

After Effects Expressions

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By
Marcus Geduld



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To Lisa

This book is an expression of my everlasting love.

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Introduction

WHAT ARE EXPRESSIONS?

Expressions are tools. Just as you use the Rotation tool and the Pen tool, you can use Expressions to control animation and composition in After Effects (AE).

Whereas you use most tools by clicking on their icons (e.g., the pointer or the pen) and clicking or dragging with the mouse, you use Expressions by typing commands on the keyboard. That's what Expressions are: typed commands. You type these commands to tell AE what to do, and—assuming AE understands your commands—it does what you want it to do.

But you don't always have to type to add an Expression. There are some clever click-and-drag tools that will save you time. But these tools just do the typing for you. Expressions are still typed commands.

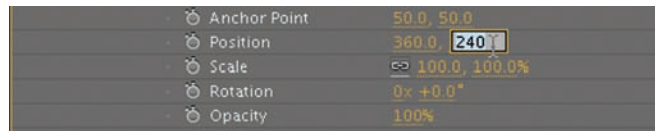
Expressions are also like recipes—directions for baking some yummy dessert: First, mix eggs and flour; then add sugar; then bake at 375 degrees for 20 minutes. Imagine you wrote such a recipe, and a helpful robot (wearing a chef's hat and apron) read it, followed the directions, and baked you a cake. With Expressions, you type out the instructions, and the robot—After Effects—bakes you a cool effect.

Most Expressions command AE to bake numbers. For instance, the Expression $1 + 2$ commands AE to bake the number 3. It's as if you've typed, "take a yummy one and a scrumptious two, and pop them in the addition oven." The AE robot does so, and a few nanoseconds later, it hands you a steaming, delicious 3 on a plate. (Don't worry; most of the Expressions you'll use, at least when you're starting out, won't look like math problems.)

I'M AN ARTIST! WHY SHOULD I CARE ABOUT NUMBERS?

Because numbers rule After Effects. In AE, numbers drive nearly every aspect of your work. AE tends to hide this fact from you, though not very well, because

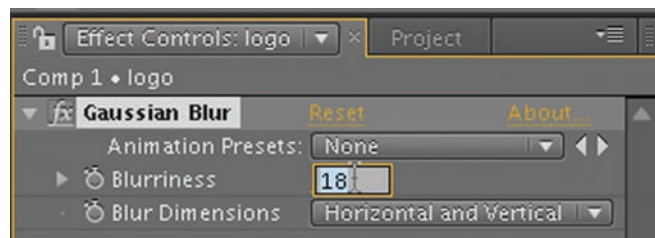
the numbers are always right there for you to see. But you can work without paying much attention to them.



The numbers I'm talking about are the ones you see in the Timeline, to-the-right-of the Transform properties. You may think of Rotation as something you control by spinning a layer with the Rotate tool, but AE thinks of it as, say, the number 45, as in 45 degrees clockwise; you may think of Position as dragging a layer down and to the right, but AE thinks of it as, perhaps, 150 and 223, x and y coordinates.

In fact, all the user-friendly tools that manipulate layers—the Selection tool, the Rotate tool, and so on—are just widgets that let you build and change numbers. When you drag a layer to the left, you may think of yourself as, well, dragging it to the left. But what you're really doing is changing the layer's x-coordinate number. AE then uses this number to remember how far left you want the layer to be. It doesn't remember that you dragged the layer; it remembers the number. And next time you preview the Comp, it uses this number to determine the placement of the layer.

Expressions are another way to control such numbers. Expressions are typed commands that control numbers.¹ These numbers don't just control the Transform properties; they also control Effect properties, like the blurriness of a Gaussian Blur (which is a number too).

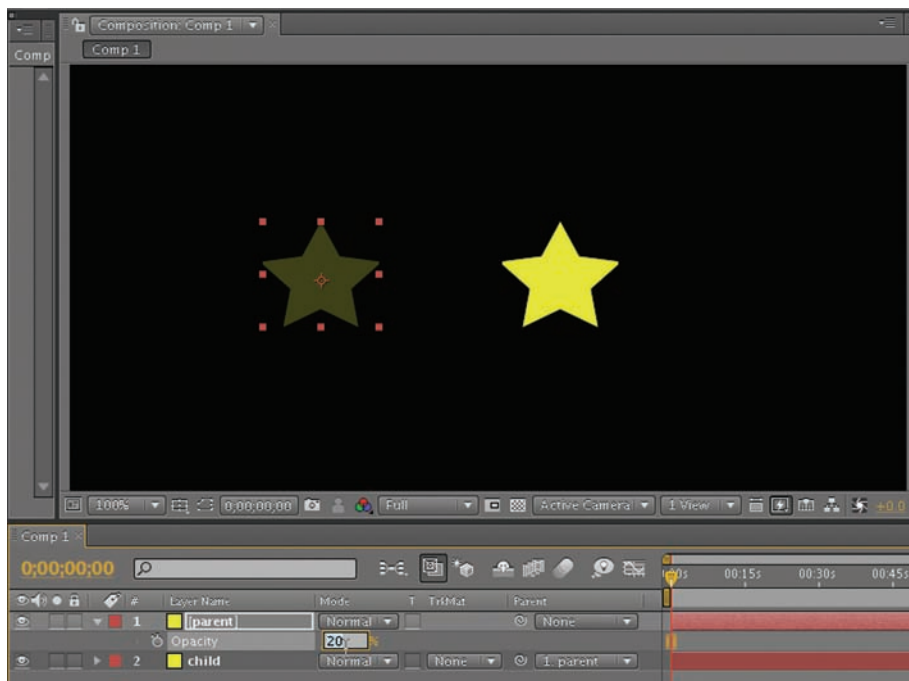


¹There are a few exceptions. For instance, there are Expressions that are commands for building the type of text you would normally build with the Type tool. Because text is not numbers, it's more accurate to say that Expressions are typed commands that control layer-property values. Most property values are numbers, but a few aren't. By the way, you might think that some property values are colors, such as the Color property of the Fill effect, but AE thinks of colors as numbers (red, green, blue, and alpha values).

Because nearly everything you do to layers involves manipulating some property's numbers (an Effect property's numbers or a Transform property's numbers) and because Expressions let you control a properties' numbers, Expressions are very powerful.

WHAT CAN I DO WITH EXPRESSIONS?

At their most basic (but still very powerful) level, Expressions can act as super-parenting tools. If you've ever used the parenting feature in AE, you know that it allows you to make one layer the parent of another. The child layer will move when its parent moves, scale when its parent scales, and rotate when its parent rotates. But that's all. If you fade a parent by adjusting its opacity, the child does not fade; if you blur the parent (saw with the Gaussian Blur effect), the child does not blur.



Expressions crash through these fences. They allow you to hook any two properties together. That's properties, not layers. So layer A's scale property can control layer B's scale property so that when A gets bigger, B gets bigger.

More intriguing, you can create an "opposite" Expression so that when A gets bigger, B gets smaller. Or, even more intriguing, you can hook A's position to

B's scale, so that when A moves to the left, B gets smaller, and when A moves to the right, B gets bigger. You can throw a glow effect onto a Text layer and use an Expression to make the text resize as the glow becomes more intense.

Expressions give you a mechanism for allowing any property to control any other property (or properties) in all sorts of complex, useful, and creative ways. With Expressions, it's as if you live in a wacky house where you can connect your toaster to your hair dryer and your washing machine to your garage door. Start the washing machine, and the garage door opens.

But that's not all. Expressions provide you with commands, like wiggle and loopOut, which cause layers to behave in complex ways. You don't need to spend hours animating them with keyframes; you just issue a command and the layer does your bidding. (Wiggle lets you randomize a property, so, for instance, the layer might randomly change colors as it moves across the screen; loopOut allows you to selectively loop one aspect of a layer, so you could make the layer bounce up and down repeatedly while, at the same time, it moves once from left to right and fades out.)

Expressions let you link several (dozens, even hundreds) of layers together so that they act as a team; with Expressions, you can create complex movements, such as pendulum swings and elliptical orbits, which are really hard to animate with keyframes. Expressions also let you use sound to control an animation (e.g., as the volume gets louder, the layer gets bigger).

Like all the complex, creative tools in AE (masks, transfer modes, 3D, etc.), Expressions are bottomless. They are limited only by your creativity. So it's impossible to list everything you can do with Expressions. All I can do is teach you the Expressions language, show you a bunch of examples, and then let you take it from there. The more you work with Expressions, the more uses you'll find for them.

WHAT IS JAVASCRIPT?

Expressions are commands, and commands must be written in a language: wiggle (English), meneo! (Spanish), iggleway (Piglatin), wiggle ().

That last language is JavaScript. JavaScript is the language of Expressions. It's a lot like English (notice that it includes the English word "wiggle"), but it's not quite English. It's English simplified so that a computer can understand it. It's more formal than English. In English, we can say, "I took the dog for a walk"

or “The dog was taken for a walk by me.” The latter is awkward, but it still makes sense. We can understand it. But that’s because we’re smart. Computers are dumb. They only understand commands that follow rigid rules, so when we write JavaScript, we need to follow these rules.

That actually makes JavaScript much easier to learn than a human language. If you learn French or German, you need to expend a lot of energy memorizing irregular verbs and genders. Because JavaScript is so rigid, there are few irregularities. Wiggle is always wiggle. It’s never wiggled, wiggler, or wobble.

You may have heard of JavaScript before. It’s built into web browsers, such as Safari, Firefox, and Internet Explorer. It’s also built into Photoshop, Illustrator, After Effects, Dreamweaver, and many other graphics and design applications. Flash employs a JavaScript-like language called Actionscript. The Expressions language is based on a subset of JavaScript, with a bunch of AE-specific additions thrown in by Adobe.

If you’re like many designers I’ve met, you’re probably starting to hyperventilate about now. “I didn’t sign aboard to be a programmer!” you’re thinking. “Where’s the exit?”

I started out as a designer with no interest in programming. But I had to do some web design, and I needed to learn JavaScript to create some animated effects. My intention was to learn just a tiny bit of programming: just enough to achieve the effects I was working on. But as my projects grew in complexity, I gradually found myself learning more and more. After a while, I understood JavaScript as well as, say, an American might understand French if he’s lived in Paris for a few years and has had to use it each day to ask, “How much does that cost?” and “Where’s the bathroom?”

When I got into AE, I was thrilled to discover that it spoke the same language as web browsers. If it hadn’t, I might never have learned Expressions. I really didn’t want to learn a second language. Luckily, I didn’t have to. And as I leveraged my JavaScript skills within AE Comps, my programming skills got stronger. Eventually, I learned Flash programming, and once again found myself speaking JavaScript—this time like a native.

You may have no interest in becoming a computer programmer, but if you learn some JavaScript, even if you learn it kicking and screaming, you’ll have new tools that can help you out in many of the applications that you use every day.

AE lets you use JavaScript in two different ways: Expressions and application scripting. Expressions let you manipulate effects and transforms in the Timeline. In other words, they are tools to help you create animation and compositing effects. Application scripting allows you to control After Effects itself. With scripting, you can add new commands to AE's menus. You could, for instance, add a command that automatically renders out a Comp at 3:30 on Wednesday and e-mails you when it's done. Such scripting is also available in Photoshop and Illustrator to help you extend the feature sets of those applications.

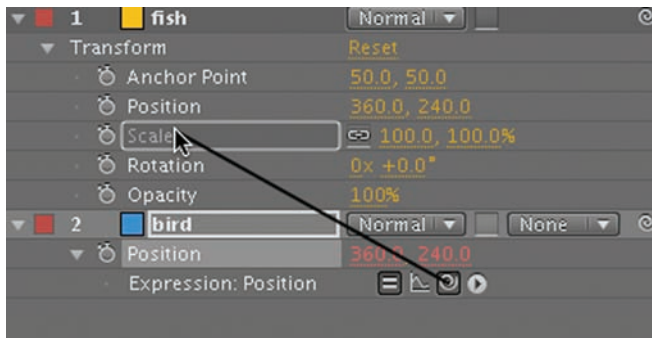
Because this is an Expressions book, that's all I'm going to say about application scripting. But it's nice to know that, once you learn Expressions, you won't have to learn a whole new language for scripting. (If you want to play with some sample scripts, you can find them in the File > Scripts menu.)

One more note about JavaScript. It's not the same as Java. Java is a completely different language (used mostly on web servers and never in AE). Not surprisingly, people always confuse Java and JavaScript with each other. JavaScript is not a "lite" version of Java. JavaScript is as distinct from Java as Spanish is from Portuguese. Why do they have such similar names? Because the company that developed JavaScript (Netscape) had a partnership with the company that developed Java (Sun Microsystems). Rumor has it that the Sun developers drink a lot of coffee. Go figure.

DO I NEED TO BE A PROGRAMMER?

No. Although you write Expressions in JavaScript, which is a programming language, you don't need to be a programmer to craft useful Expressions. You don't even need to know much about JavaScript. In fact, the beginning chapters of this book will show you tons of useful techniques you can use without any programming knowledge at all. And although it's true that you can go on to do even more useful things if you do know how to program, you're not limited to boring, 101-type effects if you don't. You can create complex, original effects without coding.

In fact, most of the time you won't even have to type. AE includes an amazing, magical tool called the Pick Whip, which allows you to create JavaScript with your mouse. You drag, point, and click; AE writes the code for you. You don't even have to understand the code. It just works.



For readers who want a deeper understanding, I've included advanced steps in later chapters. You can decide, in your own time, whether or not you want to tackle these chapters. It's my sincere hope that this book will be useful to you, even if you only read 50% of it. (Of course, I'd be thrilled if you read the whole thing.) For those of you who do want to learn it all, I promise to hold your hand through the process and gradually guide you from the simple to the complex, without making any sudden leaps.

Even if you never delve into complex JavaScript yourself, you can still use other people's scripts. JavaScript is just text, and text can be copied and pasted. Back when I first started to use Expressions, I needed to create a pendulum. But I had no idea how to write such an Expression. Luckily, I was able to find one online. I read it and was totally baffled by it. It looked like a scary mathematical equation. For a second, I felt panicked. Then I calmed down, selected the text of the Expression in my browser, copied it to the clipboard, switched over to AE, and chose Edit > Paste. Voila! My pendulum swung back and forth beautifully. I had no idea how it worked, but it worked, and that's what mattered most.

This book is for those of you who don't care how it works, as long as it works. It's also for those of you who *do* care how it works and want to be able to customize it and write other Expressions that are just as complex. This book is for the auto mechanic. But it's also for the guy who just wants to drive his car to work and doesn't really care what goes on under the hood.

DO I NEED TO BE GOOD AT MATH?

No. Many Expressions don't use math at all (even though, in the end, they spit out numbers). If you have to type at all, you'll type friendly words like "wiggle." Of the Expressions that do use math, most use simple arithmetic. So you may have to strain your brain by adding and subtracting, on occasion.

Readers who want to use more complex math and coding will enjoy some of the later chapters in this book. The math phobics can avoid these chapters (though I hope they'll give them a glance) or simply use the copy-paste method to use the fruits of these chapters without understanding. I promise that when I do use math, I'll walk you through it gently.

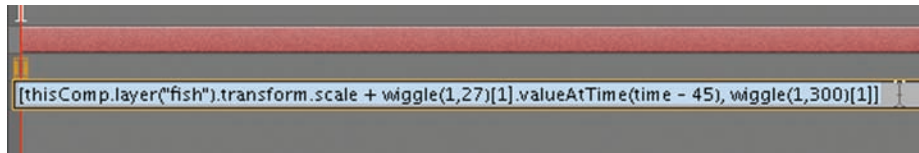
Remember, at heart AE is a number-based system. But it's packed with tools to help us creative types forget that. Expressions are among those tools. Though they can be mathematical if that's what you want them to be, they needn't be if you don't want them to be. Like English, French, and German, Expressions allow you to, well, express yourself using mostly words, not numbers. And these words give you great power. Like magic spells, they allow you to transform the world—at least the world of After Effects. So let's dust off our magic wands and get to work.

NOTES ABOUT USING THIS BOOK

I'm not a big fan of computer books that drone on and on about "how to use this book" before getting started. So I'm going to keep this short and sweet and tell you just two things before we dive in and start crafting Expressions:

1. Sometimes, when I type Expressions, I type relatively long instructions. They fit on one line on my computer screen, but they don't fit well within the margins of this book. So when you see this symbol at the end of a line ↴, it means that though the text is taking up multiple lines in this book, it only takes up one line on screen.

Example: `[thisComp.layer("fish").transform.scale + wiggle(1,27)[1].valueAtTime(time-45), wiggle(1,300)[1]]` ↴



2. Throughout the text, I refer to example files. You can download those files here: elsevierdirect.com/companions/9780240809366

That's it. On with the show!

About the Author

Marcus Geduld has written extensively about After Effects, Flash, Premiere Pro, and other software. He's also spent years teaching classes and teaching about technical topics at National Association of Broadcasters (NAB), MacWorld, and other conferences. When he's not teaching, speaking, and writing, he works as a Flash developer. He is also the artistic director of Folding Chair Classical Theatre. He lives in Brooklyn, New York, with his wife, actress Lisa Blankenship.