

Recreating BoPeep for Toy Story 4

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Figure 1: Left: BoPeep in *Toy Story* (1995), Right: BoPeep in a test render for *Toy Story 4* (2019). ©Disney / Pixar.

ABSTRACT

In *Toy Story 4*, audiences rediscover BoPeep, who returns after nearly 20 years away from the big screen. In adapting her design, we considered not only the cultural context of reviving one of our industry’s first female characters, informing our story and design, but also the technology now available, which drove explorations in shading and simulation, among other areas. Our talk describes BoPeep’s journey through production: from initial research into decades-old reference and visualization, to the modern results and strides we’ve taken across both creative and technical specialties.

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1 STORY AND DESIGN

When faced with the exciting task of reintroducing BoPeep, we had to balance truth to her original character, while developing her further as an interesting, complex member of the cast. We wanted the audience to believe that in the intervening decades, Bo had to redefine herself—forced to adapt by her circumstances, then eventually embracing the constant change of toy life on her own terms. Giving Bo this mindset allowed us to crack her new design: a toy who at her core is a Shepherdess, but using the pieces she has, can change herself suit her needs and surroundings. This also allowed artists to explore variations on a familiar color palette and shapes from the earlier films.

2 MODELING AND RIGGING

Research took us to Pixar’s archives, where we discovered a clay sculpture from the *Toy Story 1*, with the topology hand-drawn on its surface. We studied this sculpt, original NURBS model, and original designs as a starting point. We then took research trips to Disney’s porcelain fabrication workshops, to help us understand shaping

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Figure 2: Concept art by *Carrie Hobson*. ©Disney / Pixar.



Figure 3: The original clay sculpt of BoPeep from *Toy Story*, used for reference when rebuilding the new character. ©Disney / Pixar.

and qualities of the material, to a level of detail that *Toy Story 1*'s original pipeline could not afford.

3 SHADING

We always emphasize "truth to materials" when shading and texturing to support the story and characters, by making sure things look and behave like what they are made of. In addition, the *Toy Story* world has always been an interesting place to push the look of animated CG, and Bo Peep was only one of many characters where we strove to create rich detail and complex illumination responses. We started with research, creating a Ceramic Glossary presentation to make sure the director, art, shading and lighting departments could share the same vocabulary when discussing the finer points of Bo Peep's look.

We also realized early on that many new technologies needed to be incorporated to flesh out her visual appeal, including fresnel energy compensation, path traced subsurface scattering, clearcoat absorption attenuation and crackle glaze crazing, most of which are now included in the standard PxrSurface BxDF distributed with RenderMan. BoPeep's garments and accessories also required an intensive amount of detail in order to support her development.



Figure 4: A render of BoPeep's contemporary outfit, repurposing her dress as a cape. ©Disney / Pixar.

4 TAILORING AND SIMULATION

Bringing any costume in tailoring, we start with research and asking how a garment works. With a toy, we have an added layer of abstraction, from the original inspiration for a character's costume, into toy scale and its constraints for simplicity and size.

For BoPeep's classic hoop-skirt dress, we took a reference trip behind the scenes at SF Ballet. Noting their solutions to holding the silhouette of a dress under the duress of a dance performance, we moved away from the concept of a pannier hoop frame and towards building volumes and layers of skirts within our simulation setup. We replicated BoPeep's dress by combining a classic bustle volume, layers of tulle (thin fabric skirts), and clean sharp pleats where the shape is gathered. To adapt this dress for various uses in the story, we ultimately built the skirt with reversible fabric that could also transform into a cloak, cape and backpack held together with a button clasp.

5 ANIMATION

It was important for us to clearly differentiate "Classic Bo" from the Andy years vs the "Modern Bo" we see in TS4. "Classic Bo" was more restricted in her movements, living in Andy's house, whereas "Modern Bo" was confident, fun loving, athletic, and agile. Oftentimes athletic women are portrayed as more masculine, and we wanted to depict BoPeep's athleticism while maintaining her femininity and staying true to her delicate porcelain material. We also worked to incorporate her staff and skirt (turned cloak) into her acting, and add to her sense of personality.