

# Virtual Maestro

With a series of popular mobile apps that turn the iPhone into a musical instrument, Ge Wang hopes to change the way we think about music.

By Jacob Dagger • Photography by Toni Gauthier

**J**eff Smith had enjoyed plenty of success in the world of Internet start-ups. In 1993, just a few years after graduating from Stanford University, he had cofounded Tumbleweed Communications, a software company that specialized in e-mail security, catering to large corporate clients. Over twelve years, he'd expanded the company, slowly acquiring other software firms, and eventually taking it public on the Nasdaq.

But by 2005, he was ready to move on. An avid pianist and composer in his spare time, Smith decided to leave the business world and return to graduate school at Stanford to follow a different passion: computer music. Early on, Smith was particularly inspired by a course on synthesizing sound, but even more so by the course's instructor, first-year professor Ge Wang '00. A talented programmer who specialized in computer-generated sound, Wang had written a new computer language dedicated to music performance. In his first semester at Stanford, he had founded a pair of novel ensembles: the Stanford Laptop Orchestra and the Mobile Phone Orchestra, both of which featured students composing and performing music on electronic devices.

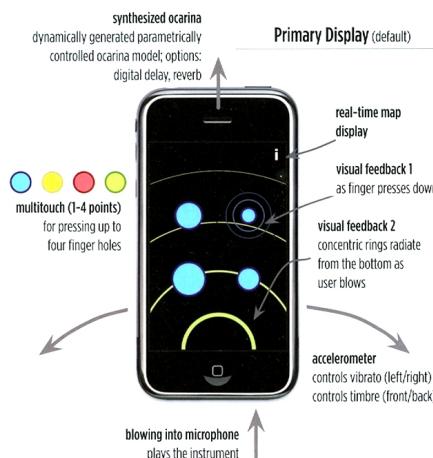
"When I met him," Smith says, "it was my conclusion that this guy was going to change music, he was going to change what it meant to [the world]."

As is often the case with those who have proven themselves successful in Silicon Valley, Smith was still routinely in touch with his former associates. It was early 2008 when a former investor asked Smith to review some new business ideas.

The previous fall, Apple had announced the upcoming release of the iPhone SDK, a software development kit that would allow

Smith to share the idea with Wang, whose programming and music skills would lend themselves well to the project. The timing wasn't perfect for either one of them—Smith had his Ph.D. work to keep him busy, and Wang was rushing to wrap up and defend his own Ph.D. thesis and adjusting to his new teaching duties—but after much discussion, they decided the opportunity was too good to pass up. "Wow," Wang recalls thinking about the iPhone. "This is going to change how people do music, this device. But someone will have to actually be there to effect that change. And we might as well be part of that." That summer, the pair launched SonicMule (later shortened to Smule), a start-up dedicated to developing interactive "social/sonic media."

## Primary Display (default)



Music man: Wang, opposite, plays theme song to Legend of Zelda video game using Ocarina app, with speaker "gloves" amplifying sound; above, original schema for what would become the Ocarina.

tended to, and shared around the world.

"I think the future of music-making is one where we might see the relationship of who is producing music versus who is constantly changing," Wang told the BBC last year. "Where you have a few performers performing on embers, it actually might be a model where

services [represent] a wonderful way to actually towards that vision," he added. "It's perhaps intimate computer that we've ever had."

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quickly became the number-one music app in the U.S. and in twenty other countries. Since 2008, it has been downloaded more than five million times.

Wang hypothesizes that the Ocarina, as well as other Smule products, have been successful because they allow people to be expressive. Users can create a catalog of tablature for thousands of songs on the Ocarina.

From his desk at the airport, he runs the program on his desktop computer. He clicks on a recently uploaded Ocarina piece, and notes begin to tickle his ear.

"This is coming from..." He squints at the screen, trying to divine internal borders on the blue and green globe. "Is that Rubik's cube?" From the app's first release in November 2008, people had raced to enter songs on the app more than 50 million times. Users have left comments on others' songs, and interest in the Ocarina has replaced TV as their regular dinnertime entertainment.

In the wake of Ocarina's success, Smule has released several instrument-based apps, including Magic Piano, Magic Fiddle (inspired, supposedly, by a symphony ensemble in San Francisco during which a local Latvian played his classical piece "Flight of the Bumblebee" on an iPad), and Leaf Trombone.

They have also teamed with singer T-Pain and the producers of the hit Fox show *Glee* to produce two branded karaoke-style apps. T-Pain's app, co-created with the show's creator Ryan Murphy, "Pop Up Karaoke" and "I'm N Lovin' (With a Steez)" is known for its concert use, or, er, use of Auto-Tune, a digital pitch-correction software that *Time* magazine once likened to "Photoshop for the human voice." Used sparingly, the software smooths our vocal climaxes and flattens our dips. When used, it turns the human voice sound mechanical and fake. The T-Pain app adds Auto-Tune to the iPhone's microphone and lets users record themselves singing along with T-Pain's songs or just about anything else.

"The irony is that [T-Pain] doesn't actually need Auto-Tune to be good," Wang says. "He uses it more as an artistic gesture. He certainly uses Auto-Tune to its boundaries in a way that Auto-Tune was never intended to be used." At this, Wang smiles, as if he's found a kindred spirit.

Wang and Suitor have had an impressive three-year run. According to cofounder Jeff Smith, the company brought in about \$1 million in revenue in its first full year of operation, 2009, selling apps for between \$4 and \$3. Last year, they made \$4 million. This year, he says, they should do even better.

But they're not resting. In addition to developing new apps, Wang and Smith say that they are trying to further develop the game-like aspects of their existing apps, for example, by including

challenges and levels that users must pass in order to earn awards, in this case a currency tentatively titled "Smosh."

They are also looking at converting some of their apps to a "freemium" model, meaning they would allow users to download the app itself for free, but then charge for add-ons. The iPad version of the Magic Piano app, released in May, represents their first attempt at this strategy. Initially, they will charge for extra songs; in future editions of the app, they hope to be able to offer different sounds—for example, a harp or a synthesizer—as well.

In the foreground of the future, Smule apps will only be available on Apple devices—other companies, he says, "are not interested in making commercial standards today"—though that may change as Google's Android is integrated into more devices.

In some ways, all of these new music apps are like a classic example of the Internet's ability to promote ownership. *Glee* karaoke, for example, lets millions of anonymous users belt out for the world to hear. It does for music what blogs, Facebook, and Twitter did for opinion—it lets individuals embrace their need, their right, to be heard. David Pogue, the *Times* reviewer, wrote, "The result—people singing bald-faced pretensions to grand gorgous and perfect—is exhilarating, no matter how bad you are." But a quick sampling of tracks uploaded by users indicates that everyone is cut out to be an American Idol.

At the same time, the apps do encourage unprecedented, and unusual, types of interaction. In March, in the wake of the massive earthquake and tsunami in Japan, a young woman from Tokyo turned on her iPhone and pulled up Smule's *Glee* karaoke app. Using the phone's built-in mic, she recorded herself singing along to the song "Lean on Me." She uploaded the song to the *Glee* website, where it could be heard by other users, and received a few friends to chip in vocal tracks.

The response was astounding. Over the next week, requests poured in from complete strangers around the globe, asking for instrumentation and vocal parts to be added to the project. Within ten days, the track framed more than 1,500 voices, most perfect singers, all singing in support of Japan.

"It's one of those cases where you create something, and then people find uses for it that are not what you originally intended," Wang says. "As a designer, that's probably the most satisfying thing." People can make what you intended is awesome, for sure, but when people kind of take a step beyond that, it's just like, wow. Because then it becomes a dialogue."

Dager was formerly the Clay Fifer Magazine Fellow and lives in Berkeley, California.

Watch a rendition of "Stairway to Heaven" performed by Ocarina app users. <http://bit.ly/prASL>

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by Jacob Dagger

## Duke Magazine

feature and profile



Electric: Ge Wang makes sure all systems go before final concert of the season.

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(continued)



Tuned in, turned on: Rehearsals for Stanford Laptop Orchestra and Stanford Mobile Phone Orchestra concert at the university's Dinkelspiel Auditorium in June.

**I**N GRADUATE SCHOOL, Wang worked under renowned computer and computer musician Perry Cook, who had a joint appointment in Princeton's computer science and music departments. Wang immersed himself in computer music. But the programmer in him was always tinkering. Since his time at Duke, Wang had spent a lot of time thinking about the nuances of computer languages. His experience debugging friends' programs made him "appreciate when software...was designed in a way that makes people's lives easier."

There are thousands of computer languages out there, including dozens designed specifically for composing computer music, but despite a great deal of experimentation, Wang couldn't find one that met all of his needs. "One day I came to Perry," Wang recalls, "and I said, 'Perry, I know there are a lot of programming languages out there for music. I think I want to build yet another one.'"

He explained the basics of the new language he was proposing. Cook took one look, and said, "Okay, that sounds pretty insane."

And we have these types of devices in the hands of tens of millions, and soon more, people."

**O**N A WEDNESDAY AFTERNOON in late April in Smule's Palo Alto, California, headquarters, Ge Wang is trying to explain some practical uses of the company's latest iPhone app.

He pulls his iPhone out of his pocket and cues up the app, Magic Piano. The app turns a smartphone into a sort of musical instrument. "If something particularly epic is happening in your life," Wang says, "you might play something like this," and as greed does before, he leans down the device's touchscreen, and often loses track of his fingers, tapping out the triumphant opening notes from *Christina's Dream*.

"On the other hand," Wang says, "if you're feeling down, you might play something more like this." Again, his fingers follow a series of descending green dots, but this time, the music that comes from the iPhone's speakers is "100 Years," pop band Five For Fighting's soulful ballad about the passage of time.

Over the past two weeks, staff members have been working long hours to get the new release—adapted from the original iPad version—just right. It was submitted to Apple yesterday, and today, in the wake of the storm, things are unusually quiet, save for Wang's performance.

**"I realized that in the vein of ubiquitous computing, just building something is not enough,"** Wang says. **"It needs to be used. It needs to be in the hands of not hundreds, or thousands, but millions, or hundreds of millions."**

The office, located on the second floor of a two-story building just off Stanford's campus, consists mainly of one large room with a wall of east-facing windows and desks in groups of four arranged in what Wang describes as "ninjas-in-star formation." Wang's desk is in one corner; Smith's is in the opposite.

The walls are decorated with colorful drafts of design documents used to build game apps, photos of staff members, and "Ah-nold Film Festival" posters featuring Wang's face Photoshopped in place of the former California governor's.

One of two conference rooms features a long table, comfortable office chairs, and a big screen; it doubles as a site for weekly business meetings and a gaming studio. An X-box console, as well as faux instruments used in the popular game Rock Band, are stashed along one wall.

**I**T SEEMS POSSIBLE TO TRACE Wang's path to computer music back to childhood, though you could also say that his interests weren't all that different from that of the average boy growing up in the 1980s.

Born in Beijing, he spent most of his childhood in Kansas, where he grew up on classic video games like Mario Bros., Donkey Kong, and The Legend of Zelda. His first musical instrument was an accordion, a gift from his grandparents; his second was an electric guitar, which his parents bought him unprompted when

he was thirteen. "In retrospect, that seemed kind of an unconventional thing for parents to do," Wang says. "To preemptively invite an instrument of rebellion and decibels into your home." He took lessons from a teacher at a local music store and was soon jamming to Metallica and Guns N' Roses. He loved experimenting with sound.

"My parents have always encouraged me to follow my interests," he says. "They never held me down on anything. They waited to see what stuck. And music stuck."

At Duke, Wang (who went by "Gary" at the time) studied computer science, excelling in programming courses, spending many late nights in the Teal Building's computer lab, and often acting as a de facto audio engineer and debugger for friends. But he also balanced out his schedule with music courses: composition, theory, music history.

One course in particular stood out for him: "Electronic Music," taught by music professor Scott Lindroth, who is now Duke's vice provost for the arts. It was during that class that Wang first heard a recording of "Table's Clear," an experimental piece of computer music by composer Paul Lansky. The piece begins with seemingly random clanks and bangs, the sounds of kitchenware being handled roughly. But as the piece goes on, the sounds begin to organize themselves into a musical groove. "This was the first piece of computer music that moved me musically," Wang says.

"It was like, I want to do that, or I want to help people do that." The course also gave him his first opportunity to compose and record his own computer music.

Until this point, Wang, like many of his computer-science classmates, had envisioned a career in the tech industry, creating a software giant like Microsoft or maybe working for a video-game design company. But now a second path appeared: Lansky, an acquaintance of Lindroth's, taught at Princeton University, which has a renowned sound lab. Wang applied to the graduate program there and was accepted.

Wang's first foray into the start-up world also came during his time at Duke. With four friends he hatched a plan to launch an Internet site that would compile, summarize, and synthesize online reviews for a wide array of consumer products. This was in the late 1990s, when reviews of this type had just begun piling up online. The five packed their things into a U-Haul and headed north to Cambridge, Massachusetts, where they rented a townhouse and got to work on their site.

The Internet has gone through peaks and valleys in terms of levels of excitement "that it raises among investors and entrepreneurs," says Matt Killingsworth '00, the group's leader. "At this point I felt like anything was possible; that *this is the future*." But over four months, Killingsworth says, "we began looking at the financial assumptions we and others in the Internet industry were making."

"In the process of raising round one of financing," he says, "we became increasingly skeptical. The rate at which we were assuming we could turn visitors into revenue seemed less and less feasible." When the time came to decide whether they should request an additional semester's leave of absence from Duke, they decided to pack up and head back to campus. The following spring, the dot-com bubble burst. (Killingsworth is now pursuing a Ph.D. in psychology at Harvard University. His thesis involves using a smartphone app he developed to more accurately measure and understand happiness in humans.)

cluding programming, music composition, and live performance.

"People learned programming because they had to go create a musical instrument and a performance, and they were going to perform it in front of the class or in front of an audience," Wang says. "The programming becomes a tool and not the end goal."

Though the class comprised fifteen college freshmen, none of whom had any significant programming experience, the experiment was a great success, Wang says. "They rocked it. We were scared. They were."

When he came to founding the Stanford Laptop Orchestra in the first semester on classmen and grad students to form pieces of his own, Wang's own students design at Smule.

His hands-on approach that attracted faculty and students to the program was really interested

**W**HEN ten students started programming fo

Gregor Essel, an assistant professor of computer science at the University of Michigan, and Henri Peninetti, a Finnish researcher, Wang added a social feature to the app, a moving image of a globe that users could pan across, seeing where in the world other people were playing the game. The app was social, but it did not rely on the same web of links that other social media services offered a sort of anonymity that Wang thought was powerful. "This is here to show you that you're not the only one. Like you, these other people around the world have also paid a buck to get a fake lighter on their iPhone." The globe has now become a recurring feature in the company's apps.

Their next project was more ambitious. They would turn the iPhone into a flute-like musical instrument, played by a motion-sensor wind instrument featured in one of the early Legend of Zelda video games, the ocarina. For this product, Wang pulled out all of the stops, making use of every iPhone feature he could think of. The design is colorful. Users blow into the device's microphone while

fingering virtual holes that appear on its touch screen. Tiling the device, thereby altering the built-in accelerometer, changes the pitch of notes, and the phone's GPS makes performances playable on a map. Wang called the instrument Ocarina.

Ocarina proved to be a massive success, commercially and critically. It earned raves from critics at tech-focused publications like *PC Magazine*, but also caught the attention of general media publications like *Newsweek*, *Scientific American*, and *The New York Times*. Times technology critic David Pogue invited Wang onstage at the MacWorld 2009 Expo to demo the Ocarina. Accompanied by Pogue on keyboard, Wang played The Beatles' "Yesterday." The app racked up 400,000 downloads in its first month and

but millions, or hundreds of millions. When you reach those different scales, different things become possible, socially and musically. And as a researcher, that is irresistible. I feel like both academia and the commercial world had something to offer this."

Their first product was not music-based, or at least not obviously so. It was a virtual cigarette lighter of the sort that causes fans to snort and sneeze. But it was designed to look like a pack of other lighters in the Apple App Store, featuring a clean black screen with a remarkably realistic flame that shifts when you brush your finger across it and actually seems to singe the edge of the screen if you tilt it too far one way or the other. You can also extinguish the flame by blowing into the phone's microphone, or, using the flamethrower feature, pass the flame to another iPhone that has

been set on fire in the field and one that has the iPad into a diagnostic device. The app is designed for medical school researchers studying the effectiveness of customized treatment plans.

Over the course of the semester, students met frequently with their clients to deliver formal presentations, answer questions, and just to chat. The students enjoyed working "with real human beings whom the clients are interested in helping develop a big app. But how should they go about gaining the necessary skills?"

At Duke, there's a class for that. This past spring, computer science lecturer Robert Dowell and associate professor of practice Richard Lucz introduced a new course, "Software for Mobile Devices." The course's eight upperclassmen broke into teams to complete two projects for campus-based clients: one that used an iPad in a lab, where heavy books and piles of notes can weigh students

down in the field and one that has the iPad into a diagnostic device. The app is designed for medical school researchers studying the effectiveness of customized treatment plans.

In 2007, a group of Stanford University undergraduates founded a company called Terribleville, which, after working on apps for a number of large corporations, including Starbucks and Dell, created a mobile app directed toward students. In 2009, Terribleville was acquired by academic Web giant Blackboard, which is helping them roll out campus-specific apps around the country.

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*"There's a Class for That*

**T**he world of smartphone app development can be lucrative for those who take the right combination of skills, passion, and entrepreneurial spirit. For ninety-nine dollars, anyone can purchase a developer's license from Apple. Once an app is approved for sale in the App Store—essentially a worldwide marketplace—the developer takes 30 percent of the revenue.

So it's not surprising that college students, known as much for their energy and creativity as for creativity and drive, are interested in developing their own big app. But how should they go about gaining the necessary skills?

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