

SHAPES OF THE SOLAR SYSTEM

[Illus: Squiggle and Circle are dressed as backpackers. Circle pores over a map with a view of the Solar System in the distance]

[Squiggle] Look, the Sun! Oh my gosh, planets! Was that a comet? I've always wanted to explore the Solar System! Are you new here too?

[Circle] Yup! I'm going to fit right in. After all, *basically* everything in the Solar System is a circle. Uh... what shape are you?

[Squiggle] Oh... I don't know yet. You can call me Squiggle. My mom says I'm a late bloomer.

[Illus: morphs into a flower shape] Tell me more about circles!

[Circle] They're everywhere! Planets are *round*, they *circle* the Sun, which is a giant *ball* of hot plasma... maybe I'm a little self-centered, but when you're a circle, that's kind of the point.

[Squiggle] You really know your stuff! Where should we go first?

[Circle:] Let's start with Mercury – it's absolutely covered with circles! Mercury is a *circle*, and it orbits in a *circle* around the Sun.

[Squiggle] Isn't its orbit more of an oval? Look, the Sun's not even in the middle! And wait, is its direction... changing?

[Illus: Squiggle changes into a precessing elliptical shape, like a spirograph tracing]

[Sidebar: Those tiny circles covering Mercury's surface are called **craters**. Craters happen when leftover debris from the solar system's formation smacks into the surface of a rocky planet.]

[Mercury] Oh, goodness, dearie, you noticed! My orbit is a special type of oval called an ellipse. It changes direction so quickly because I'm the closest planet to the Sun's strong gravity.

[Sidebar: Mercury has the most stretched-out orbit of any planet, but all the planets have elliptical orbits if you look close enough. The changing direction of the orbit is called **precession**, which is the same thing that makes a top wobble as it spins.]

[Circle] OK, fine, it's *almost* a circle. *Anyway*, let's go see one of the biggest circles in the Solar System... the very biggest planet a-*round*... that's right, it's...

[Circle:] Jupiter!

[Squiggle squints, gets out a measuring tape] Hm, is Jupiter really a circle? It looks a little wider than it is tall.

[Jupiter] Sharp eyes, little fella! I'm the biggest planet, but I spin so fast that I have the shortest day – only 10 hours long! Spinning so fast makes my belt bulge just a little – I keep it loose cause I'm kind of gassy. Some people call me an oblate spheroid, but I think that's rude.

[Circle] FINE. Where are the *real* circles?

[Squiggle, pointing] Duck!

[Circle, hitting the ground] What's the matter?

[Squiggle, morphing into a rubber duck] No, I think I see a duck!

[Circle] Impossible! I told you, the Solar System is made of—

[Illus: A duck-shaped comet, 67P Churyumov-Gerasimenkov, whizzes over circle's head]

[Jupiter, waving] Oh, hey, bud! That's one of my Jupiter-family comets – he swings across my orbit now and then. I call him Mr. Quackington. Scientists call him 67P.

[Sidebar: Scientists once landed a robot on that duck-shaped comet, as part of the Rosetta mission. The duck shape comes from two little rubble piles whose gravity pulled them together until they touched.]

[Circle] Ovals, ducks... this is getting weird. I know! Let's go where there are circles within circles within circles. Some people call them "rings," but we know what they *really* are. That's right, we're off to...

[Circle:] Saturn! King of the rings! Check out those beautiful *circular* bands of wind around Saturn's surface.

[Squiggle peers underneath Saturn's south pole, morphs into a hexagon] Hey, look at this! You're not going to believe it. I found... a hexagon!

[Sidebar: Saturn's rings are one of the flattest things in the Solar System. If you could shrink them down to the thickness of a piece of paper, that paper would be over a mile wide.]

[Circle, joining squiggle to stare upward] Impossible! Everything here is round... how could there be a hexagon?!

[Saturn] Yoo-hoo, tiny travelers! Eyes up here, please! When you're made of flowing gas, you can make lots of interesting shapes. Take a gander at my exquisite north pole!

[Squiggle] No way! A decagon!

[Sidebar: Depending on how fast a planet spins and how easily its gas flows, it can make lots of different shapes. Gas planets around other stars might have pentagons or octagons around their poles.]

[Circle] Isn't anything a *real* circle around here?

[Squiggle] Hm... How about a dwarf planet?

[Circle] Now you're on a roll! Let's go visit my old pal, Pluto.

[Sidebar: Comets and asteroids don't have much gravity, so they're lumpy, like if you just lightly crumple up some aluminum foil. Dwarf planets have enough gravity to squeeze themselves into a spherical shape, like if you push down hard while you roll a ball of foil around a table.]

[Circle:] Now THIS is a circle! Even with their best measurements, scientists haven't been able to find any differences between Pluto's shape and a perfect sphere.

[Illus: New Horizons image of Pluto showing heart-shaped ice plain]

[Squiggle, morphing into a heart] Awww... a heart! So sweet!

[Pluto] I just *love* it out here! All this ice makes me feel so chill.

[Circle] Yeah, the heart is sweet. But look at all of Pluto's lovely *circular* craters...

[Squiggle] Wait... why aren't there any craters on her heart?

[Pluto] That's where my glaciers are! They flow like rivers of ice, and smooth out my surface. If you just go with the flow, you can keep things smooth.

[Sidebar: Stuff is always smacking into rocky planets and making them rough. So anytime you see a smooth part of a rocky planet, it means something is flowing to make the surface flat again. It could be ice, or lava, or even water -- which is why you don't see many craters on Earth.]

[Circle, wide-eyed] Wait... first all those things weren't circles... and now all those tiny circles are getting... erased?

[Circle collapses in a puddle of tears]

[Squiggle] Hey, Circle... it's OK! You're a really important part of our Solar System! Pluto wouldn't be the same without you. Plus, new craters form all the time! Circles are beautiful, and... don't you think other shapes are too?

[Sidebar: Craters are always circles, even if the asteroids are lumpy or hit at an angle, because it's the explosion after the impact that makes the crater round.]

[Circle] Well, *sniff*... it *is* kind of amazing that our Solar System has ovals, and hearts, and hexagons, and oblate spheroids [Jupiter says: "I heard that!"], and even ducks! I think I'd like to give this trip another try...

[Illus: Return to the original scene at the start of the book, where now Circle and Squiggle stand in front of a variety of littler shapes]

[Circle] Welcome to the Solar System! I'm Circle.

[Squiggle] And I'm Squiggle. We'll be your guides today!

[Circle] See how many different shapes you can spot. I used to think the Solar System was all circles. Turns out, it's much more interesting than that!

[Squiggle] Just keep an open mind and look carefully. Who knows what you'll discover!

[Circle] The Solar System is amazing – and it's big enough for all of us.