

Jay Bonner

Education:

M.Des. Royal College of Art, London, England, 1982

Concentrations: Islamic ornamental design (thesis), and Islamic architectural ceramics (project). The Royal College of Art offers post-graduate degrees by project or thesis. I elected to complete my degree by meeting the requirements of both tracks.

Thesis: "Cosmological and Metaphysical Aspects of Islamic Pattern-Art."

Project: Islamic Architectural Ceramics: glaze chemistry, traditional materials and methods of fabrication.

Note: I was accepted into the Master's Degree program at Royal College of Art without an undergraduate degree. The RCA bylaws allow for this circumvention in exceptional circumstances wherein the applicant is determined to have an equivalent professional experience. As a professional designer with many years of experience prior to my applying, I was granted this exception. I was told that from the RCA's foundation in 1837 until my application, such an exception had never been granted.

Post-Graduate Research and Award:

- 1982: **Research Fellow** in the Department of Ceramics and Glass, Royal College of Art, London. This position lasted two consecutive years, and involved extended research into (1) traditional burnt luster glaze technologies, and (2) an overview of the British ceramic tile industry.
- 1982: **Awarded** the Royal College of Art Major Traveling Award. This was their highest college-wide award at the time, and was awarded to a single recipient. I used the funds provided by this award for extended travel to ceramic tile factories in Italy, as well as prominent sites of Islamic architecture in Southern Spain.

Conferences, Seminars, Lectures and Teaching:

- 2009: Contracted by the Turquoise Mountain Foundation in Kabul, Afghanistan to assist in the design of a ***Traditional Afghan Design Curriculum*** for their college-aged students. This organization is dedicated to the preservation of native Afghan artistic practices, and employs traditional *ustads* who are the finest living exemplars of their art. Yet the knowledge of creating traditional Afghan designs has been largely lost. My work with Turquoise Mountain devised a teaching program for creating original designs based upon multiple geometric and floral designs from their past. This program includes a workbook (see Publications below).
- 2008: Lecture titled ***The Polygonal Technique: the Traditional Use of Polygonal Matrices in the Design of Islamic Geometric Patterns*** given at the Pécs-Ars Geometrica conference in Pécs, Hungary.
- 2006: Lecture titled ***The Polygonal Technique: an Exposition of the Primary Historic Method of Constructing Islamic Geometric Patterns*** given at the Geometric Patterns in Islamic Art conference at the Lorentz Center, University of Leiden, Netherlands.

- 2006: Lecture titled ***Seljuk Geometric Patterns: Recreating the Astonishing Compound Islamic Geometric Patterns of 13th Century Anatolia*** given as part of the Special Lecture Series in Computer Science at the University of San Francisco, San Francisco, California.
- 2006: Lecture and one-day seminar on ***The Use of Polygonal Systems to Create Islamic Geometric Patterns*** given to undergraduate students in the Math and Aesthetics class at the University of San Francisco, San Francisco, California.
- 2003: Lecture titled ***Three Traditions of Self-Similarity in Fourteenth and Fifteenth Century Islamic Geometric Ornament*** given as the plenary address at the ISAMA - Bridges Conference at the Faculty of Sciences, University of Granada, Spain. In 2006, I was asked to give a second presentation at the Geometric Patterns in Islamic Art conference at the Lorentz Center, University of Leiden, Netherlands (see above), and chose to present this paper.
- 2002: Outside advisor for PhD candidate in the Computer Science and Engineering Department of the University of Washington, Seattle, Washington. The dissertation title was *Computer Graphics and Geometric Ornamental Design*. Over a period of four months prior to the completion of his dissertation, I advised the candidate in specific aspects of traditional design methodology used in the construction of Islamic geometric patterns.
- 2002: Lecture and presentation of ***My Work as a Specialist in Traditional Islamic Design and Architectural Ornament*** to graduate students in the Architectural Department at the University of Washington, Seattle, Washington.
- 2002: Lecture titled ***Ornamental Designs for the Kaaba Minbar*** presented to the annual meeting of the Muslim Networks Consortium at Duke University. This lecture focused on the large number of carved marble floral designs I produced for the minbar for the Kaaba courtyard of the Grand Mosque in Mecca, Saudi Arabia (Al Masjid Al-Haram).
- 2001: Lecture titled ***Aesthetic Synthesis and Contemporary Islamic Architectural Ornament*** presented to the first International Conference on *Muslim Networks: Medium, Methodology and Metaphor* at Duke University, North Carolina.
- 2001: Lecture titled ***The Role of Geometry in Islamic Ornament***. This was a college-wide lecture organized and sponsored by the Architecture Department in association with the Department of Graphic Design at the Rhode Island School of Design.
- 2001: One-day seminar titled ***Systems in the Design of Traditional Islamic Geometric Patterns*** given to the undergraduate student body of the Department of Graphic Design at the Rhode Island School of Design.
- 1999: Five-day seminar titled ***The Formative Principles of Islamic Geometric Patterns*** for Crestone Design Seminars in Crestone, Colorado. This was the inaugural program for their *Geometer's Art* series; focusing upon the traditional methods used in creating complex geometric patterns. The students were from a range of professional backgrounds related to the arts and education.
- 1982: As a Research Fellow in the Department of Ceramics and Glass at the Royal College of Art in London I served, in part, as an instructor to two graduate students. This work was primarily concentrated upon ceramic glaze chemistry, and the appropriate balancing of decorative design with architectural ceramic fabricating technologies.

Architectural Ornament and Design Projects:

- 2011: Senior Ornamental Design Consultant to **Fry's Electronics** for the decorative component of the **American Institute of Mathematics Research and Conference Center (ARCC)** in Morgan Hill, California. This building is dedicated to the study of advanced mathematics; is approximately 575,000 square feet, includes 21 live-in suites for conference attendees, and is designed in the style of the Alhambra in Granada, Spain. This project is in the early stages of Design Development and is expected to take several years to complete. The ornamental design is in the high Nasrid style of the Alhambra, and fabrication will be carried out by the finest Moroccan craftspeople.
- 2011: Contracted by **SL-Rasch GmbH** of Stuttgart, Germany as the lead design consultant for their contributions to the **Shamiya Expansion of the Grand Mosque in Mecca (al-Masjid al-Haram)**. This was a 20 month contract, during which I was principally responsible for the interior ornamental design for the 36-meter diameter dome in the royal entry hall, as well as the twelve 18-meter diameter Sliding Domes within the new construction of the mosque. I also provided the designs for the 20-meter high ornamental screens that dominate the exterior façade, the wood doors, and the grand chandelier in the royal entry hall.
- 2009: Commissioned (client prefers anonymity) to design a **Highly Ornamental Custom Steel String Guitar**. The ebony fretboard and headstock are inlaid in mother-of-pearl. The floral inlay is in the same style that I originally developed for the 27 Sliding Dome of the Prophet's Mosque in Medina, Saudi Arabia (see below). This guitar was made by the Santa Cruz Guitar Company of Santa Cruz, California. The woods for this guitar include Atlantic cedar for the soundboards (from the Atlas Mountains in Morocco), and super-quilted mahogany from "the tree" for the backs and sides (a wind-fall from Belize).
- 2009: Contracted by **Fry's Electronics** to provide ornamental designs for the **Windows and Doors for the American Institute of Mathematics Research and Conference Center (ARCC)** in Morgan Hill, California (see above). This building is being designed in the style of the Alhambra in Granada, Spain, and is dedicated to the study of advanced mathematics. The design of their windows and doors was my first contract for this project, and this was followed by several other contracts for the ARCC; including the review of their overall architectural plans with recommendations for the ornamental treatments throughout the 575,000 square foot building. My initial work on the ARCC spread across a three-year period. After completing these initial contracts in 2009, the project experienced a hiatus until 2011. It has now resumed, and I am once again their senior ornamental consultant.
- 2008: Contracted by **Keith Yates Design Group** to design the **Ornament for a State-of-the-Art In-House Theater**. This elaborate room was designed in the style of Moorish Spain, and evokes the feeling of early themed movie theaters in the United States. Keith Yates Design Group is a pioneer and leading practitioner in the field of advanced acoustical engineering for architecture. This project was for a private client in Mill Valley, California.
- 2007: Contracted by **SL-Rasch GmbH** of Stuttgart, Germany to design the ornament for the **Abraj Al-Bait Clock Tower** in Mecca, Saudi Arabia. With their 43-meter diameter faces, the four clocks that surmount this tower are the largest in the world. At approximately 600 meters, it is also the tallest clock tower, and the second tallest building in the world. This tower is part of the Abraj Al-Bait Tower complex of five towers, and when completed will have the largest amount of enclosed floor space of any building in the world. I designed the high relief glass mosaic floral and geometric ornament for the four clock faces, the floral ornament for the minute and hour hands, the observatory dome, and miscellaneous tower details. This project is scheduled for completion in 2011.

- 2006: Contracted to design a **Mughal Style Tomb for a Sufi Sheikh** in Tasmania, Australia. This small project was for a private client.
- 2003: Contracted by **SL-Rasch GmbH** of Stuttgart, Germany, to design the ornamental details for multiple **Quran Bookshelves for the Prophet's Mosque** in Medina, Saudi Arabia (al-Masjid al-Nawabi: the burial place of the Prophet Mohammad). These were hand-carved in India from Corian (to simulate the white marble used throughout this building).
- 2002: Contracted by **SL-Rasch GmbH** of Stuttgart, Germany to design all ornamental details for the final version of the **Kaaba Minbar**. This minbar is placed adjacent to the Kaaba in the courtyard of the Grand Mosque (al-Masjid al-Haram) in Mecca, Saudi Arabia. The extensive floral ornamentation is in the pan-Islamic style I developed for the 27 Moving Domes for the Prophet's Mosque in Medina (see below). The floral panels for this minbar were made from hand-carved marble, and inlaid with Persian turquoise. All the marble elements for the minbar, including the multiple hand-carved ornamental panels, were produced in India, and shipped to Saudi Arabia for assembly and final installation into the Kaaba courtyard. This minbar is portable: engineered to allow for its easy removal from the Kaaba courtyard during the peak-use period of Hajj pilgrimage.
- 2002: Contracted to design a series of **Enamel Murals for the Department of Science and Mathematics at the University of Colorado** in Pueblo, Colorado. The Islamic geometric patterns developed for these panels reflect several areas of interest in math and sciences, including self-similar geometry, aperiodicity, and molecular symmetry as revealed by X-ray diffraction patterns. This work was carried out in collaboration with the enamel artist Pat Musick.
- 2000: Contracted to design the architectural ornament for the **International Medical Center** in Jeddah, Saudi Arabia. This is a large state-of-the-art hospital designed by the Saudi architect **Dr. Sami Angawi in association with Steffian Bradley Associates**. It is intended that the hospital demonstrates the appropriateness of incorporating extensive traditional Islamic ornament into contemporary civic architectural projects in the Middle East. This building called for the extensive use of traditional ornamental features and a combination of both hand-made and state-of-the-art manufacturing technologies. My designs for this project included an extensive use of muqarnas vaulting for both the interior and exterior of the building; plaster and stainless steel squinch-net vaulting; carved wood, water-jet cut stone mosaic flooring, stained and etched glass, cast bronze, etched stainless steel, and ceramic tile and mosaics. In order to coordinate the ornamental elements of this building with other aspects of the architecture, I also consulted closely with the interior designer, landscape architects, and a signage consultant.
- 2000: Contracted by **SL-Rasch GmbH** of Stuttgart, Germany, to design the **Ornamental Details for the Kaaba Stairway**, a large teakwood movable stairway used once a year by the king when entering the Kaaba chamber in Mecca, Saudi Arabia. As custodian of the holy sites, this is a purely ceremonial function of the king. The floral ornament was hand carved from teakwood by craftsmen in Malaysia, and inlaid with lapis lazuli.
- 1998: Contracted by **SL-Rasch GmbH** of Stuttgart, Germany, to design the **Rainwater Runoff Grates for the Flat Roof of the Prophet's Mosque** in Medina, Saudi Arabia (al-Masjid al-Nawabi). These were manufactured in Germany from cast aluminum.
- 1997: Contracted by **SL-Rasch GmbH** of Stuttgart, Germany, to design the interior **Textile Appliqué Decoration for the Reception Tent for a Beach Palace in Obhur**, Saudi Arabia. The surface coverage of this tent is approximately 300 square meters, and the material of the tent and appliqué is PVC.

- 1997: Contracted by **SL-Rasch GmbH** of Stuttgart, Germany, to design the **Bronze Gates and Wall Grilles for the Enclosure of the Muna Tent City** for Hajj pilgrims in Mecca, Saudi Arabia.
- 1995: Contracted by **SL-Rasch GmbH** of Stuttgart, Germany, to design ornamental details for the **23-meter Umbrellas for the Piazza of the Prophet's Mosque**, Medina, Saudi Arabia (al-Masjid al-Nawabi).
- 1995: **Ornamental Consultant and Furniture Designer** for the **Morrelli Corporation** in Santa Fe, New Mexico. This company produced fine quality hand-made furniture; specializing in highly ornamental hand carved pieces. I worked as a design consultant for this firm for three years; concluding in 1995.
- 1994: Contracted by **SL-Rasch GmbH** of Stuttgart, Germany, to design the **Cast Bronze Ornamental Details for the Lamp Columns for the Piazza of the Prophet's Mosque**, Medina, Saudi Arabia (al-Masjid al-Nawabi).
- 1993: Contracted by **SL-Rasch GmbH** of Stuttgart, Germany, to design the ornamental **Bronze Gates for the New Piazza of the Prophet's Mosque**, Medina, Saudi Arabia (al-Masjid al-Nawabi).
- 1993: On-going design contracts with **SL-Rasch GmbH** of Stuttgart, Germany, to design three important features for the courtyard of the Kaaba in Mecca, Saudi Arabia: (1) designs for the **Maqam Ibrahim**, a large reliquary adjacent to the Kaaba that houses a stone upon which Ibrahim is believed to have stood when he founded the Kaaba; (2) the first iteration of designs for the portable **Kaaba Minbar** (completed in 2002: see above); and (3) the first iteration of designs for the highly ornate, hand-carved wooden movable **Kaaba Stairway** for the once-a-year ceremonial use by the king when entering the Kaaba chamber (completed in 2000: see above).
- 1992: Consultant to **I.P.C.A. Ltd.** of Bristol, England to **Research Filming Locations** in Cairo, Egypt for a documentary on the expansion to the Prophet's Mosque in Medina, Saudi Arabia (al-Masjid al-Nawabi).
- 1991: Contracted by **SL-Rasch GmbH** of Stuttgart, Germany, to design ornamental details for the cast bronze column capitals for the **Twelve 14-Meter Architectural Umbrellas for the Two Courtyards of the Prophet's Mosque** in Medina, Saudi Arabia (al-Masjid al-Nawabi).
- 1990: Contracted by **SL-Rasch GmbH** of Stuttgart, Germany, to design the interior ornament for the **27 Sliding Domes for the Prophet's Mosque Expansion Project**, Medina, Saudi Arabia (al-Masjid al-Nawabi). Each dome has an approximate diameter of 20 meters, and is engineered to slide open and closed - turning a domed chamber into an open courtyard. The floral style I developed for this project is pan-Islamic: designed to be recognizably Islamic to all pilgrims from all areas of the world, yet not associated with the ornamental style of any particular epoch or Muslim culture. The ornament is elaborate and is comprised of a variety of hand-carved Moroccan Atlantic cedar floral panels (a.k.a. Atlas cedar), inlaid with semi-precious amazonite stones set in gold-plated bezels. The wood carving for this project was undertaken in Morocco where some 150 wood carvers were employed for over a year to complete the project. For this immense project I was also contracted to consult on the quality control of the woodcarving and stone cutting, as well as the pre-installation of all decorative elements in Germany.
- 1990: Contracted by the **Al-Furqan Foundation** in London to design and supply **22 Linear Meters of Carved Walnut Arabic Calligraphy with Highly Ornamental Floral Background, Brackets, and Borders**. The renowned Pakistani calligrapher, Rasheed

Butt, undertook the calligraphy for this project. This work was undertaken by traditional woodcarvers in Pakistani Kashmir. The Al-Furqan Institute is dedicated to the photographic recording and preservation of Islamic manuscripts, and their facility is located in Wimbledon, London.

- 1988: Design and quality control of the **Chemically Etched Decorative Steel Cladding used in the Elevators** that were installed as part of the modern expansion of the Grand Mosque in Mecca, Saudi Arabia (Al Masjid Al-Haram). This project was undertaken during my position as **Senior Designer for Tenda Ltd**, a London design firm specializing in contemporary Islamic architecture.
- 1987: Design for the **Stained Glass Window and Interior and Exterior Ceramics for the Data Darbar Mosque and Shrine** in Lahore, Pakistan. This mosque complex was built at the burial site of the great eleventh century Sufi saint Al-Hujwiri (Hazrat Data Gang Bakhsh). This project was undertaken during my position as **Senior Designer for Tenda Ltd**, a London design firm specializing in contemporary Islamic architecture.
- 1986: The design of a series of **Large Wooden Foliated Kufi Calligraphy Panels** with bold relief for the Pakistani government's New Senate House in Islamabad. This project involved collaboration with the renowned Pakistani calligrapher Rasheed Butt. The fabrication was carried out in Pakistan by local craftspersons. This project was undertaken during my position as **Senior Designer for Tenda Ltd**, a London design firm specializing in contemporary Islamic architecture.
- 1986: Design of the glass reinforced **Gypsum Squinch-Net Vaulting, Muqarnas Capitals, and Stained Glass Windows** for the interior the Mecca City Gate in Mecca, Saudi Arabia. This modern building serves as a ceremonial entryway into the city of Mecca. Along with the calligrapher Rasheed Butt of Pakistan, I also designed a series of ceramic calligraphic panels for the exterior of this building. This project was undertaken during my position as **Senior Designer for Tenda Ltd**, a London design firm specializing in contemporary Islamic architecture.
- 1985: Design and quality control of the ornamental **Dome Interiors for the Renovation of the Historic Quba Mosque** in Medina, Saudi Arabia. This work was produced in glass-reinforced gypsum, and manufactured in Wales, UK. This project was undertaken during my position as **Senior Designer for Tenda Ltd**, a London design firm specializing in contemporary Islamic architecture.
- 1984: The **Design, Fabrication, and Installation of Decorative Ceramic Tiles** for the London Post-Modernist residence of **Charles Jencks**. This was featured in his book *Toward a Symbolic Architecture*, Academy Editions.
- 1984: Private commission for the design and production of a **Ceramic Fountain** for the palace of **Sheikh Sulman al-Sabah** in Kuwait.
- 1984: Consultant to the ceramic tile company **Langley of London** for the development of a 'traditional' range of tiles for the Middle Eastern market.
- 1983: Design, fabrication and installation of a series of **Decorative Ceramic Tile Panels for the Ismaili Centre** in South Kensington, London. The architect Sir Hugh Casson, of Casson & Condor Architects, London, commissioned this work.

Publications:

- 2011: My forthcoming book titled ***Islamic Geometric Patterns: Their Historical Development and Traditional Methods of Derivation*** is under contract with **Springer-Verlag** (NYC). This work details the history of Islamic geometric design, and places this subject into the broader context of Islamic art and architecture. Most importantly, this work is a comprehensive exposition of the traditional methods used in the construction of these complex designs. The primary intention of this book is to assist in bringing new life to this once vital ornamental tradition. This book is scheduled for publication in mid-2012.
- 2011: Contracted by **Deutsche Gesellschaft für Internationale Zusammenarbeit** (GIZ) GmbH of Eschborn, Germany to assist in the preparation of an **Afghan Jewelers Design Workbook** specifically for jewelers in the Mazar-I Sharif region of northern Afghanistan. This NGO is working to preserve the ancient jewelry traditions in this region by raising the quality of design and fabrication, and encouraging the international export of their wares. I undertook this work in association with Thalia Kennedy (historian of Islamic art and architecture) and Mitchell Crites (Asiatic jewelry specialist).
- 2010: Contracted by **Turquoise Mountain Foundation** in Kabul, Afghanistan to prepare an **Afghan Design Workbook** for their college-aged students. This organization is dedicated to the preservation of native Afghan artistic practices, and employs traditional *ustads* who are among the finest living Afghan exemplars of their art. Yet the knowledge of creating traditional Afghan designs has been largely lost. My work on the Afghan Design Workbook included historical surveys of the arts of sequential Afghan dynasties, detailed analyses of diverse examples of Afghan ornament, and a series of practical design exercises for their students. (See above: *Conferences; Seminars, Lectures and Teaching.*)
- 2003: My paper “**Three Traditions of Self-Similarity in Fourteenth and Fifteenth Century Islamic Geometric Ornament**” was published in the proceeding for the ISAMA/Bridges Conference. This was a juried paper, and was selected as the opening paper published in their proceedings for this year.
- 1997: Designed and assisted in the production of a set of **Ornamental Polyhedra**: an educational product that applies Islamic geometric patterns to the five Platonic and 13 Archimedean Polyhedra. These ornamental models are made from pre-cut and pre-creased paper, and are accompanied by an explanatory booklet covering the historical link between Islamic geometric design and polyhedral geometry. This set of 18 models was produced by **Design Science Toys** in New York, and went by the name of *Geodazzlers*. Since 2010, under the name *GeoBalls*, this same set of ornamental polyhedra is being produced and sold in Japan by **Image Mission, Inc.** - a geometry-based educational toy company.

Exhibitions:

- 1994: Exhibition of photographic examples of my ornamental work at the Middle East Studies Association (MESA) Conference in Arizona.
- 1992: Examples of my work for SL-Rasch GmbH on the Sliding Domes at the Prophet's Mosque in Medina, Saudi Arabia were included in the exhibition **Gestalt Finden: Joint Exhibition of the Work of Frei Otto and Bodo Rasch**, Munich, Germany.
- 1986: Contributor to the British Arts Council traveling exhibition of **Contemporary British Calligraphy**. I contributed a single laser-cut wood panel of Kufi calligraphy, with multi-level floral background, bordered by an interweaving geometric design.

Professional Expertise:

Design:

As a specialist in the field of Islamic architectural ornament, I work extensively with geometric patterns and the floral idiom. I am a recognized authority in the field of Islamic geometric patterns, with an international reputation. My work in this discipline requires a detailed knowledge of the traditional methodology used in the creation of even the most complex Islamic geometric patterns. My discovery of the *polygonal technique* for generating geometric patterns, and the historical evidence for the use of this technique, is the basis of my forthcoming book on this topic (Springer Verlag: see above). The use of this methodology allows for the *recreation* of traditional patterns, as well as the *creation* of original patterns that fall squarely within this ornamental tradition. These patterns cover the tremendous range of symmetrical complexity: from the most basic isometric and orthogonal designs, to patterns that employ multiple centers of diverse localized symmetry, and frequently repeat on atypical grids. I have also extended the traditional use of the polygonal technique to self-similar and aperiodic Islamic geometric designs. Additionally, I have worked extensively on the application of Islamic geometric patterns to non-Euclidean space: especially on the application to the surface of the sphere. My work as an architectural ornamentalist also includes the use of several traditional vaulting techniques. These include a detailed understanding of muqarnas, star, and star-net vaults (also known as squinch-net vaults). Similarly, I am conversant with the traditional methods used to place Islamic geometric patterns onto the surface of domes, and have used this methodology in my design practice. As a specialist in the Islamic floral idiom, I am familiar with a wide range of local Muslim conventions. These include the Samarra beveled style, the floral style of the Mamluks, the *ablaq* style of the Zangids and Ayyubids, the *yezdi bendi* dual-level floral style of the Safavids, Nasrid and Marinid floral conventions, the cut-tile mosaic floral style of the Timurids, and the semi-realistic carved stone relief style of the Mughals. I have also worked with the pre-Islamic acanthus style. At various times and for different projects, I have had to work with these floral conventions. I also developed a pan-Islamic floral style for the Prophet's Mosque in Medina, Saudi Arabia, and have used this frequently on my projects in Mecca and Medina. In both my geometric and floral work, I pay careful attention to incorporating symmetrical diversity through a practical understanding of the 17 wallpaper groups.

Production:

As a designer of diverse architectural ornaments, I am particularly concerned with the constraints that materials and production processes place upon design. This specialized knowledge extends equally to both traditional hand-craftsmanship, and state-of-the-art CAD-CAM fabricated processes. My production expertise includes a wide range of material and technologies. These include decorative ceramic tile; cut-tile mosaic faience; hand-carved wood; laser-cut inlaid wood marquetry; turned-wood *mashrabiya* screens; hand carved stone relief; hand carved pierced marble *jali* screens; water-jet cut inlaid stone; pre-cast glass-reinforced gypsum panels and vaults; stained-glass set in gypsum, stained-glass set in lead; cast bronze; and chemically etched stainless steel. I am often contracted to provide onsite quality control during the manufacturing process.

CAD:

My architectural clients use AutoCAD, and it is vital that my ornamental designs be easily incorporated into the working drawings of a given project. Hence, I use AutoCAD extensively for ornamental work, as well as presentation and production drawings. When relevant, I provide manufacturers with data files for computer-controlled manufacturing. For three-dimensional design, I prefer Rhino3D. I also regularly use Adobe Illustrator.