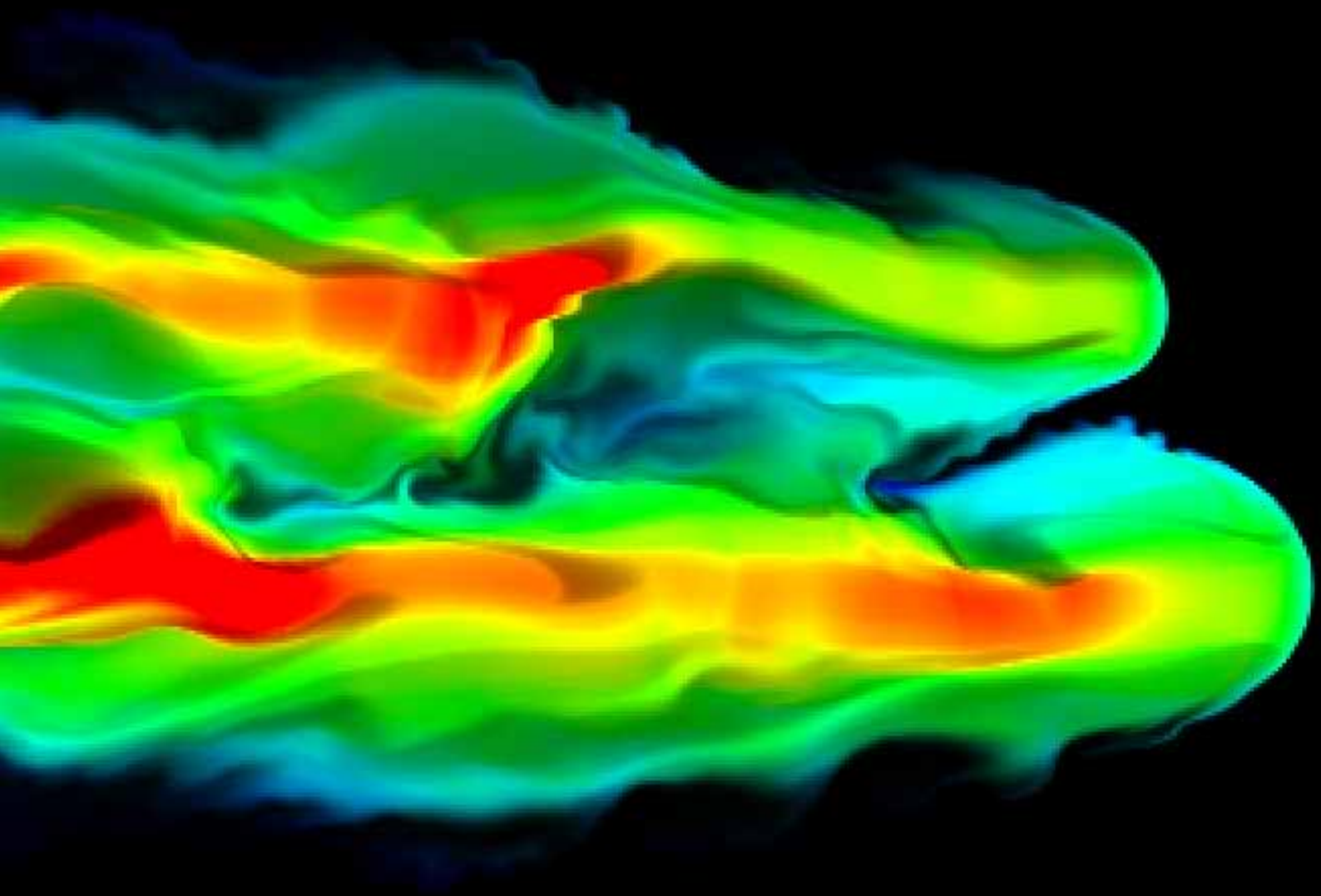
AU

Design Computation Symposium

November 28, 2012 | 1:00 p.m.–4:30 p.m. | Mandalay Bay Hotel, Las Vegas, Nevada



Design Computation Symposium AU 2012

Wednesday, November 28, 1:00 p.m.–4:30 p.m.

SOUTH CONVENTION CENTER, SOUTH SEAS A, LEVEL 3

Session 1 | 1:00 p.m.–2:30 p.m.

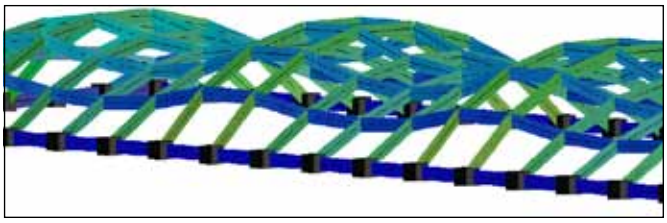
Introduction: Robert Aish [Autodesk]

This year's Design Computation Symposium brings together new developments in scripting, modeling, optimization and digital fabrication, with presentations that span from the development and use of innovative computation design tools through to the design of stunning architectural and engineering projects.

Holistic Design Optimization Strategies Using DesignScript

Al Fisher [Buro Happold]

Analysis and optimization as design processes have traditionally resided in discrete silos corresponding to each design and engineering discipline. Consequently, approaches to achieve custom multidisciplinary optimization can be challenging or require very specific frameworks.



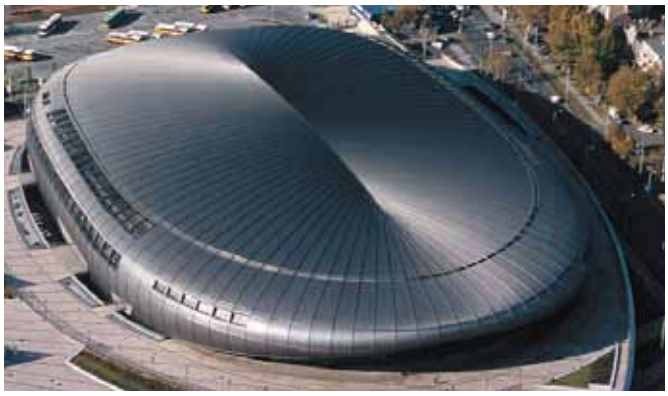
■ *Script-driven form finding and structural analysis with SMART Form, Autodesk Robot Structural Analysis and DesignScript. Image courtesy of Buro Happold.*

Here we present current research that uses DesignScript to create a general platform to enable transparent development of bespoke design and optimization processes, customizable for any given project. We will give several examples that harness Autodesk® Robot™ Structural Analysis, SMART Form (form finding), and Performative Design (environmental analysis).

Paneling Design Explorations for Digital Fabrication Using DesignScript

Peter Mehrtens [Bemo Systems]

One of the main challenges in realizing adventurous architecture involves the digital fabrication of doubly curved roof surfaces. The approach presented here uses highly specialized computer-controlled 3D roll-forming equipment for the digital production of MONRO standing seam panels. This technology enables mass customization of metal panels that have individually curved edges and are bent with varying curvature. Driving this fabrication system requires that the architect and digital fabricator collaborate to develop an optimal panelization strategy. Typically, this involves using a script-driven approach to the geometric analysis of the underlying doubly curved surface and generating different panel layouts. We will illustrate this process using a large-scale project currently under construction in Asia. This case study shows the surface analysis and panel layout generation using DesignScript.

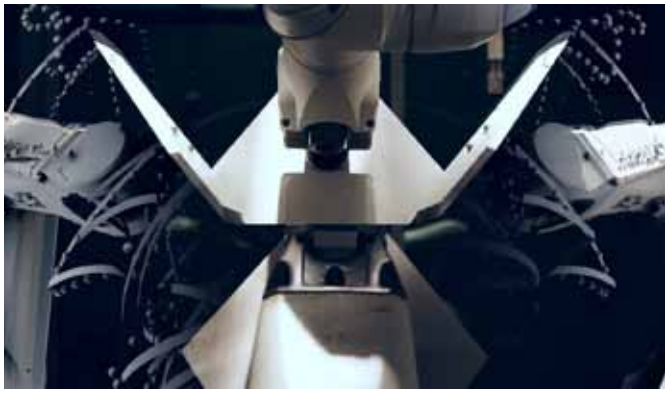


■ *Papp László Budapest Sportaréna, Budapest, Hungary. Architect: KÖZTI (Skardelli György, Pottyondy Péter), Hungary. Image courtesy of KÖZTI.*

Augmented Fabrications: The Role of Speculative Manufacturing

Brandon Kruysman, Jonathan Proto [SCI-ARC]

Kruysman and Proto are researchers at SCI-ARC, one of the most forward-looking architectural schools. This presentation will discuss their current research into collaborative robotics, blurring the boundary between design speculation and new methods of fabrication through their purpose-built motion control and communication software plug-in for Autodesk® Maya®.



■ *Robotic fabrication using Autodesk Maya. Image courtesy of Kruysman and Proto.*

Session 2 | 3:00 p.m.–4:30 p.m.

Craftsmanship in the Digital Age

Bill Kreysler [Kreysler and Associates]

Kreysler & Associates has over 30 years of experience fabricating custom products using traditional tools as well as CNC tools and 3D laser scanning, having created their first all digitally defined sculpture project, a 36-foot-tall statue for a Japanese theme park, in 1986. This presentation will focus on the process of working from digital designs to create reliable, code-compliant, durable products that can be predictably executed, and are efficient and cost-effective. Understanding material properties, assembly processes, and delivery means and methods is pivotal to successfully move a project from the computer to the built environment. Kreysler considers this a natural evolution of the contribution made by generations of craftsmen whose role remains, but whose tools, as they have for centuries, continue to evolve.

■ *The Bing Concert Hall at Stanford University. Image courtesy of Ennead Architects.*

Raising the Cutty Sark: Restoring and Transforming an Iconic Ship

Wolf Mangelsdorf [Buro Happold]

The Cutty Sark is a nineteenth-century sailing ship and is a key part of Britain's national maritime heritage. During the recent restoration project, the whole ship—weighing 600 tons—was lifted 3 meters. The lifting of the Cutty Sark involved some of the most complex 3D analysis and modeling that Buro Happold has ever undertaken, including performance of the prestressed system under thermal and wind loads, the lifting, and the different equilibrium states during lifting and change of supports. This presentation will focus on the advanced engineering used in this project, including Robot Structural Analysis models, live monitoring of forces during lifting, and reconciliation with our analysis models, modeling assumptions, and material systems.

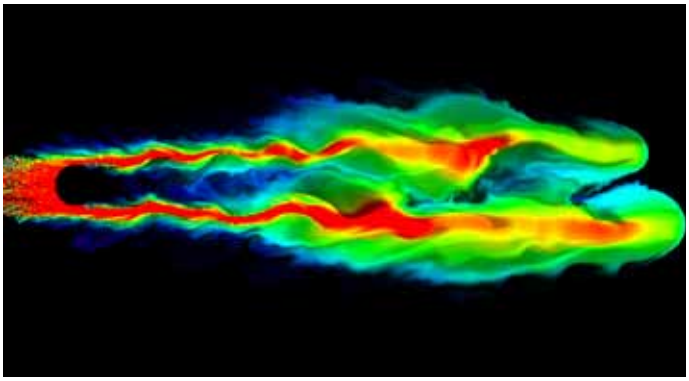
■ *The Cutty Sark about to be lifted. Image courtesy of Burl Happold.*

■ *The Cutty Sark in its final position. Image courtesy of Jim Stephenson.*

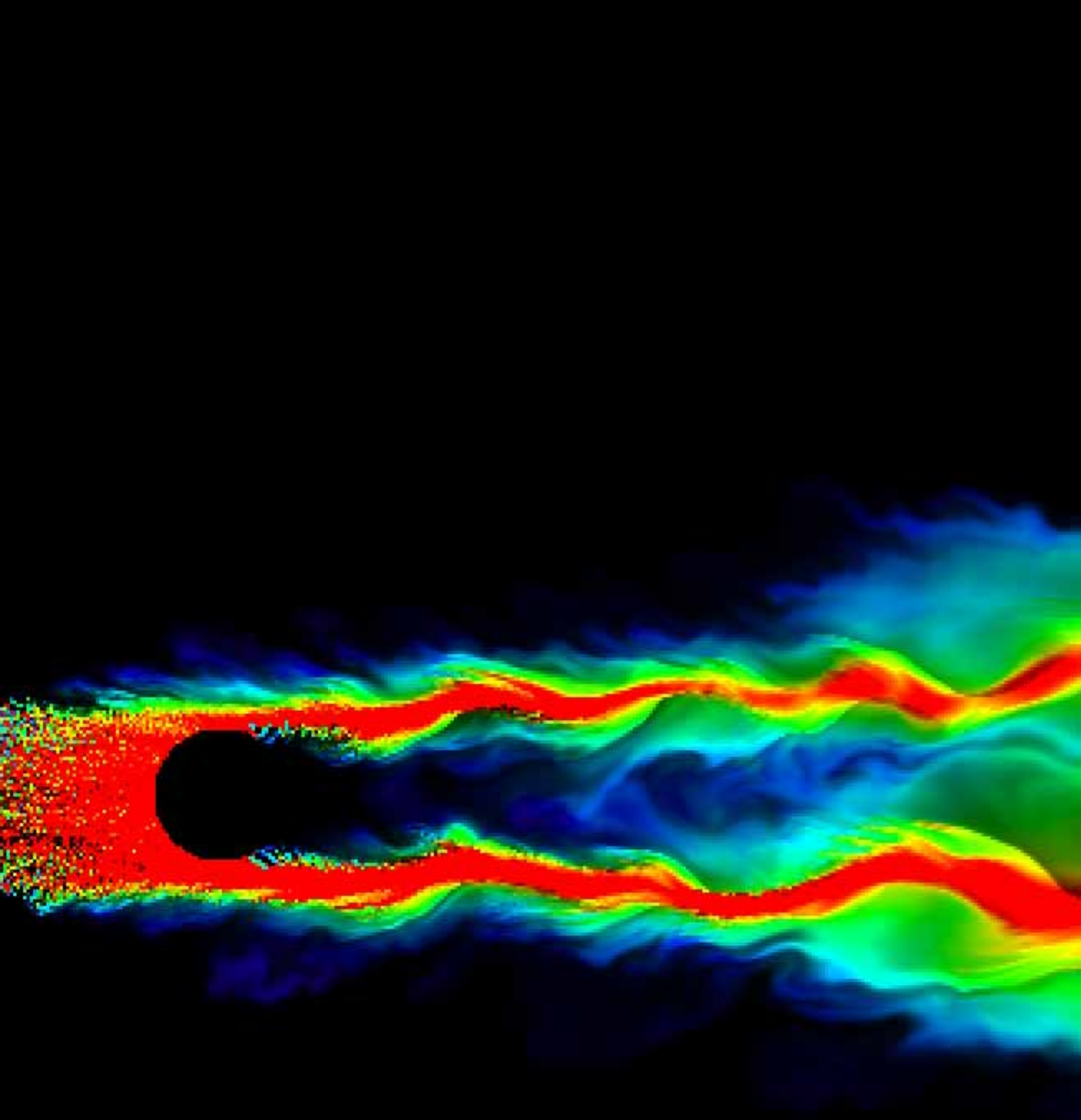
Human Intuition, Computational Rigor

Francis Aish [Foster + Partners]

Foster + Partners are internationally renowned architects who have pioneered advanced computation as an essential design tool. Using a number of different project examples, this presentation will describe how their Applied Research and Development team works with integrated design teams to combine human intuition and computational rigor to generate performance-driven design options and suggest optimal solutions.



■ *Real-time CFD simulation. Image © 2011 Foster + Partners. All rights reserved.*



Autodesk®