

Character Design: Visual Complexity in *Brave*

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Brave's thematic components of defiance, peril, and consequence necessitated that we construct a world that respected the gravity of those themes. We were tasked to fill this world with characters that would be true to Pixar's canonical execution of strong design and appeal but with a level of realism and physicality that had not been done at the studio before.

"Simplexity" is a word that describes a harmony between the simple and the complex. In art it can be used to describe the design of a carefully crafted piece of work which may appear simple at a glance but is complex beyond its surface. Our journey in creating these memorable characters was one of balance between caricature and realism. We present our process in finding that relationship in the design and execution of the horse and the bear.

1 Our Design Spectrum

Pixar's previous film aesthetics are deeply rooted in caricature. The *Incredibles*, *Ratatouille*, and *Up* all took liberties with both human and animal proportions to create an appealing silhouette. Early art direction of the characters in *Brave* favored realism, with fully described musculoskeletal anatomy.

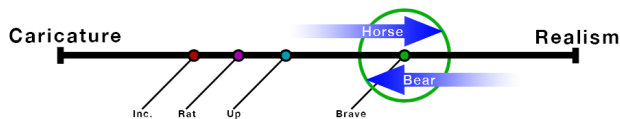


Figure 1: Design Spectrum *Brave*. ©Disney / Pixar. All rights reserved.

2 The Horse and The Bear

As one of our first characters in production, The horse (Angus) was our test bed for exploring how to achieve this new look. The same techniques used in previous films yielded a fairly simple rendition of the character and we learned that our traditional methods of modeling and articulation would need to be extended. Realism implies a physical response to a physical world. With that in mind, we began by experimenting with modeling the behavior of sub-components of the character such as its muscles, skin, and bones. In our earlier films, we approximated this behavior using manual and labor-intensive techniques. For *Brave*, our techniques ranged from volumetric simulations of the character's mesh reacting to an underlying armature, to individually rigging and simulating muscle interactions. Neither of these solutions resulted in completely believable motion. One of the problems we encountered was the character's skin appearing to be glued to the underlying musculature. To mitigate this, we introduced an additional simulation which allowed the skin to slide over the simulated muscles without breaking silhouette.

Work on the Bear began while Angus was in mid-production. At this point, the sophistication of Angus' rig seemed to be setting the benchmark for what the rest of the film would require. As such,

the Bear's first incarnations were highly detailed in their description of musculature, and we employed many of the same modeling techniques.

Although we were approaching the aesthetic goal for Angus, the resulting model was extremely slow for animation, it was difficult to support, and it was not easily art-directable. Our first approach had informed us how to get the look we wanted but we knew that both Angus and the Bear would ultimately require a much different treatment in order to be usable in production.

For Angus, we retained the useful data we had gained from the complex rig by baking the shapes back into its base rig. We then scrapped the muscle rig in search of a new approach that would give us the dynamic look we wanted but with a smaller footprint.

The Bear's layer of fat was something we did not have to account for in Angus. Physical simulations fell short of representing this added layer of complexity, and in many cases we found we needed to cheat the volume away from what would be physically correct to achieve an appealing look. The fatty volumes that described the Bear were stored in a similar way to the baked data of Angus muscles.

Baking this data was critical in reducing the complexity of the rig, freeing us to find our new solution which was to utilize both the volumetric and skin simulations on the aggregate volumes of the characters as opposed to their constituent parts. This new method was much easier to setup, it did not slow down the model for animation, and it was much easier to art direct. In Angus case, these simulations were tight, to reflect the powerful musculature of a horse. The Bear's simulations were more loose, selling the weight and fatty skin of a bear.



Figure 2: Angus (left) The Bear (right) *Brave*. ©Disney / Pixar. All rights reserved.

3 Trends Set the Range

Angus' process progressed from caricatured to realistic; we added complexity as needed and removed it where we went too far. The Bear evolved in the opposite direction; her complexity was found in subtlety and she ended up a much simpler design. In the end, we were able to achieve "simplexity", yielding appealing, complex, and believable designs for both characters.