

SIMPLY AUDACIOUS

BLUE SKY STUDIOS' ARTISTS TRANSFORM CHARLES SCHULZ'S CHARLIE BROWN, SNOOPY, LUCY, AND THEIR FRIENDS INTO CG CHARACTERS

BY BARBARA ROBERTSON



Translate Charles M. Schulz's "Peanuts" comic strip into a 3D animated feature? Easy peasy, right? Indeed, that's what many on the crew at Blue Sky Studios thought. These artists had simulated dozens of furry creatures in *Ice Age* and created *Epic's* complex environments. Surely anyone would consider that for these artists, the process of creating Charlie Brown's modest shape and his unfussy neighborhood would be as simple as a peanut butter sandwich.

Lead Character Designer Sang Sung Lee sums up a typical reaction: "Someone said to me, 'You did character design? So, what did you do? The characters are already designed.'"

And therein lies the problem. As everyone on the crew soon learned, moving a classic comic strip into the 3D world in a way that preserves everyone's memory of the comic and the 2D television specials, while at the same time meets the expectations of modern audiences familiar with 3D animated films, is neither simple nor easy.

Steve Martino, who had directed Fox/Blue Sky's animated film version of Dr. Seuss's *Horton Hears a Who*, directed *The Peanuts Movie*. He, Producer Michael Travers, and others on the Blue Sky crew worked with the Schulz family, the Schulz museum staff, and the artists at Charles M. Schulz Creative Associates in Santa Rosa, California, on the film's story and visual development. Schulz's son Craig, his grandson Bryan, and Cornelius Uliano wrote the script.

"We logged a lot of hours traveling to Santa Rosa," Martino says. "As we developed the story, we'd think of ideas, gags, things the characters might do. This is a 2015 feature film. We couldn't have two talking heads. We needed more physical storytell-

ing. Not backflips, but emotional moments and feelings expressed through the way a character moves. Craig understands his father's Peanuts universe very deeply. He'd tell us when we crossed the line."

Craig Schulz also came to Blue Sky to help the development team master the visual lines.

"When we first got the project, our initial reaction was gleeful," says Art Director Nash Dunnigan. "The characters were already designed. We had lots of the world designed. Well, it turned out it wasn't so easy. When we built our first hero models and sent them around, the reaction was, 'Eww. You totally missed our memory of who they are.'"

RATS!

Thus, Dunnigan gave a group of artistic and technical supervisors the chore of finding the best version of each character, a task complicated by the comic strip's longevity. Schulz published his first "Peanuts" comic strip in 1950. His last appeared hours after he died in February 2000.

"The supervisors discovered there was an evolution in Sparky's style," Dunnigan says, using Schulz's well-known nickname. "Snoopy went from quadruped to biped. In the '60s, the characters' head shape was like a windshield, with eyes high on their faces, which would have been easier for us. But in the '70s, '80s, and '90s, the eyes migrated to the sides of the heads. When a character looks at us from the front, we're actually looking at it from the side, like a Picasso head."

The more the team talked with cartoonist Paige Braddock, the creative director at Charles M. Schulz Creative Associates who oversees products related to Peanuts licensing, the more they settled on the Peanuts family as drawn in the '80s and '90s.



(TOP) WHEN TRANSLATING SCHULZ'S DRAWINGS INTO 3D CHARACTERS, ARTISTS STARTED FIRST WITH SNOOPY. (BOTTOM) IT TOOK 18 MONTHS TO CREATE THE CG VERSION OF CHARLIE BROWN.

"We call it the classic period," Dunnigan says. "We had the supervisors bring us models for each character from that period, starting with Snoopy – facing right, sitting, walking, standing. As a group, we voted on the best pieces and parts, and combined them into a FrankenSparky. When we saw it, we sighed. That was our best version of Snoopy. We knew that if we all agreed, probably the fan base in the world would, too."

The team applied the same process to each character, creating hero models from pieces and parts that received the most votes.

"That shape was the beginning of the process," Dunnigan says. "Then to get the CG version of what Charlie Brown looks like took another year and a half."

Adds Lee, "The benefit of 3D is that we can create characters more believable to the audience than 2D characters. If you look at Horton (in *Horton Hears a Who*),

any angle in 3D works. But the Peanuts characters change shape with every angle. And, the mouth shape looks like a pen line."

According to Dunnigan, they tried lots of versions of eyes and hair. "We balanced colors. We tried to be faithful to the graphic pen line," he says. "When Steve [Martino] said, 'We're going to commit to the graphic look,' we breathed a sigh of relief. We weren't going to 'upgrade' the look. But we knew it would be technically difficult to get a pen line to work in 3D CG. Sparky was so economical and sparse in the way he drew lines. We had to find out what that meant sculpturally."

The artists had to make the CG characters' shape changes and pen lines credible to immerse them in a believable 3D world.

GOOD GRIEF!

It fell to the character development team – Character



A FLEXIBLE RIG MOVED SNOOPY'S HEAD INTO A BOWLING PIN SHAPE. A PAINTING BY CHARLES SCHULZ HANGS BEHIND THE COUCH.

Development Supervisor Sabine Heller, Rigging Supervisor Justin Leach, Lead Materials Technical Director Nikki Tomaino, and Materials Supervisor Brian Hill – to wrestle CG technology into forms that could honor Schulz's minimalist style in fully formed 3D characters.

The artists decided to develop all the characters' bodies from the model of Charlie Brown that took 18 months to develop, morphing heads and changing clothes to fit each character's design. The magic that blended the 2D designs with the 3D characters happened in rigging.

"Our normal approach for rigging didn't work out," Heller says. "In Sparky's profiles, the head shape can change, the nose moves down, and the ears drop. So we created character views in the rig. An animator could select 'Sparky three-quarters' (which is more like one quarter), push a button, and it would happen."

Each child had six head poses – profile right, one-quarter right, profile left, one-quarter left, extreme down, and extreme up.

"The majority of the time, the head shape stays the same, but the nose, eyes, and ears slide around," says Supervising Animator Nick Bruno. "If I were to rotate the head and the head shape changed, the eyes would become distorted. We had to keep everything in real-world space in the same direction, but we had to move all the parts. So, to hit all the poses Sparky drew, we built a Mr. Potato Head system of parts that we could move, slide, switch out, and replace."

Eventually, the animators, modelers, and riggers would create hundreds of poses.

"It was like stop motion," Bruno says. "Otherwise, it would have been impossible to keep the characters on model. But, in stop motion, animators take off a head and replace it. We have switches for the heads that blend between targets."

To connect and disconnect the heads, the riggers developed a "suction cup" plug-in for Autodesk's Maya.

"It's a hybrid rig that uses shrink-wrap in Maya," Heller says. "We have two separate meshes, but they render as

seamless as one mesh. We can rotate Snoopy's head up so it looks like a bowling pin and it stays attached. We can move his head over and it stays."

DRAW THE LINES

Schulz was able to give his hand-drawn characters expressions seemingly with a flick of his pencil. But while his 2D characters might have dots for eyes, the CG characters' eyes needed to be 3D objects. Sometimes shaped like dots, sometimes shaped like sixes and nines.

"We needed to create a specific style," Heller says. "Charles Schulz drew very specific eyes with expression lines that we interpreted as a nine or a six. And he also had a pair of wrinkles that we call periwinkles."

A custom rig made it possible for the eyes and eyebrows to ride on the surface of the models.

"We had a lot of special technology to move shapes across topology," Heller says. "We didn't want to change the volume. When an animator pulls the eyebrow down, a custom plug-in creates a blink."

In addition to typical controls for moving the characters' heads, animators could pose the floating elements using controls within the rig.

"They'll follow the surface," says Supervising Animator Scott Carroll. "But, we can move them independently."

The animation supervisors gave libraries of poses to each of the 80-plus animators and sent each to "school" for three weeks of course work to learn what they could and could not do; what was within the style and what was not.

"We had to teach them which poses to use and when," Carroll says. "Picking the poses was key. Some artists thought they'd feel limited by having to stick to these poses, but they found it liberating. They were able to be creative within the Peanuts universe."

The poses extended to the characters' entire bodies as well as to their heads and facial expressions. "Charlie Brown's arms have to grow for him to reach over his melon of a head," Bruno says. "We switch from the default four-finger pose to

five sometimes. Snoopy has poses with three fingers, four fingers, and a paw. Every hand, every arm pose is different, so the rigs had to be robust.”

To create a performance, the animators picked poses with selected body parts and expressions for each frame.

“Typically, we let the computer do interpolation between poses,” Carroll says. “But on this film, we had no interpolation at all. It was like stop motion. We moved and shaped the poses on a per-frame basis.”

Fortunately, they chose to pose on “2s” rather than “1s,” much like the Peanuts Christmas specials, albeit in 3D rather than 2D. The resulting snappy animation helped them hide head switches. But, with motion blur added, the snappiness went away.

“We didn’t want to use motion blur everywhere,” CG Supervisor Rob Cavaleri says. “But we had to use it in some places because we’d get strobing when the characters moved too quickly. So [animator] Jeff Kabour came up with a way to add animated 2D lines from the comic strip. That allowed animators skilled with 2D drawings to bring Sparky’s lines into the movie and soften the transitions. We also smeared the geometry to simulate motion blur.”

In addition, the crew created the appearance of motion blur with a 2D animation trick: multiple limbs.

“If we had done that normally, we would have needed to create an asset for all of each character’s extra limbs and garments,” Leach says. “That would have meant creating 2,940 extra assets, which was way too many. So we made ‘ghost limbs’ within the character.”

If an animator wanted to use the left leg, he or she could see only that and then use the same

asset again. “We’d turn everything else off,” Leach says. “We worked with R&D and the materials crew to fill it and make it a solid textured object when rendered. But the geometry was the same, we didn’t have new data.”

ROUGH!

Many of the Peanuts characters have a full head of hair, and all wear kids’ clothing, some with costume changes during the film.

“We had good grooming,

growing, animation, and simulation tools,” Cavaleri says. “But we didn’t expect the precise level of control we’d need.”

Typically, the crew would create a hair groom default with a rig the animators used to pose

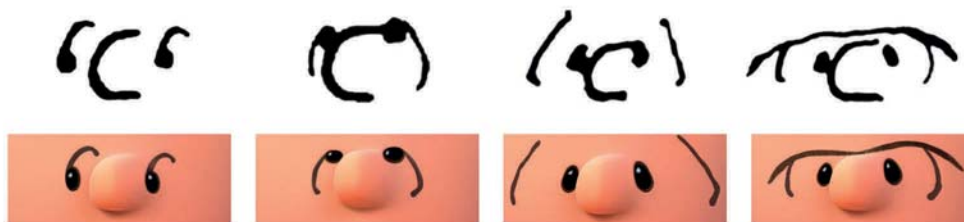


A CUSTOM RIG MADE IT POSSIBLE FOR “SPARKY” PEN LINES TO RIDE ON MODEL SURFACES. ARTISTS ADDED PEN LINES TO SUGGEST MOTION BLUR, AND INCORPORATED “SPARKY” LINES IN VOLUMETRIC SIMS.

R&D DEVELOPED GROOMING TOOLS THAT COULD HANDLE EXTREME SHAPE CHANGES.



CG ARTISTS OFTEN INTERPRETED SPARKY'S HAND-DRAWN EXPRESSION LINES AS NINES AND SIXES.



the hair, and then if the hair needed follow-through movement, it would travel through the pipeline to simulation. But, it didn't work for these characters. Sally was the test.

"We tried growing and grooming her hair the typical way," Cavaleri says. "That exposed a problem in the way we grew hair on the control surface. So, Nathan Zeichner, an R&D scientist, helped us rewrite that tool."

The second problem was that when a character's shape changed with a new pose, the hair might deform so much it would fall off the model.

"Lucy's hair had to literally flip from left to right depending on the way she looked at you," Cavaleri says. "We needed 12 different grooms for her."

The clothing also presented unique challenges.

"We have a creature simulation team for clothing, and a pipeline," Cavaleri says, "but

when you're animating on 2s, you're holding every other frame. The clothing keeps moving, and you don't want it to."

The team tried tightening the settings to have more control over the simulation. But that didn't work.

"We were trying to fit a square peg in a round hole," Cavaleri says. "We realized the animators would have to hand animate all the garments. We knew the silhouette of the garment, even while holding a pose, contributed to our ability to recognize the characters."

That meant the rigging department needed to add separate clothing controls to the character rigs, as well.

"When we saved a pose for a character, we saved everything: the eye expression, the facial expression...everything, including the garment," Cavaleri says.

As for the color and texture of the garments, during the 18

months of rig development, the materials department worked on a new material rig. Blue Sky uses a proprietary raytracing renderer called Studio, and all the materials except the stripe on Charlie Brown's shirt are procedural.

"We Spark-ified everything," says Tomaino. "You see the wiggle we added in every piece. The kids' jeans. The leather. The roof of the doghouse. The lines in the trees. The Charles Schulz line is sacred to us."

MATERIAL RIGS

"At first, I thought this film would be easy because materials would play such a small role," Tomaino adds. "But, it wasn't the case at all. Being subtle was a big challenge. For *Epic*, we could pull skin reference. The Schulz world had no reference."

She found reference in unusual places. A grape in the light. A toy pony. M&Ms. Yogurt.

"We worked with R&D to reinvent our transmittance model," Tomaino says. "It took a lot of back and forth. These crazy models were challenging."

The crew also developed new methods for rendering the sliding elements on the face without distortions, and for rendering "Spark-ified" textures, even though the shapes beneath changed dramatically.

To create facial expressions, the animators controlled the shape of the sliding periwinkles, the eyes, and the sixes and nines, but the geometry they saw in animation was for visualization only.

"We pulled the geometric NURBS sheets representing the sixes, nines, and periwinkles, and used a closest-point procedure to apply the materials," Tomaino says. "The director and animators wanted the periwinkles to arch in and divot down, but if they were on the model, they would change shape. So, the only way to have them maintain their shape was to use the closest-point procedure. We also took the geometry that is on the sliding eye and used that in a procedure to create an eye divot. It all happens on the Studio [rendering] side of things." That meant Director Martino could change the way the periwinkles and eyes looked at render time.

The materials group also used the closest-point procedures to create a control signal on the skin surface to change color, specular, roughness, sub-surface, and bumps.

"When we use closest point to create a signal on the surface, you can really feel the integration," Tomaino says. "It gave us subtle effects with the light. Otherwise, with these NURBS sheets, if we had a light rig spin around the character, the light on the sheets wouldn't change."

Shrink-wrap helped with the integration, as well.

"Shrink-wrap was our savior," Tomaino says. "When you take the NURBS sheets from little to big, if there isn't enough topology, they will wrinkle. With shrink-wrap engaged, I could scale the periwinkles so the topology would match and make a beautiful line. We worked with Autodesk to have them develop it for us, and now it's freely available."

Using the rig this much to drive materials meant reinventing the process at Blue Sky, but it gave animation control over the materials for the first time.

"Rigging and materials have worked together before, but never like this," Heller says. "Depending on the pose the animator puts the character in, the rig spits out values automatically."

"Well, almost automatically," Tomaino laughs.

DUST MAGNET

Although animation took the lead from simulation in moving the characters' clothes, the effects crew helped define one of the characters: Pigpen, the boy who is always surrounded by a dust cloud.

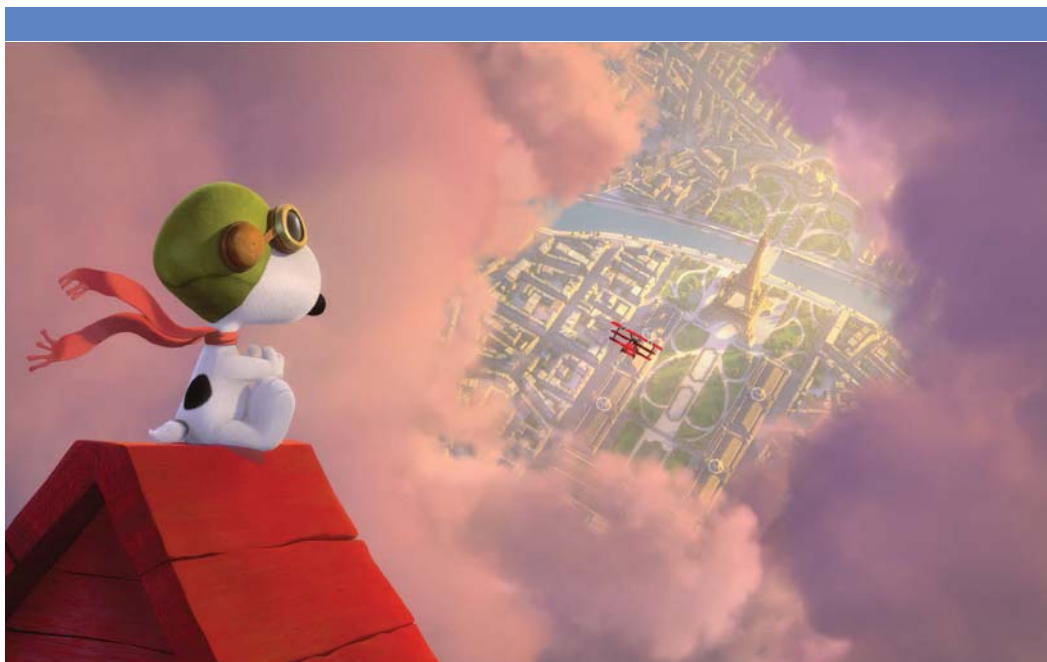
To fit the comic-strip style into volumetric 3D simulations, the artists integrated 2D pen lines and dust specs scanned from Schulz's drawings.

"We brought Charles Schulz's hand into the movie," Cavaleri says.

At first, the effects team tried realistic dust clouds and tried stylizing the volumes using 2D outlines.

"It didn't feel right," says Elvira Pinkhas, effects supervisor. "The characters are animated on 2s, and effects weren't in sync. When Pigpen holds a pose for a frame, the dust has to do exactly the same thing."

The effects team gave anima-



SNOOPY'S WORLD

"The best thing about Snoopy is that he loves Charlie no matter what," says Director Steve Martino. "Because of that, he becomes a great help. He teaches Charlie how to dance. The two put on a pretty good magic act. But in addition, Snoopy carries the emotion of what Charlie goes through in his [Red Baron] fantasies. Snoopy's fantasies aren't just sidetracks. They tie into the bigger story. They take Charlie's issues and put them through a bigger filter using Snoopy's bigger, broader personality."

For animators, Snoopy was the most complicated character.

"Sparky didn't want Snoopy to be a dog," says Supervising Animator Nick Bruno. "Wagging his tail is on the very boundary of dog. His action is more like that of a kid. But he has to open his mouth to a wide degree, and that mouth has to lie within his sculpt. His eyes move to the side of his head."

Animator Jeff Gabor, who was the character lead for Snoopy, adds, "To be honest, animating Snoopy was like doing 2D animation with 3D parts and forms."

Riggers provided controls for animators to flip Snoopy's eyes to one side of his head, lift his head into a bowling pin shape, slide his ears and eyes, and stretch his mouth from tiny to huge.

Moving Snoopy into his bigger imaginary world gave the artists more 3D freedom.

"Charles Schulz drew Snoopy in World War I

with more detail, so we took that cue to make our cameras more detailed and dynamic," says Cinematographer Renato Falco. "That contrast made the movie more fun."

When Snoopy is in his backyard, his world is like that of the other characters – a comic strip. But in his imaginary world, the scale and scope grow. Camera lenses are shorter. The camera and colors are more vibrant. Snoopy's imaginary world is more like that of other CG films, but still within the Peanuts universe.

In Charlie Brown's world, long lenses on the camera make the world look flat, and the camera is always level. In Snoopy's world, the camera is still level with Snoopy when he's in the picture, but it moves more.

"We had fun with scale and lighting in Snoopy's world," says Lead Set Designer John Townley. "We have big gobo shapes for clouds in 1900 Paris. And, you might even see Snoopy's doghouse at the top of the Eiffel Tower."

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PEPPERMINT PATTY'S PENCIL TEST

Animator BJ Crawford did one of the first tests using hand-drawn animation to explore poses from the comic strip while trying to capture the sensibility of motion from the original television specials.

"The scene is Peppermint Patty dialing up Charlie on the phone, then hopping off the chair," Crawford says. "To prepare myself, I went through the comic strips and tagged iconic scenarios I liked. The props are all oversized, so she has to hold the phone with two hands. I tried to maintain the original proportions, poses, and expressions as much as I possibly could while translating the graphic style into animation."

Later, Crawford found himself assigned to drawing 2D animation that would appear in thought bubbles. He worked in TVPaint Developpement's TVPaint Animation software.

"It was hard," Crawford says. "I'd go through the comic strips to try to find an exact panel so I could match the line weight as closely as possible to my image. I learned so much. Once I roughed out the action and the timing, I had to put a Schulz line on top. The program is fast, but it gave me a boring line. I had to go in and etch out the line. Inking a character was something I had to learn."

— BARBARA ROBERTSON

tors a big sphere to use as a visual guide, but the final cloud is made from small spheres converted to volumetrics and the scanned drawings of dust specs.

"We wanted something that had depth, to look good in stereo," Pinkhas says. "We didn't want just pen strokes. So, we added the volumetric elements – poofs of dust. The arc at the top of each sphere is represented as a pen stroke. We used a rig to control the size of the poofs and their speed, and added noise to skew and squish some of the arcs. We also controlled the motion of the dust specs. Usually we let the physics simulation do its thing, but for this movie we needed more control."

Similarly, the crew stylized water to create a look and animation style that fit into the Peanuts universe.

"To get a staccato feeling

in the animation, there's no motion blur," Pinkhas says. "So we needed to figure out how to make our effects read well without motion blur."

For water, they used the shape of the water drops to create a motion-blur illusion.

"Rather than spheres that look blurred when rendered with refraction, we modeled elongated water drops into the shapes the motion blur would represent," Pinkhas says. "It was the same with splashes. We sculpted them frame by frame, or every few frames, using shapes in Sparky's style."

These tiny models of raindrops look like Charles Schulz's pen line. By instantiating the models to particles and holding back the particles on every other frame, the effects artists cleverly matched the animation style.

"Wrestling effects into shape was really challenging for the ef-



THE ELONGATED RAINDROP SHAPES CREATE THE ILLUSION OF MOTION BLUR AND MATCH THE ANIMATION STYLE.

fects crew," Cavaleri says. "They had to think about every frame like a 2D effects animator. Our tools were not made for that. But the effects came out great."

WOBBLES IN THE NEIGHBORHOOD

The crew's respect for Schulz's line and their determination to reproduce the comic strip as faithfully as possible extended into the backgrounds, as well.

"Sparky was the spirit of everything we designed," Dunnigan says. "We looked to his strips for inspiration and found great landmarks. The living room with the couch. The thinking wall. The kite-eating tree. The doghouse. Then we had to learn how to draw like Sparky. Steve's [Martino] mantra was, 'Where do we find the pen line?'"

They started with Snoopy's doghouse.

"We did drawings and sculptures, trying to keep the wiggly lines and beveled edges without having the doghouse look old or rubbery," says Jon Townley, lead set designer. "From there, we went to snow, other edges, and trees. We had to train ourselves to put the right wobble in the clapboard, to have the right frequency in the snow blobs and branches."

They wanted an asymmetric

look, something more playful than typical CG environments, more organic. But as they began to move from the doghouse into the neighborhood, they realized that Schulz didn't draw establishing shots.

"He drew dialog and characters, and pieces and parts of the neighborhood," Dunnigan says. "Windows, rooftops. So for reference, Steve Martino and Craig Schulz went to St. Paul, Minnesota, and took photos of the neighborhoods where Charles Schulz grew up."

Then, working from the script and story beats, they designed the neighborhood. The house where the Little Red-Haired Girl lives, across the street from Charlie Brown. The baseball field. The school.

The shooting style, however, introduced technical problems in the newly created CG neighborhood. To match the comic strip's flat look, the crew had decided to shoot with long lenses.

"Charlie is like a basketball on a body," Martino says. "We didn't want his head to balloon out and look odd."

Moreover, they kept the camera about three feet off the ground, and sometimes lower for Snoopy.

"It was astonishing how much we had to massage the other elements in the frame to



THE DESIGN TEAM REFERENCED PHOTOS FROM CHARLES SCHULZ'S HOMETOWN FOR THE NEIGHBORHOOD.

create the right look," Cavaleri says. "When the kids are in school, the camera doesn't fit in the classroom. We needed a breakaway wall so we could put the camera across the street. If we had used a shorter lens, we would have distorted the characters' heads."

For color, the design team referenced the Sunday comic strips. But, they found that, especially in the early days, the colors were more muted and pastel than they wanted.

"We went to Santa Rosa and asked when Charles Schulz had a hand in coloring," says Lead Color Designer Vincent Nguyn. "The last thing for which he chose colors was the book 'Peanuts Jubilee.' These colors were saturated and vibrant. We used that, and since all the characters came with their own colors, we decided to downplay the background. We kept it muted and tighter in range, and saved color for the characters."

The design department set the scenes in winter to create a timeless and less specific feeling. Then they gave the lighting department color keys. This department, too, discovered that creating Schulz's simplicity

was a daunting effort in 3D.

"When you have characters covered with fur or frantically flying, you can get away with a lot," says Lighting Supervisor Jeeyun Sung Chisholm. "Charlie's head is huge and spherical, and so simple that we needed a perfect shading model."

In this minimal world with snow often covering the ground, muted backgrounds, and vibrant characters, the color of the light was particularly important.

"Snoopy was a white dot in front of white snow," Chisholm says. "We had to make him a neutral gray."

And while the crew used perfect five-point hero lights (key, fill, rim, top, and bottom bounce) with the bright light behind for the children, to make Snoopy pop, they had to do the opposite. "Our biggest challenge was balancing how realistic the lighting should be," Chisholm says. "We tested a lot of levels of saturation and contrast, and explored a more stylistic approach."

WHY 3D?

Given the enormous technical and artistic challenges inherent

in making a respectful 3D version of the comic strip, why not just make a 2D animated feature?

"One reason I wanted to do the movie in CG is that as I started working on the film, people came to me with Snoopy plush toys," Martino says. "The toys were yellowed. Their necks were floppy. People had this great connection with Snoopy as a plush toy. I thought if we could depict that softness and still have fun with him in animation, it would be a nice combination."

Texture, Martino points out, gives audiences an anchor in the imaginative world.

"Everything in this world is based on drawings, but the materials give us something we can relate to," Martino says. "The wood texture, the doorknob, the stucco, or bricks on the side of a house. We can relate to these materials, and they tell us the scale is right. People can then believe the world exists and the character is alive."

Martino also believes that CG can add emotion.

"Nick Bruno tells this story,"

Martino says. "There's a moment when something rough is going on for Charlie. He's down in the dumps. His head is down. Snoopy walks up behind him and is going to put his hand on Charlie's back. Because we have lighting, we see his shadow come up to meet his hand. His hand presses into Charlie's clothing, and we feel the connection. Because we get those subtle elements in CG, there's a stronger emotional connection in that moment."

And then, to turn the question around, why – other than respect for Charles Schulz and the Peanuts fan base, not a small consideration – did they work so hard to bring elements of the comic strip into the 3D world?

"People ask us why, if we're making a 3D film, did we embrace the 2D and try to come close to the comic," Dunnigan says. "I think that's what is innovative about this film."

"We picked the hard way," Lee says.

Townley adds, "But it was the only way it could have been done." ■

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