"We've designed the Mod to be very easy to interact with."

Paul Clifton talks about the potential of personalised pleasure

Three? Five? Seven? How many different vibration patterns should a vibrator offer? As far as the start-up Comingle is concerned, the answer is obvious: as many as you want. Their first product, "The Mod", is a vibrator based on the open source hardware Arduino, allowing the user to programme new vibration patterns, to control the vibration from their smartphone, or even to translate their heart rate into a vibration pattern. "These days, pretty much anything can be turned into electric signals," as Paul Clifton puts it in our EAN interview. He also tells us about the development of The Mod, and about the features the vibrator will offer when it hits the market later this year.

exclusive

Comingle is a young start-up, founded in 2014. Can you tell us a bit about your company and your philosophy?

Paul Clifton: While outwardly, Comingle looks like a tech company that is focused on innovation in the sex-tech field, our mission is much bigger than that. In terms of product design, we focus on user experience. We designed the Mod to be an excellent vibrator in terms of form, materials, and sensations, while also supporting customization. Beyond that, we aim to spread sex-positivity and promote education in technology through our products, web-community, and workshops. Free open-source software and hardware, and a focus on community building around sex-tech is how we will achieve those goals.

You are currently operating with a team of four. Can you introduce your team to us?

Paul Clifton: Andy is a polymath adventurer exploring new ways of interacting with living creatures. At Comingle, he employs his skills in physical computing and animal interaction to develop novel means of engaging with the human animal. Craig oversees Comingle's electronics and software design. His background is in materials science and nanotechnology process development.

Melanie helps craft and document our growing list of how-to articles. She has a background in non-profit administration and sociology.

My focus at Comingle is on interaction design, combining shapes and sensors in ways that let our products respond to your body. My background is in digital media, interaction design and engineering.

What led you to found a company in the sex toy sector?

Paul Clifton: A few different factors led to our interest in creating sex toys. First, during a workshop in Panama, a participant asked Andy if he could help her make a vibrator. He said yes, and through that collaboration he learned about some of the interesting design challenges that vibrators entail. Next, during a conversation with Paul, it became clear that there was lots of unrealised potential for technology and interaction design in the sex toy industry. Andy and Paul had been studying how to design interactions for physical-digital hybrid interfaces during their Ph.D. research and sex toys seemed like an excellent field to apply their skills to. Finally, the intersection between interest in sex-positivity and technology became more and more apparent as

they talked to people about their work. Comingle found a space where it could promote technological education and give people an opportunity to learn about sexuality at the same time.

You are currently working on a vibrator called „The Mod", which will hit the markets next summer. What will make this vibrator different from the many others, currently on the market?
Paul Clifton: User-experience, in more ways than one, sets the Mod apart from all other vibrators. The design of

most vibrators focuses on shape and texture and provides a few vibration patterns and intensities. Those are important qualities for a vibrator to be satisfying, and we've definitely focused on them as well. But the user experience of Mod goes beyond that. We've designed the Mod to be very easy to interact with. It has an on/off button, so when you're finished using it, you can just turn it off, without fiddling with controls. And it has only one main control button that can switch patterns and control intensity, which means that you don't have to

Among other things, Paul's job at Comingle is to ensure a harmonious relationship between body and technology

look at the controls or feel around to find the right button to push. Beyond using the vibrator on its own, the Mod creates new experiences by being totally customizable. We provide easy-to-install apps on our website that change the patterns the Mod can run and that make it possible to control the Mod from a website, your phone, a Nunchuck controller, a heartbeat sensor or any number of other things. Because it's so easy to change the software that runs the Mod, it's easy to create new sex toy experiences. And, we've focused on making it easy for people with different levels of comfort with technology to change and create their own behaviours for the Mod, so people can really explore their different sexual moods and preferences using a single device.

Your product is composed of two separate parts: the actual vibrator, and a controller. Why have you chosen to divide up your product and not put the technic into one piece? What are the advantages of the separate controller?

Paul Clifton: The external controller has two main advantages. The first is flexibility. If we had included the technology from the controller in the vibrator, it wouldn't be possible to connect a different controller later. So if someone wanted to switch from the Nunchuck to a heartbeat sensor, he or she would have to buy another vibrator. By keeping the controller external, we make it

The Dilduino board is at the core of all Comingle products

possible for people to use the same vibrator in lots of different ways. The second is power and control. The controller that comes with the Mod has lots of sensors in it, many of which wouldn't be very useful if they were embedded in the vibrator itself. For example, the controller detects tilt and rotation, which we've set up to control which motor in the shaft is vibrating and how intense it is. So, just by moving the controller around, the vibration changes. If that was in the vibrator, you couldn't control the vibrations and move the vibrator around at the same time. There are other benefits to external controllers, like making it easier for your partner to control the vibrations while you use the Mod. So once again, our decision to use external controllers really goes back to user experience design, with an entire system of interactions and customizations as one of our primary goals. As we release more controllers, some of them will be smaller and fit seamlessly on to the base of the Mod; others will be wireless; and still others might be embedded in future versions, but the design of the controllers will always focus on how they'll actually be the most useful and fun.

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Besides the direct control on the vibrator itself or the separate controller, it will be possible to control The Mod in many different ways: via the movement in video chats, the heartbeat and touch sensing. Can you tell us how this is achieved technically?

Paul Clifton: The Mod is based on an open-source hardware platform called Arduino, which in a very general sense is a tiny, cheap computer. It's designed to make it easy to hook up sensors and outputs (buttons or controllers and vibration motors in the case of the Mod). It also is the core technology that supports a huge, worldwide community of DIY enthusiasts and electronics tinkerers, so it's a natural choice for the foundation of a customizable product. We've engineered a piece of Arduino-based hardware that we call the Dilduino that is designed to ▶
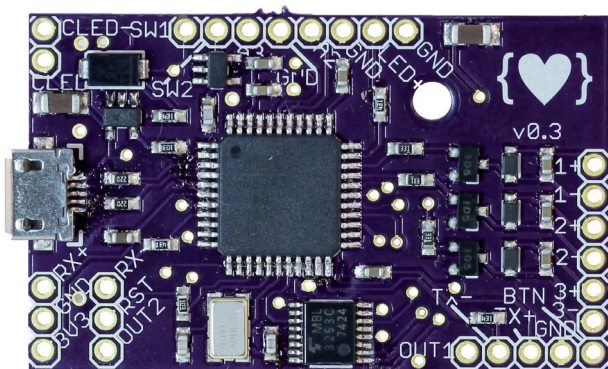
INTERVIEW

make it easy to embed in a vibrator and still connect different controllers. Basically, we put a USB port on it. A USB cable is just some wires on the inside, and the Dilduino just needs some electronic signals to respond to. So now that we have this tiny computer that we can plug anything in to, we can just write software that sends signals to the Mod over a USB cable.

The video chat example uses some software called Open-CV to look at every pixel in each frame of a video chat window and detect when they change. It then calculates how many pixels changed each frame and turns that in to a number that indicates how much movement there is in the video. It sends that number to the Mod as a voltage on the USB cable. The Mod has a program running that says if the number is high, vibrate a lot. If it's low, vibrate less.

The heartbeat demo works in a similar way. We have a sensor that sends an electric signal every time your heart beats. The Mod's software looks for that signal, and turn on a vibration motor whenever it receives it, so it beats in time with your heart.

Since the magic happens in software, we can do lots of cool stuff with these signals. These days pretty much anything (stock prices, music, your lover's footsteps, waves crashing against the beach, etc.) can be turned in to electric signals, and we can really control the Mod with any of those things. The tricky part is making the inputs and outputs make sense together in a way that is pleasing in a sexual context, and that's where Andy's and my background as interaction designers comes in very handy.

To be honest, I'm having a hard time imagining the touch sensing feature of The Mod. How does it work and how can it be used?

Paul Clifton: The touch sensing that will be available at launch turns your or your partner's body in to a controller for the Mod. It works using capacitive touch sensing, which is the same sort of tech that is in a phone's touch screen. Basically, your body completes and electric circuit, and that circuit sends a signal to the Mod, and the software on the Mod responds to that signal by turning on and off vibration motors.

We're still working out the best way to use this technology for controlling a Mod, but one specific example that we're working on is detecting stroking. The vibrations move up and down the shaft of the Mod as you stroke yourself from your leg to your breast. This really lets you use both hands and your whole body in cooperation with the Mod to have a really personal experience.

> **Because it's so easy to change the software that runs the Mod, it's easy to create new sex toy experiences."**

Software is an important point when it comes to the customization of sex toys. What do you offer in that regard and how can I use it to program my Mod? Can it also be used for other products?

Paul Clifton: The Dilduino is our hardware platform and we're calling our software library OSSex. OSSex is written in the Arduino programming language, which can be used to program any hardware based on the Arduino platform, of which there is a lot. Since our library runs on any Arduino, OSSex could be used to control anything that needs a motor control or patterning library. It will be really useful for people developing haptic feedback devices, which include video game controllers and prosthetics.

We will also use the same library to control our future products, so a pattern developed for the Mod will work just as well on our future vibrators. And since the inputs and outputs are arbitrary, we can use OSSex to control future toys that use different outputs. For example, a prototype we published last year, called the Electric Eel Digital Condom, used three e-stim pads. The Electric Eel

could run programs written for the Mod and vice versa. It would just feel very different.

OSSex's real power is that it makes it easy to create new patterns and design controller behaviors. We've written applications for our website that let you create patterns using your mouse to move sliders around, which can be used to generate OSSex based patterns that are directly uploadable to the Mod.

Will this come with a comfortable customer interface to create the patterns or will I have to write the code? Can I record patterns which I created using one of the other input methods and alter them later?

Paul Clifton: Not only will it be easy to create patterns without writing code, but if you're interested, you can use creating patterns as a tool to learn programming.

On our website, we'll provide visual interfaces for drawing patterns, creating patterns from music, controlling the Mod directly, and more. The web apps generate the code for the patterns on the server, completely in the background, and that code will just look like an icon that you install on your Mod directly from our site. These apps could be compiled to run on a phone or PC, so if people don't want to go to our site to make patterns, we'll make them available for download.

Since we want to inspire people to learn about technology as well, we're also designing apps that let you design patterns directly, like described above, but also show you visually, what's going on in the code while the pattern is running. That will make it easy for people to see what parts of the programs are actually changing, and make it less intimidating to change bits of code to feel what happens to their patterns.

By giving people direct access to the code, they'll be able to modify their patterns later, or load them back in to the tools we provide to make changes using a visual interface.

It seems that it is all about controlling and modifying the vibration patterns of the vibrator with you guys... why do you think that this is what the customer wants?

Paul Clifton: Controlling and modify patterns is what it looks like on the surface, but what we're really all about is empowering people to create their own sexual experiences, explore the possibilities of technology in (or outside of) their bedrooms, and open themselves up to sexual exploration. The Mod is the first physical embodiment of those goals. Its features, which focus on stimulation and control are our first attempt to make our vision a reality. We talk about patterns a lot, and so do other sex toy companies, but on the Mod, a pattern is something very different. Since the Mod has three motors in the shaft a pattern can be a sequence of vibrations that simulate movement or texture. A pattern can be how each motor responds to the beats of music. A pattern can do something different every time you run it depending on how it's being controlled. A pattern, then, is really more of a description of what the Mod's motors are doing in response to some input. Input and output – I/O – are the broad terms for what we're calling

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control and patterns, so for the Mod, the combination of control and patterns is what leads to the truly unique experiences that the Mod enables. First and foremost, we think customers want a high-quality vibrator that makes them feel really good. That's where we started, but we add value to that by giving our customers the ability to take (or give) control of their sexual experiences.
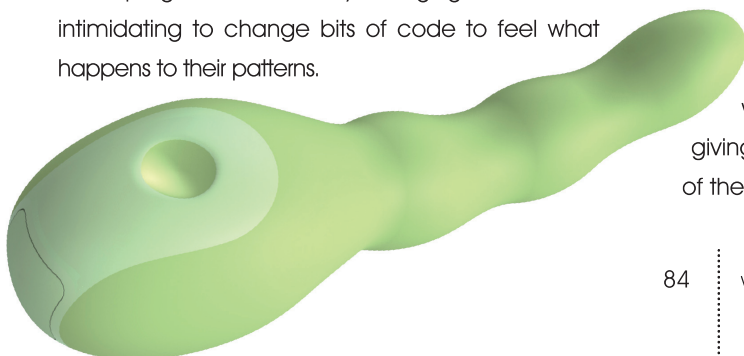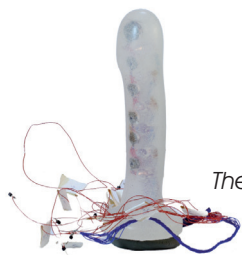
The software you are developing to control The Mod is open source. Does that mean, it can be used by other companies to control their vibrator as well? Is your software compatible with all Arduino platforms?

Paul Clifton: Definitely! Any company can use our software. It only runs on Arduino-based platforms, but our algorithms are open-source too and could be reverse engineered pretty easily. We'd love it if other companies started making Arduino-based sex toys and using our platforms and software, because anything they developed would work on our toys. And anyone who had a toy made by someone else would eventually find their way back to us and try out some of the software and hardware that we make available. An open-source ecosystem with a shared set of standards benefits everyone. That's what has driven the growth of the Internet and what will continue to drive the spread of tech throughout our day-to-day lives.

Our software should be compatible with all Arduino platforms, so it can also be used for non-sex related applications or other DIY sex-tech projects, even if people don't buy a Dilduino from us.

Can The Mod also be accessed using a smartphone?
Paul Clifton: The Mod can be controlled using a smartphone. We've published a tutorial about hooking it up to an Android tablet, but we're still designing the user interface for the smartphone app that people would actually use. We are also working on a wireless add-on for the Mod, which would make it easier to use the Mod with a smartphone.
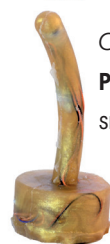
Coming back to the hardware you are using. What will your vibrator feature in that regard?
Paul Clifton: Besides the Dilduino, the Mod is powered by a USB rechargeable LiPo battery that lasts for several hours on a full charge (depending on controllers and motor power). The Mod also has three vibration motors in the shaft. The motors we use are the best option in terms of power, size, and how they work with our platform. Having three of them lets us create a range of

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sensations, from a low frequency rumble, to pulsating patterns that move up and down the shaft.

How are you planning to market your product, once it is finished? Will the vibrator and the controller be available separately?
Paul Clifton: We will sell the Mod on its own or bundled with a controller. As we release more controllers, we'll give people more bundle options. We'll also sell the components separately and as kits for people who want to make their own Mod or alter the design in some way. Additional controllers will be available for purchase on their own, so once people have Mods, all they have to buy is a new controller to have a new experience.

Will The Mod be available in Europe? Are currently looking for distributors to sell your product?
Paul Clifton: The Mod will be available worldwide, through our website. We are interested in talking to distributors as well.

Do you have any plans what will come after The Mod? Will there be different shapes, using the same technology?
Paul Clifton: The Mod is just the very first piece of a very large vision. In terms of the multi-vibrating platform, we will definitely be offering additional forms including a version with a clitoral stimulator and bigger and smaller versions. We'll also be working to improve our website by improving our pattern design apps and allowing user-generated content, with the goal of supporting a community of people interested in the intersection of sex and technology. We also intend to design a multi-vibrating sleeve and a set of e-stim toys, like the Electric Eel, based on the Dilduino platform. **e**