

# SOARING INTO THE FUTURE



National Science Foundation  
WHERE DISCOVERIES BEGIN





Hi! My name is **Obi**, and I live at Stanford University in California.

It may not look like it, but I have a very important job — **I'm a scientist!**







My lab mates and I work hard every day  
to answer a question that has puzzled  
humans for hundreds of years:

How do birds fly?

I don't mean to brag, but **birds** are much better at steering **than an airplane**, and we use a lot less energy to fly around.





The way my wings move the air to lift me up is different from how an airplane's wings keep it in the sky.



That's why some of my cousins can fly so far **without any help** from an engine or needing to refuel.

Some make trips as far as Alaska to New Zealand without taking a single break. Others can stay in the air for a whole year without ever touching the ground — they even **sleep while flying!**



While the work I do is very important, I'm not the only test pilot in our lab. We have a whole flight team, including hummingbirds, pigeons, lovebirds, bats — even **flying robots!**

We fly through **wind tunnels** and in special boxes designed to help us see exactly what's going on when we take to the air.



Right now, I'm focused on one especially mysterious part of our big question: How does flapping my wings move the **air** around me to lift my body off the ground?





After months of training with my co-pilot, Eric, we're finally ready for our latest experiment to try and answer that question.





I strap on my safety goggles and wait for  
Eric's cue. **3-2-1-TAKE OFF!**

I soar through the mist and bright lasers, and  
land right on target. **Mission accomplished!**

With the experiment over, it's time to grab a nice snack and look at the **results!** While I was in the air, Eric's laser illuminated the mist around me. His super-fast camera then took pictures of the mist moving as I flapped my wings. That lets us see how the air swirled and shifted with every **wingbeat**.



Now, Eric is working on his computer to build a cartoon of what I looked like during my flight, and is using **math** to figure out how my wings pushed and pulled the air to lift me up off the ground.



My lab's work isn't just about understanding how my friends and I fly. What we do is called **basic research**, and it lets us learn about all sorts of things.



Basic research is how scientists explore the world around us — without it, most of the cool **technology** and **medicine** we use every day could never have been invented!



The basic research that my lab mates and I do taught us how to make **flying robots** that flap their wings and fly farther than ever before...

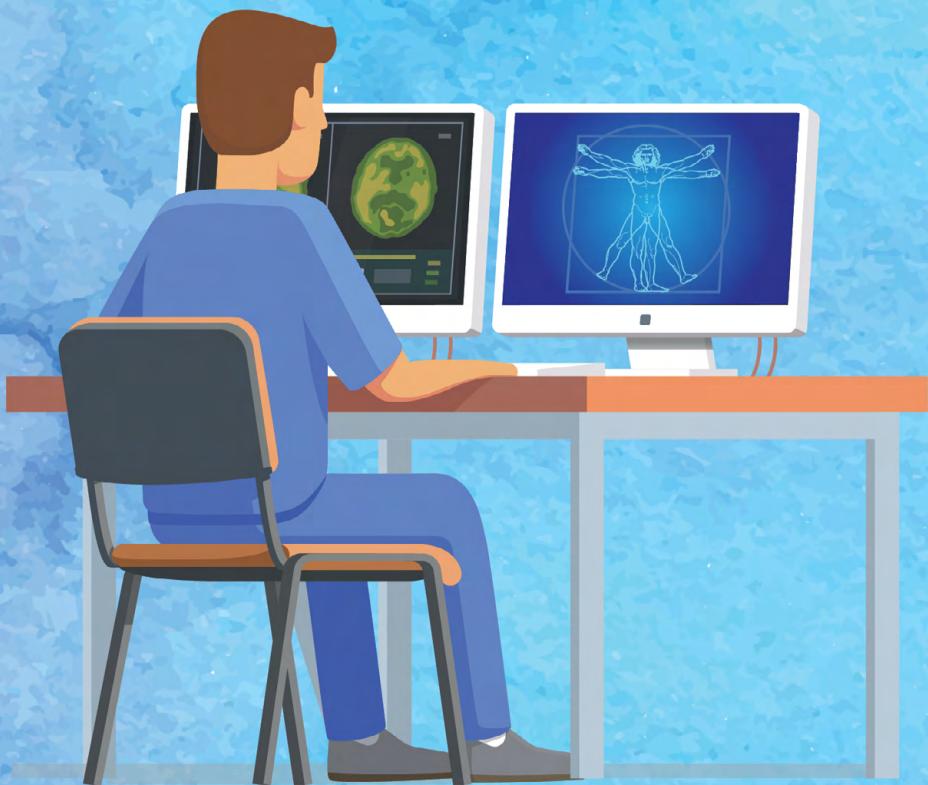


1.  $v=v_0+at$
2.  $\Delta x=(v+v_0)t$
3.  $\Delta x=v_0t+\frac{1}{2}at^2$
4.  $v^2=v_0^2+2a\Delta x$



...and even helped us figure out how  
my **dinosaur ancestors** learned to fly.  
They used their wings to hop around  
and gather food in trees before learning  
to fly over oceans.

That's what basic research is all about — **feeding our curiosity** to come up with creative new ideas!





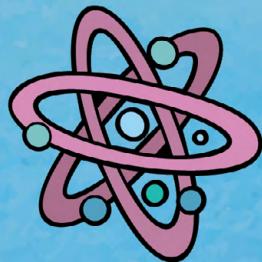
Asking questions about **microbes** living in hot springs led scientists find a tool to study our DNA, and asking what **magnets** do to tiny spinning atoms helped doctors invent a way to look inside our bodies when we're sick.



When you ask questions about the world through **basic research**, you never know what you might discover!



That's why I love being a scientist — just by doing my job, I get to have fun with my friends while making the discoveries that will help us **soar** into the future.



## LEARN MORE ABOUT OBI

Obi is a member of a Pacific parrotlet flock in Dr. David Lentink's lab at Stanford University. His work with Dr. Lentink's graduate student, Eric Gutierrez, was published in *Bioinspiration and Biomimetics* in December of 2016. Next, Obi's friends showed how Obi's dinosaur ancestors could have mastered flapping flight while jumping between branches in trees searching for food, published in *Science Advances* in 2017. Their lab's ongoing research is supported by NSF grant IOS-1552419. To learn more about Dr. Lentink's lab and their work on flight, visit [lentinklab.stanford.edu](http://lentinklab.stanford.edu).

*No test pilots were harmed in the performance of these studies.*



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