Introduction: Cyberspace Grows Up

> "Cyberspace. A consensual hallucination experienced daily by billions of legitimate operators, in every nation, by children being taught mathematical concepts…A graphics representation of data abstracted from the banks of every computer in the human system. Unthinkable complexity. Lines of light ranged in the nonspace of the mind, clusters and constellations of data. Like city lights, receding…"
>
> William Gibson, *Neuromancer*

When these lines first made it into print - in 1984, coincidentally - very few people had heard of the Internet. Virtual Reality didn't exist, except as a high-end pipe dream of the U.S. Defense Department. And no one thought of computer networks - when they thought of them at all - as places. But join the electric *cyber-* with the sensual *-space*, and suddenly - as if by magic - everyone saw the value of a visible network. The network as place *makes sense*, requires no training or sophisticated skills - it simply *is*. With a sudden lightning-stroke of recognition - that computers *could* be as easy to use as the real world - the face of computing changed forever.

This book is about that change, and how you can take an active part in it.

The New Worlds of the Web

The World Wide Web - that is, the galaxy of computers which share information across the global computer network known as the Internet - has come to symbolize cyberspace. But the Web itself isn't colorful or particularly engaging; most of it consists of "pages" of text information, with a few pictures thrown in to spice it up a bit. This book is about a new type of information that can be published and shared through the Web. VRML - short for the Virtual Reality Modeling Language - is the newest, and perhaps the most expressive form of communication available to anyone building the Web, and probably the most enjoyable type of content for someone who's "surfing" it. VRML has given the Web new "worlds" - depth in detail, in character, and emotional engagement. A few examples of how it's being used right now will give you a sense of the possibilities:

Watch a cartoon…

Silicon Graphics - a company which pioneered 3D computer graphics, and now leads the way in VRML - has an episodic VRML "cartoon" on its Web site. The main character - a lovable lizard named "Floops" - passes the days away in his tiny terrarium, telling stories, plotting escapes - and occasionally gets taken into school for a little show-and-tell. Every Tuesday and Thursday, a new episode of "Floops" goes up on http://vrml.sgi.com/floops, and people flock to the site for a peek at his latest 30-second adventure. It's driven traffic

to the site up about 600% - to nearly half a million hits a day! - and keeps folks coming back for more.

"Floops" looks almost real as he struts and paces through his virtual world - and there's a reason for it. Created by the animation wizards at Protozoa (who also created the sour-tongued "Dev Null" for MSNBC's *The Site*), "Floops" is a combination of computer graphics and human puppetry; a human being mimes "Floops" movements into a computer which captures the information, converts it to VRML, then binds these movements to the computer's image of "Floops", and - voila! - a synthetic actor suddenly looks charmingly human.

…visit a lost empire…

The ancient Aztec capital of Tenochtitlan has laid in ruins for a half a thousand years. Only recently rediscovered, it's been recreated on the Web, in its entirety. You can walk through the streets of a city of temples, a place where pyramids reach skyward to honor the Sun and the Moon. Click on a hand - your guide through this world - and you pass from vista to vista - finally closing in on the Temple of the Sun, where - on its summit - a human sacrifice is being performed.

Drawing on architectural blueprints of Tenochtitlan, and using a full complement of sounds and sights actually captured at the site (http://vrml.sgi.com/handbook), the model feels less like virtual reality than a history book come alive - happening all around you, with all of the bloody glory of a crumbing kingdom. It opens the door to a new kind of teaching; historians can now create simulations of the past, rather than retelling it.

…tour the wonders of the human body…

Gray's *Anatomy* has been *the* bible for generations of doctors, physiologists, physical therapists, and, of course, anatomists. Its pages detail the wonders of the body, but they lack depth; that's just not possible in print. Sam Chen - a designer working at Silicon Graphics - has created an interactive tour through the human body, *CyberAnatomy*.

When you visit this world (http://reality.sgi.com/sambo/Oobe/CyberAnatomy/intro.html), you see a golden ring on the floor, with a puddle of black-and-white-checked goo in it. But, as you progress forward into the anatomy lesson this goo morphs - just like in *Terminator 2*! - into a human form. Then, with another click, the skin on this human form becomes transparent, showing a fully realized human skeleton. You can zoom in on the spine, or the skull, or the jaw - where ever you might want to examine how the bones fit together. With another click, the skeleton fades away, showing a beating heart and breathing lungs; zoom in again and you can hear the lub-thub of the heart, and the woosh of air as it enters the lungs. Click on any organ, and links guide you to deeper levels of information. While CyberAnaomy doesn't yet approach the detail of Gray's, its the beginning of a publishing revolution in education; no longer will we need to tell the stories of how our bodies work, using VRML, we can watch a demonstration.

…and fly high above the Earth.

For forty years, we've put satellites into orbit high above us, to warn us of hurricanes, or droughts, or - in the vast majority of cases - simply to keep us informed of the cycles of rain and sun that make up the weather. While we've grown accustomed to the daily weather maps and satellite photos shown on the news or printed in the newspaper, we've never had any ability to piece that information into a greater whole - until now.

WebEarth (http://www.hyperreal.org/~mpesce/we/) uses images gathered from all of the orbiting weather satellites - not just one or two - to create a composite three-dimensional image, a "globe" of sorts, showing the Earth as if viewed from space. Because these satellite images are updated continuously, WebEarth is a *live* model of the planet - a view not very different from out the porthole of the U.S. Space Shuttle. You can watch the Amazon rain forest undergo its daily cycle of cloudburst and release - almost like a human body, breathing - or watch hurricanes tear their way across the Atlantic, or spring storms across the Northern Hemisphere. It's the Earth come alive, delivered anywhere in the world, across the Web.

Rocket Science?

Does all of this sound incredibly complicated, and impossibly hard to understand, let alone master? It isn't. The principles of computer graphics are intelligible to anyone who understands TinkerToys (we'll come to that in a few chapters), and the principles of VRML will be clear to anyone who can grasp why a light switch turns on a light. From such simple concepts, an entire universe - a virtual world - can be created. You don't need to know anything about programming - what you'll need you'll pick up along the way. You don't need to be a computer graphics wizard like the ones who created the dinosaurs for *Jurassic Park*. You don't even need to know how the Web works - we'll cover all of that, in clear, easy-to-understand terms, as we begin.

How This Book is Organized

This book is divided into three main sections, which reflect the three stages of creating a building such as a cathedral or a temple. Part One, "Foundation", covers all of the introductory information you'll need to know to understand the concepts covered in subsequent sections, such as how the Web works, how a VRML plug-in works, how to get a VRML plug-in, how to use it, etc. Part Two, "Pillars of the Temple", covers the basic features of VRML as a language, its syntax, and how to create rich worlds using it. Finally, Part Three, "Altar", launches into advanced areas of interactivity, creating small VRML "programs" using JavaScript - which is a very easy-to-learn language, and closes with information about how to prepare your VRML worlds for publishing on the Web. Each section is designed to build upon the concepts covered in the preceding one - if you're a novice, it's probably a good idea to cover them in the order they're presented.

The subtitle of this book is “Design for Cyberspace”, so prepare yourself for equal doses of technology and philosophy. Why is philosophy so important? Cyberspace presents us with a world of almost unimaginable possibility - so much so that its easy to get overwhelmed by what can be done; but what can be does isn’t always what should be done. Deciding what should be done - in other words, an appropriate course of action, has always been the role of philosophy. In a few chapters interspersed throughout the text, I’ll cover the history of communication, of virtual reality, the Web and VRML - then launch into some outstanding examples of virtual reality - some successes, some failures. From these we can get a sense of not only what has worked, but why it has. That’s very important, because you might get a “big idea” as you read this book - or you might already have one - something that you’d like to do with VRML. If you can learn anything from the stories I’ll tell, or the lessons learned from them, learn what *not* to do.

I get plenty of occasions to talk to designers about what they can do with VRML; over and again I stress that it’s up to them (and you) to develop a design sensibility - really, a style - for cyberspace. Once I even called for a “Martha Stewart of Cyberspace”, someone who would step up to the role of arbiter of style in a realm so new that just the basic design principles are still only rarely encountered. Just as a fashion designer would never design an outfit with stripes with polka-dots, a virtual worlds designer should never build a world without “floors” and “ceilings”, or cues for the user. If I can pass along some hard-won lessons, your work may be received better when you pitch it to a client, or an employer, or your child.

The “Black Book” and the “White Book”

For those of you who read my first book on VRML, *VRML: Browsing and Building Cyberspace*, you’ll find some material that’s been reused in this edition - particularly in the first few chapters. Most chapters - such as this one - are entirely new, and all of the technical chapters represent lessons learned from two years of teaching people how to work with VRML. That first book had a black cover, while this one has a white cover (or will if the publisher listens to my pleas), and the texts are meant to complement one another, both in their structure and their themes. The black book “expired” as we moved from the first generation of VRML to the second, and this book will incorporate and expand upon it.

In the Hebrew language of biblical days, the poetry of the Psalms or the Song of Solomon didn’t rhyme with similar sounds, instead, they rhymed with ideas, one stanza after another, one idea expressed in two ways. So - if you do have my first book - look at the chapters side-by-side. Some things will read the same, some will read different, but some will be reflections of the other. In that reflection, you’ll see how cyberspace has grown.

Growing Cyberspace

The Web didn’t build itself just because Tim Berners-Lee and Marc Andreesen and a few other folks thought it was a good idea. They created the Web as an ongoing project, with

an open invitation to anyone who wanted to contribute their own part to the whole. VRML is itself one of those contributions, as are the tens of millions of Web pages created by individuals, by companies, by governments - perhaps even a few created by aliens - forming a whole around the idea that sharing information makes it more valuable.

VRML didn't emerge fully-grown from anyone's head. It was born - like a child - needing lots of care, feeding, and education. But a community of individuals stepped up to the task, and now - years later - thousands of individuals share that load; in that evolution VRML has matured from a very primitive three-dimensional language of the Web into a rich, expressive and emotional medium. It turns the Web into a stage, and upon this stage the dramas of life - real and imagined - can play out. Ted Nelson - the man who coined the word "hypertext", said that, "In the future, we'll all be filmmakers." VRML is the realization of Nelson's vision, so when you read this book, put yourself in the shoes of an Orson Welles or Stanley Kubrick - or even Quentin Tarantino. Your worlds are your movies - they can be deadly serious or incredibly comic - and you're the director.

So, without further ado, "ACTION!"