OVI worked with Montreal-based Pierre-Félix Breton, who acted as technical coordinator on the project. Using **3ds max** software, OVI and Breton determined where to locate and how to orient the more than 900 lights used throughout these rooms so that they met broadcast lighting requirements while integrating into and working with the rooms' unique architecture.

Regarding specific challenges, OVI notes that the ceiling in the Debating Chamber and the committee rooms was completely irregular, which meant they couldn't just lay out a track light and expect it to work because aesthetically, this sort of lighting would not fit into the space. They had to figure out exactly where to place each luminaire so that it integrated into the space.

"Because the architects didn't want it to be obvious that broadcasting is occurring in these rooms, the lighting needed to be tucked away and out of view," Sundin adds.

Furthermore, because the ceilings in these rooms are vaulted, lights in the center of the ceiling would be further away from the floor than lights positioned along the sides of the ceiling and the walls. "As a result, the light intensity of the luminaires in the center of the ceilings would be lower than the intensity of the luminaires elsewhere in the rooms," Breton says. "We had to adjust for that."

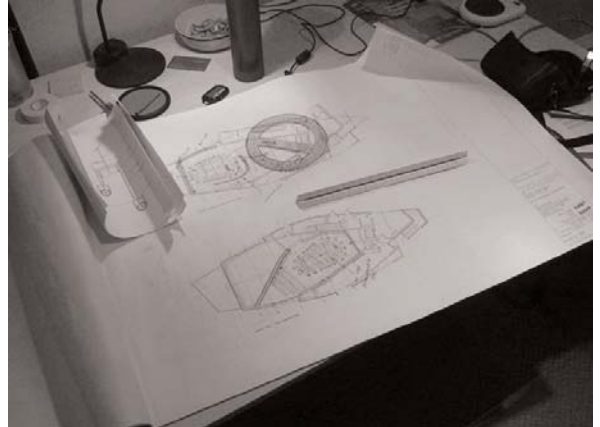
In addition to contending with light intensity and design issues, target light levels had to be met to achieve specific angles and intensities prescribed by television standards.

For other lighting design software, these challenges could prove too difficult to overcome. But that wasn't the case for **3ds max**. To begin, basic models of the rooms were built in **3ds max** and the rooms were populated with basic characters, also built using **3ds max** software. Then, using photometric data provided by manufacturers of various lighting fixtures, luminaire assemblies were created in which geometric details and IK constraints were defined.

For the Debating Chamber, OVI and Breton used **3ds max** to insert luminaire assemblies into the space and aimed them at clusters of about four to eight characters. Then, using the **3ds max** radiosity simulation engine, which is a lighting calculation algorithm, along with light meter tools in **3ds max**, OVI and Breton were able to measure lux levels falling on the characters' faces and shoulders.

"We'd start with the light, position it where we thought the angle was good and the light wouldn't interfere with the design, and then shoot the energy from the light and measure it on the characters' faces," Breton explains. "If it wasn't high enough, we'd add another light to increase brightness. By going through these iterations, OVI and Breton determined optimal light intensity, as well as where and how to orient the lights so that they met the broadcast lighting criteria. OVI then used the resulting **3ds max** light replications to choose which specific lighting fixtures to use in the final design.

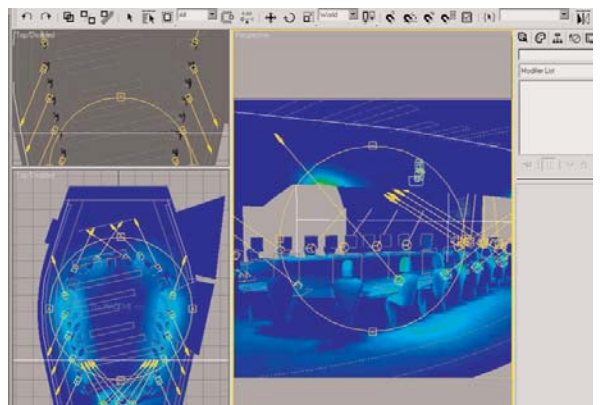
## Committee rooms



The process started on paper...



Definition of aiming angles according to the broadcast lighting requirements in the room.



According to Breton, the ability of **3ds max** to read photometric files was crucial to the success of this task. "Not every light bulb emits light in the same way. Based on the reflector you put around that bulb, for example, you may get a narrow beam, a more intense beam, and so on. To convey that information, luminaire manufacturers define the way light is being emitted from their fixtures in something called a photometric file.

"**3ds max** can read photometric files," he adds. "And in its radiosity system the software can precisely emit light energy based on the manufacturers' data. **3ds max** can reproduce, in terms of energy, the same things the manufacturers have measured—real measurements of the light fixtures. Without the software's ability to do this, we wouldn't have been able to accomplish this part of the project."

As helpful as Discreet's **3ds max** software was in determining the position, location, and intensity of the lights in these buildings, the software also played a crucial role as a design validation tool. For instance, in one case OVI laid out the lighting and realized the edge of a vaulted ceiling was occluding some projector lights, which meant shadows would be cast on people's faces.

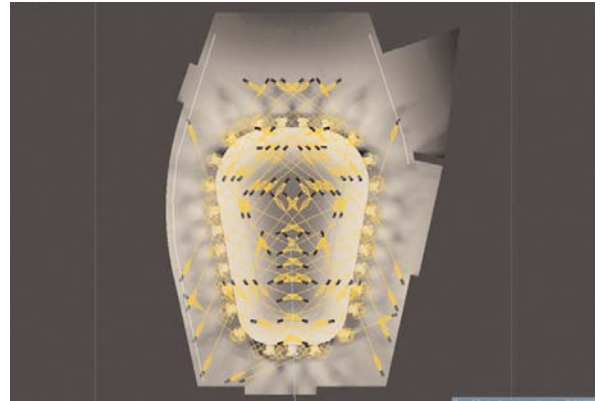
To communicate this issue to the remotely based architects and client, Breton and OVI exported Shockwave files and posted them on the Internet. "Then all they had to do was open a web page in their offices to see what we were illustrating," Breton says.

"The ability to export **3ds max** files as Shockwave files was really helpful," Sundin notes. "The lighting is so integrated with the buildings, so identifying these issues was important to the project's success."

"We could communicate these issues in 3D quickly, so the architects and client could see them," Peiniger adds. As a result, he says, parts of the ceiling were redesigned so that the light beams could reach their targets without creating shadows.

The OVI team also used the **3ds max** imagery to alleviate potential issues regarding the scale and size of fixtures. For example, in one of the committee rooms the design called for projector lights to hang from the ceiling. "We decided to design a beautiful hanging device that minimized the appearance of the fixture and made it look appropriate in the space," Sundin says. "**3ds max** was quite helpful in terms of showing us what would and wouldn't work."

In addition to all these benefits, **3ds max** also was beneficial when it came time to communicate the lighting design to the contractor who installed the fixtures. "The software's ability to extract the 3D information and put it into a 2D drawing was critical," Breton notes. "We're talking about more than 900 luminaires, all with different wattages, positions, orientations, and elevations."



Backlighting intensity and distribution tests.

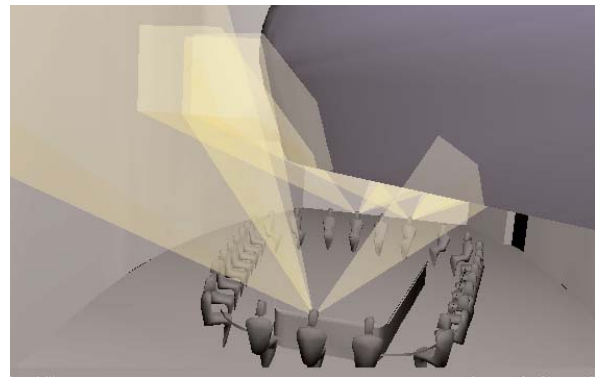


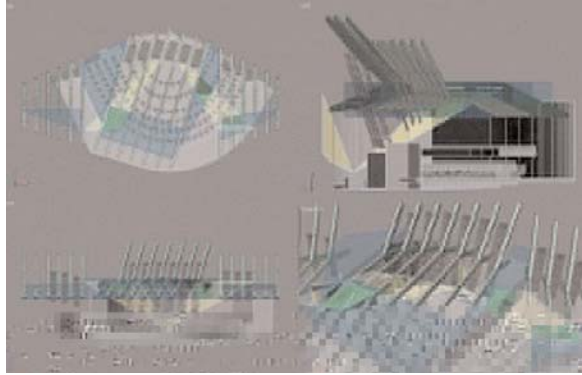
Illustration of lights being occluded by a vaulted ceiling in a committee room. Initial design assumptions (made without 3d graphics) proved to be wrong. With 3d techniques, we could identify where problems were and resolve them easily.

According to Breton, the project was streamlined by writing custom scripts using the MAXscript feature in **3ds max**. "The script I wrote would extract the relevant information—including each luminaire's exact location in 3D space and the direction in which it was aimed—and create an accurate 2D drawing from that." And he says the MAXscript feature made the task quick and painless. "Given the amount of time we had to generate this information, without scripting this would have been impossible," he states.

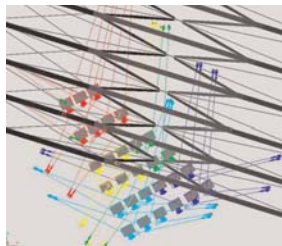
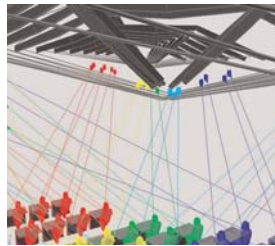
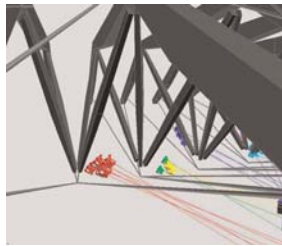
The Scottish Parliament opened its doors in October 2004, and according to OVI, the architects and client are extremely pleased with the outcome. "The architects told us the lighting in the rooms is fantastic and is absorbed into the architecture," comments Peiniger. He and Sundin add that OVI will continue to work on projects in which **3ds max** software will play a role.

"You normally don't think of **3ds max** as a lighting tool," Breton concludes. "But in projects like this, it's absolutely essential."

## Debating Chamber



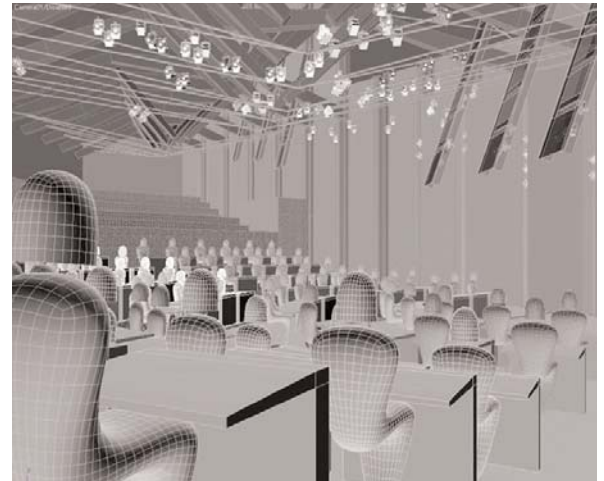
Evaluation of the possible location for the luminaires (green), defined by the intersection of the aiming angle volumes (yellow) and predefined light zones volumes (blue).



Illustrations of studies made to mount luminaires in the ceiling. Luminaires are mounted in such a way that light does not get occluded by the structure of the ceiling.



Test rendering on a seating section in the debating chamber.



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