



Industrial Press, Inc. | NEWSLETTER

Focus on 3D Modeling Software: AutoCAD® and Grasshopper

A WORD FROM OUR EDITOR

Since 1883, Industrial Press, Inc. has been publishing essential resources for the machining community and related manufacturing industries. This issue focuses on two types of 3D modeling software, a necessity for anyone designing objects for the three dimensional world we live in. Hitting the market in March will be two practical and user-friendly titles that thoroughly illustrate and explain how to design in a 3D environment. Learn more about these and related topics from the “Q&As” with our experts. We hope you enjoy this newsletter, and we always look forward to hearing your comments. - *Judy Bass, Editorial Director*



Bright Future Ahead for 3D Design

A Conversation with Engineer, Author, and AutoCAD Specialist Steve Heather



IP: *The AutoCAD® Workbooks and the Pocket Reference have been a successful learning package for more than a decade. To what extent do you see your new book as an extension of the original AutoCAD Workbooks?*

Heather: *The AutoCAD® 3D Modeling Workbook is designed in the same fashion as the Beginning and Advanced*

AutoCAD® Workbooks, and is suitable for classroom instruction or self-study. This Workbook is designed in such a way so that complete beginners to 3D Computer Aided Design (CAD) software using AutoCAD can start to create 3D models within minutes. More experienced AutoCAD users who wish to learn the art of 3D modeling will also find this Workbook extremely useful.

IP: *What ignited your interest in 3D Modeling? Can you point to instances when you've used it for professional AND personal uses?*

Heather: *I started my career as a mechanical engineer and specialized in tool making, designing and manufacturing jigs, fixtures and multi-staged press tools for the aerospace, defense, lighting and car industries. In the early 1990's, a company I worked for purchased the world-renowned CAD software AutoCAD®. It soon became apparent that we could use this CAD software to create 3D models of the tools that used to be designed using the old-style methods of pen and paper. It was now possible to view the design in 3 dimensions showing exactly how the tool would look and work. Viewing your design as a 3D model gave us the ability to see if any changes were needed to the design without actually manufacturing the parts first. This not only saved a great deal of time, but also a great deal of expense.*

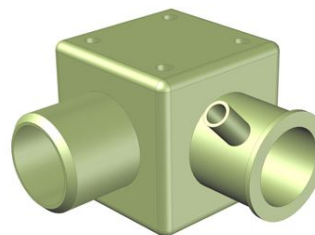
One example of the many tremendous benefits of 3D model-

ing software was when I had to design a multi-stage press tool for a specialist lighting company. The tool had to be designed so that a flat strip of aluminum could pass through it while getting pierced with holes and cut-outs, then formed and cropped, and eventually emerge at the other end in a completed component. The entire tool was designed using AutoCAD 3D modeling software. And since this was an expensive tool, the pressure was on to get it right. I can safely say that every piece of the tool worked exactly as designed and not a single part had to be re-designed or remade.



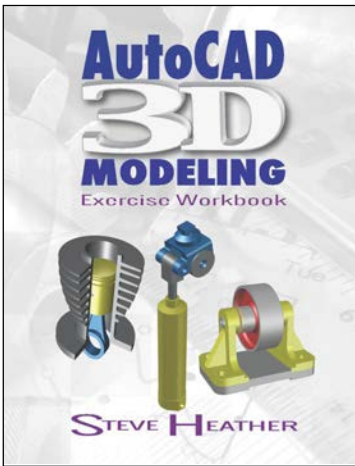
Multi-stage press tool for the lighting industry

Not only is 3D modeling software great for professional applications, but it is also ideal for personal uses. A friend had several commercial washing machines that he used in his business. A plastic component broke on one of his machines. He searched for a replacement only to find that the component he needed was part of a larger component that would cost over \$200. My friend asked if



3D model of the plastic component

I could create a 3D model of the plastic component which he could then send to a 3D printer to manufacture the component. Never one to back down from a challenge, I created the 3D model of the component within an hour. It was then sent to the 3D printer and manufactured for just under \$100. Needless to say my friend was a very happy, grateful man.



IP: What are some of the "bells and whistles" of the AutoCAD 3D Modeling Exercise Workbook?

Heather: The exciting thing about the *AutoCAD 3D Modeling Exercise Workbook* is that no prior experience with the software is needed. The introduction to the Workbook shows users how to open and start a new drawing file, how to view 3D models, and how to change the

IP: Where do you see the future of 3D modeling software over the next few decades? And how important is it for students and professionals to continue their AutoCAD education by learning 3D Modeling?

Heather: The future of 3D modeling software is very bright and the possibilities are endless. Just over three decades ago design was done using paper and pen. Now we can design realistic 3D models using CAD software at a fraction of the time and cost. 3D modeling is the future and it will get more and more advanced as time goes by. So it is extremely important for students and professionals to keep pace with the advancement of CAD software. And what better way than to learn 3D modeling than through an instructional book such as the *AutoCAD 3D Modeling Exercise Workbook* from Industrial Press?

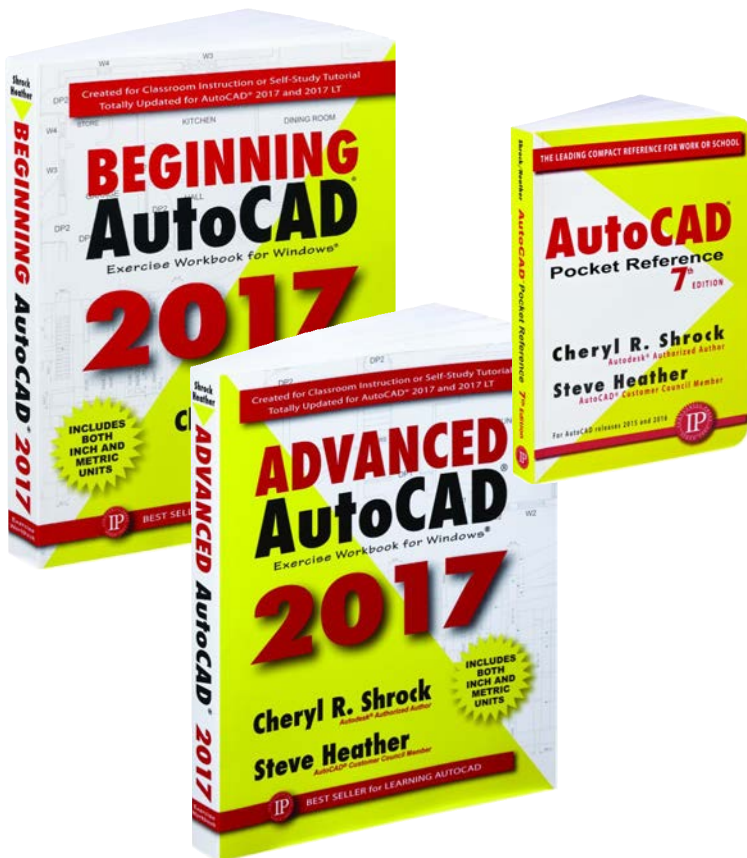
visual style of the models. Included are 8 carefully constructed lessons that start off by showing users how to create the 7 basic 3D shapes and then progresses to creating complex 3D models. Following each lesson are exercises so users can practice the skills learned in that lesson. Additionally, there are 4 exciting 3D modeling projects, allowing users to combine all the skills learned in the 8 lessons. What's more, there are several sample files for the user to download from the Industrial Press website which aid in some of the lessons.

**AUTOCAD 3D MODELING
EXERCISE WORKBOOK**

By Steve Heather

Pages: 296, Softcover
ISBN (print) 978-0-8311-3613-0, Price: \$49.95
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Design Possibilities are Limitless!

A Conversation with Author, Mathematician, and Designer David Bachman



IP: *Your background is in mathematics. What sparked your interest in 3D software and design?*

Bachman: I began making 3D models for demonstration purposes in my calculus classes. I also designed a few models that I'd bring to conferences as visual aids, to help me explain my research in mathematics. I ended up enjoying the modeling process so much that it became something of a hobby. Subsequently, I started co-teaching classes exclusively on 3D modeling with faculty in our art department, which is where my interests in using mathematics, 3D modeling, and 3D printing for the production of fine art comes from.

IP: *The Grasshopper platform you focus on in your book requires no programming knowledge. How instrumental is this for students who are just learning how to use 3D software such as Rhino?*

Bachman: I believe it is crucial. In my experience, the majority of people interested in 3D modeling do not know how to program. Architects and jewelry designers, for example, are two of the largest group of people who use Rhino, yet practitioners in both groups don't tend to know how to code.

What's more, Grasshopper is not just for people who don't know how to program. The platform lends itself to a more interactive (parametric) design process that is difficult with traditional programming. I am a proficient programmer, but I still prefer to use Grasshopper for my own design work.

IP: *Of the many software packages and platforms available, why are Grasshopper and Rhino good choices?*

Bachman: Each modeling package has strengths and weaknesses. Some are good for hand-modeling, such as sculpting in clay. Others are good when designs have to conform to exact dimensional constraints, such as from a blueprint. Rhino is a good compromise between these two paradigms, while being much easier to use and more intuitive than many similar packages. Grasshopper adds a parametric element to design in Rhino: models can be built through a scripting process that allows one to plan the design steps in an easy-to-understand, yet precise fashion. At the same time, the resulting scripts are interactive through the use of variable sliders that the user can adjust in real-time to make aesthetic choices. Furthermore, various plug-ins expand Grasshopper's capabilities in countless ways, for example by adding physics-based modeling, additional mesh-modeling tools, paneling tools, and tools for controlling external devices such as an Arduino.

IP: *What kinds of projects do you envision your students and other readers of your book creating in Rhino?*

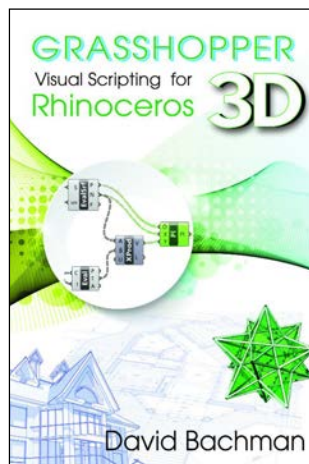
Bachman: Users of the book should walk away with the knowledge necessary to design virtually anything they can imagine that would come from a systematic design process. Grasshopper won't help someone sculpt a bust of Abraham Lincoln, for example, but it will help a jewelry designer create an elaborate braided ring with adjustable size parameters. Architects will be able to design custom paneling systems. Scientists of all types will be able to design and produce demonstration models. Product designers can create anything from custom hubcaps to phone cases.



David Bachman Design Inc.

IP: *Can you make any predictions about the future of 3D modeling software?*

Bachman: There are a few different paradigms for 3D modeling. Rhino, for example, is primarily a NURBS based modeling package, which means it stores information about curves and surfaces with a few points, and interpolates between them with polynomial equations. This is a nice compromise between various considerations (memory, flexibility, etc.), but sometimes other types of modeling (e.g., meshes, sub-division surfaces) are better. No single program is great at everything, but I believe they will all get better at allowing users to work with multiple types of objects.



**GRASSHOPPER:
VISUAL SCRIPTING FOR
RHINOCEROS 3D**

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