

MARK BURRY

USES NEW FABRICATION METHODS TO HELP FINISH THE SAGRADA FAMILIA



When Melbourne-based architect Mark Burry visited Barcelona in 1979 as part of his master's thesis on Spanish architect Antoni Gaudí, little did he know that Gaudí's unfinished masterpiece, the Sagrada Família, would become his life's work. On that fateful trip, Burry had the opportunity to interview two architects in their 90s who had actually worked with Gaudí as students. 'I think I was just lucky to be asking the right questions at the right time,' says Burry, because he was soon offered a job on the project and spent a year and a half on site. Now executive architect and researcher on

the building, Burry maintains a long-distance relationship with the church via conference calling and digital collaboration, in addition to making regular trips to Barcelona. Fluent in both Spanish and Catalan, he has been involved with the privately funded project, which welcomes more than two million visitors annually, for more than 30 years.

The ornate and geometrically complex building has no flat surfaces and no straight walls, and Burry was faced with the challenge of describing and analysing the structure. 'I had to stop working like an architect and

start working like a geographer,' he says. 'We couldn't use architectural computer programs, so I developed my own digital tools in 1989.' Advanced digital tools extend Gaudí's repertoire, and Burry, who shares Gaudí's interest in parametric design and material computation through model-building (in his lectures he shows photos of Gaudí's hanging chain models), feels assured that Gaudí would have approved of using digital design methods to complete the project. 'Absolutely,' he says. 'Gaudí designed parametrically.'

Using a mashup of customized digital tools, Burry has been a pioneer

Text Terri Peters



EXTRACTING STONE FROM THE TARN QUARRY (FRANCE) 'CUT TO ORDER' RATHER THAN CRUDELY BLASTED FROM THE ROCK FACE. THE PARAMETRIC MODEL OF THE NARTHEX COLONNADE GENERATES 3D MODELS FOR THE GRANITE BLOCKS IN ORDER TO MINIMIZE WASTE.



TONI CAMINAL FROM THE SAGRADA FAMILIA DESIGN OFFICE, IN CHARGE OF THE PRODUCTION AND WORKFLOW FOR THE INDIVIDUAL STONE COMPONENTS.

'I had to stop working like an architect and start working like a geographer'

— Mark Burry —

THE ARCHITECT AND THE STONEMASON: MARK BURRY (LEFT) AND JORDI BARBANY DISCUSSING THE OPTIONS FOR PREPARING THE INDIVIDUAL COMPONENTS OF THE PASSION FAÇADE COLONNADE ABOVE THE NARTHEX.



SEVEN-AXIS ROBOT SAW AND TURN-TABLE COMBINATION AT GRANITS BARBANY, ONE OF SEVERAL STONEMASONS CONTRACTED BY THE SAGRADA FAMILIA CHURCH.



'For the first 20 years I was like an apprentice working on Gaudí's designs, interpreting directly from his materials in an analogue way,' he says. 'But the last ten years I've been working more on synthesis – on working in the bits he did not specifically design in detail.' Gaudí left some hints to the overall design, such as a section through the building that gives spot heights and several surviving plaster scale models. Unfortunately, Gaudí's studios were sacked during the Spanish Civil War and many of his key works lost. During his involvement in the project, Burry has worked to establish the rules and prin-

ciplines that guide Gaudí's designs, thus allowing 'new' designs and geometries to be extracted from surviving fragments and leading to work that is both innovative and conceptually true to the existing unfinished building.

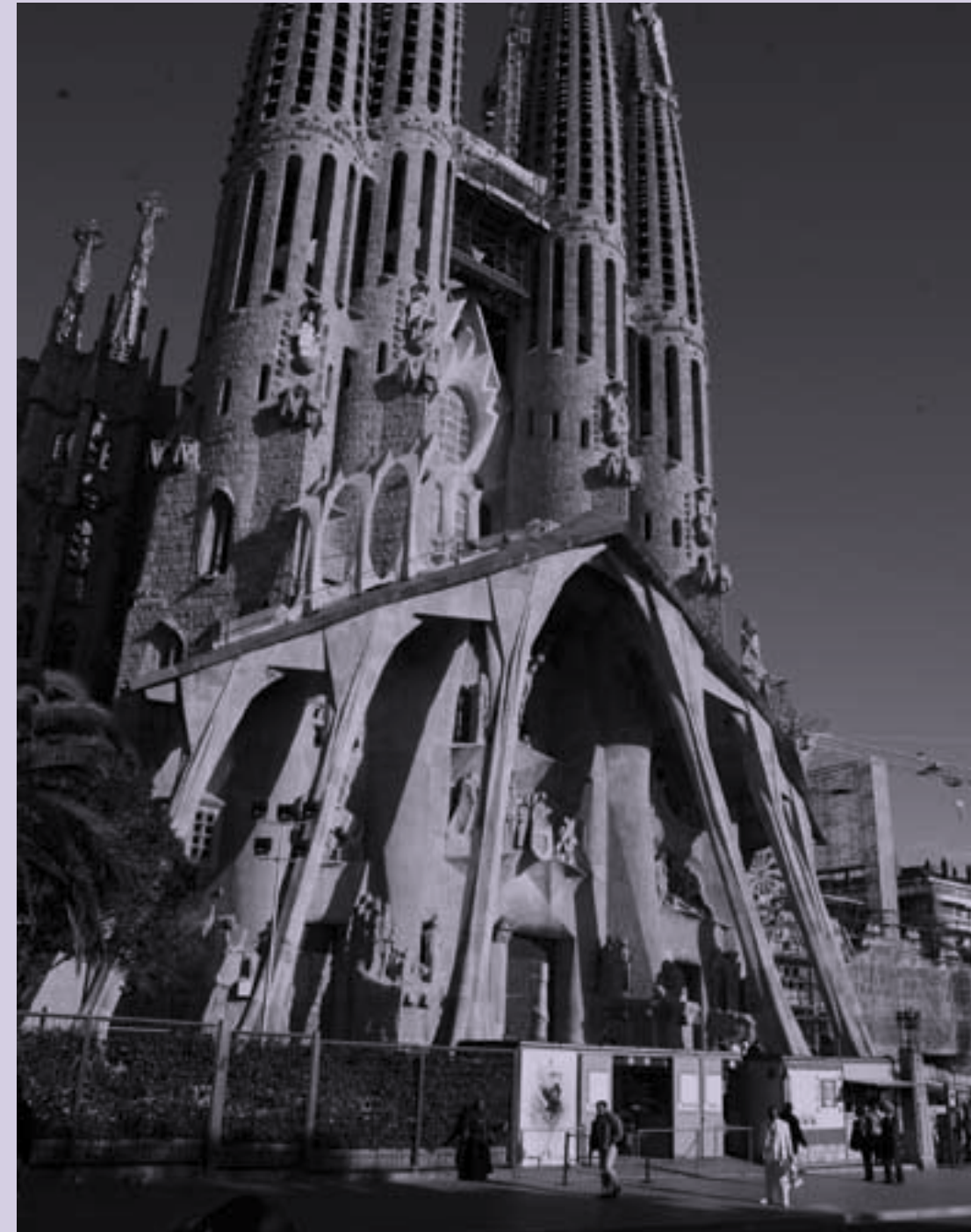
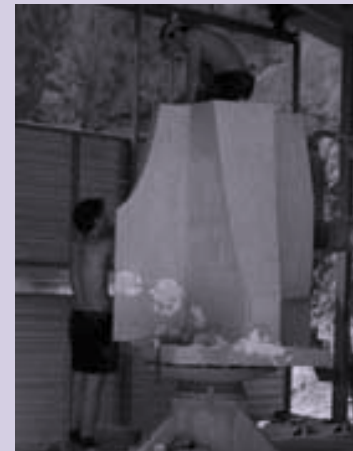
The building's materials are traditional, largely concrete and stone, but thanks to innovative materials and new methods of fabrication, current work can be carried out efficiently and accurately. The stone is milled off-site at a granite quarry, permitting mass customization: although the many stone pieces are machine-made, each has a subtly different geometry. Generations of stonemasons from the area have been working on the project and, despite their artisanal traditions, have embraced digital technologies. They now operate the five-axis robot (from the automobile industry) with its two-axis turntable, which mills the stone into the desired shapes. Shuttering for the concrete is made off-site, in a small village, from laser-cut steel plates, and a new type of concrete developed for this project allows a much larger amount of concrete to be poured at once, often up to several meters in one go. The hybrid and high-profile nature of the project – part reconstruction and part extension,



IN ORDER TO MINIMIZE MACHINE TIME FOR THE SEVEN-AXIS STONE CUTTER AND ROUTER AT GRANITS BARBANY, A BLANK IS PREPARED CUT BY A DIAMOND WIRE AS CLOSE TO THE FINAL SIZE OF THE PIECE BEING PREPARED, IN THIS CASE, THE BASE FOR ONE OF THE NARTHEX COLUMNS.



PREPARATION OF THE COLUMN BASE FOR ONE OF THE NARTHEX COLUMNS, A FULL-SCALE PROTOTYPE HERE MADE FROM GRANITE PRIOR TO BEING HAND-FINISHED. A VARIETY OF SURFACE TREATMENTS ARE TESTED AS PART OF THE DESIGN PROCESS.



DEVELOPMENT OF THE COLONNADE DESIGN ABOVE THE NARTHEX (PASSION FAÇADE). THE COLUMNS HERE ARE PAINTED POLYSTYRENE PROTOTYPES MACHINED DIRECTLY FROM A 3D DIGITAL MODEL.



with dozens of interested parties making sure Gaudi's intentions are carried through – extends to the manner of working, with digital and analogue tools and processes operating side by side.

The New Zealand-born architect is currently the director of SIAL (Spatial Information Architecture Laboratory) at RMIT in Melbourne as well as the RMIT Design Research Institute, which acts as a creative think-tank accessible to both local and international practices, including ARUP in Melbourne and London, dECOi in Paris and Gehry Partners in Los Angeles. He has lectured for 30 years on the process of untangling the geometry of the Sagrada Família project and has published dozens of articles, book chapters and catalogues on Gaudi's life and work.

'Over the years, every time I got asked to do something on the project, I would wonder if it was the last thing,' he says. 'But in November 2010 the interior will be finished, although from the outside it will look far from being a completed church with twelve towers yet to be built.' These include six towers in the centre of the roof, four towers over the main entrance and two 45-m-tall domes on the site. It looks as though now, nearly 130 years after the first stone was laid, the Sagrada Família is nearing completion. Burry is resigned to this fate but is characteristically humble in his celebration of the results. 'It has been good – but, yes, the end is in sight!'

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