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STRATEGIES for

CREATIVE

PROBLEM

SOLVING

Third Edition

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with

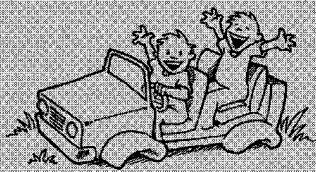
Benjamin R. Rizzo



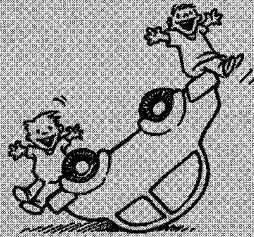
**PRENTICE
HALL**

Upper Saddle River, NJ • Boston • Indianapolis • San Francisco
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Eliminate: Remove the engines and side panels, and make go-carts.



Rearrange: Turn the car upside down, and use it as a teeter-totter.






77 Cards: Design Heuristics

A new technique that is more extensive than SCAMPER is *design heuristics*.^{2,3} This vertical thinking technique includes lists of prompts intended to help designers move through a “space” of possible solutions and also to support designers in becoming “unstuck” when they are struggling to generate more, and different, ideas.^{4,5} The 77 design heuristics below are a result of combined outcomes from a designer case study, extractions of characteristics of award-winning products, and protocol studies of designers and engineers of varying expertise levels.

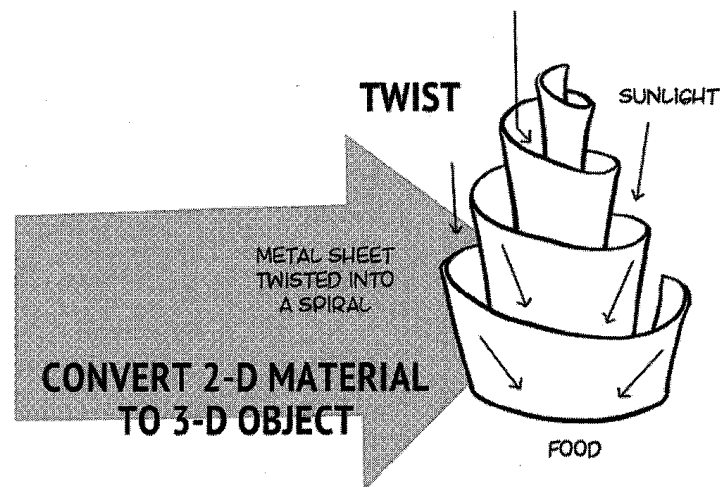
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|---------------------------------------------|-----------------------------------|---------------------------------------------|---------------------------------------------|
| 1 Add features from nature | 19 Change flexibility | 41 Make components multifunctional | 59 Scale up or down |
| 2 Add gradations | 20 Change geometry | 42 Make components attachable or detachable | 60 Separate parts |
| 3 Add motion | 21 Compartmentalize | 43 Make product reusable or recyclable | 61 Slide components |
| 4 Add to existing product | 22 Convert 2-D to 3-D | 44 Merge functions with same energy source | 62 Stack |
| 5 Adjust function through movement | 23 Convert for second function | 45 Merge surfaces | 63 Substitute |
| 6 Adjust functions for specific users | 24 Cover or remove joints | 46 Mirror or Array | 64 Synthesize functions |
| 7 Align components around center | 25 Cover or wrap | 47 Nest | 65 Telescope |
| 8 Allow user to assemble | 26 Create system | 48 Offer optional components | 66 Texturize |
| 9 Allow user to customize | 27 Distinguish functions visually | 49 Provide sensory feedback | 67 Twist |
| 10 Allow user to reconfigure | 28 Divide continuous surface | 50 Reconfigure | 68 Unify |
| 11 Animate | 29 Elevate or lower | 51 Recycle to manufacturer | 69 Use alternative energy source |
| 12 Apply existing mechanism in new way | 30 Expand or collapse | 52 Reduce material | 70 Use common base to hold components |
| 13 Attach independent functional components | 31 Expose interior | 53 Reorient | 71 Use continuous material |
| 14 Attach product to user | 32 Extend surface | 54 Repeat | 72 Use human-generated power |
| 15 Bend | 33 Extrude | 55 Repurpose packaging | 73 Use multiple components for one function |
| 16 Build user community | 34 Flatten | 56 Reverse direction or change angle | 74 Use packaging as functional component |
| 17 Change contact surface | 35 Fold | 57 Roll | 75 Use recycled or recyclable materials |
| 18 Change direction of access | 36 Hollow out | 58 Rotate | 77 Utilize opposite surface |
| | 37 Impose hierarchy on functions | | |
| | 38 Incorporate environment | | |
| | 39 Incorporate user input | | |
| | 40 Layer | | |

The design heuristics, which can be used for vertical thinking, are represented on cards that can be found at www.designheuristics.com. Each card includes a description of the heuristic, an abstract image depicting the application of the heuristic, and two product examples that show how the heuristic is evident in existing consumer products. An example card for heuristic 77, “Utilize opposite surface,” is below.

<p>UTILIZE OPPOSITE SURFACE 77</p>  <p>Create a distinction between exterior and interior, front and back, or bottom and top. Make use of both surfaces for complementary or different functions. This can increase efficiency in the use of surfaces and materials, or facilitate a new way to achieve a function.</p> <p style="text-align: right; font-size: 0.8em;">© Design Heuristics, LLC</p>	<p>UTILIZE OPPOSITE SURFACE 77</p> <div style="display: flex; justify-content: space-between;"> <div style="width: 60%;">  <p>980 TATOU <i>Annika Lubber</i> With the laces extending toward the bottom, these shoes allow for better mobility and can respond to unique movements.</p> </div> <div style="width: 35%;"> <p>FARALLON CHAIR <i>fuseproject</i> The dining chair contains hidden storage spaces and pockets by using a continuous fabric as part of the seat.</p>  </div> </div>
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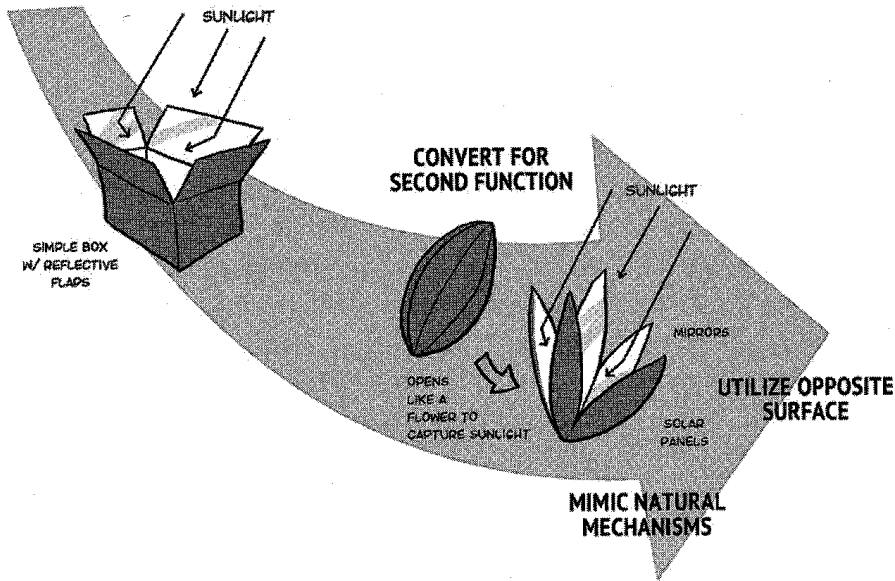
For example, we could use ideas from the 77 cards to develop conceptual designs for a device that utilizes sunlight *to heat and cook food*.⁴ Let’s use the design heuristics to develop three unique ideas.

In the first idea we combine the strategies of two separate cards—heuristic card number 67, “Twist,” and card number 22, “Convert 2-D material to a 3-D object”—to generate a single idea. By combining these cards, we are able to create a spiral-shaped reflector out of a single sheet of metal, capable of concentrating a large amount of light onto a small cooking surface.



In the second idea, we begin with a simple box with flaps to reflect light into the center, and then use heuristic card 1 and card 23 to transform the ideas. “Mimic

natural mechanisms” prompted thinking about how flowers bloom, “Convert for second function” prompted thinking about how the device could function in two different states (closed or open), and “Utilize opposite surface” prompted ideas about mirrors that could be used on the inside to direct light to heat food and about solar panels that could be used on the outside to capture energy and generate heat for the food.



In the third idea we start with heuristic card 15 (“Bend”), 35 (“Fold”), and 65 (“Telescope”) to generate an idea for a deployable parabolic reflector. Next, we modified that idea by changing the reflective parabola to be constructed from multiple small pieces of recycled mirrors by using heuristic card 54 (“Repeat”) and 75 (“Use recycled or recyclable materials”).

