

An Insider's View of the Future of Virtual Reality

by Jaron Lanier, VPL Research, and Frank Biocca, University of North Carolina, Chapel Hill

Biocca: In the early days of each new communication medium, there are corporate visionaries who play a major role in defining the cultural character of the technology. In the 1920s, for example, David Sarnoff¹ laid plans for the application of a new technology, a “radio music box.” At the birth of broadcasting, it would have been valuable to have a Sarnoff look into the future and tell us what he saw, to have him consider the psychological, social, and cultural implications of the medium he was guiding into the homes and minds of millions. More than the inventors and engineers of a medium’s technology, these corporate visionaries come to define the social character of the new media. I went out to find the David Sarnoff of virtual reality (VR) technology.

Jaron Lanier, founder and chief scientist at VPL, may be virtual reality’s David Sarnoff. VPL is a leading manufacturer of virtual reality hardware and software. Lanier coined the term, *virtual reality*, and is the key creative force behind VPL products.

I first met Jaron Lanier at SRI, the West Coast think tank. With his massive mop of reddish brown dreadlocks, shaggy beard, and wild, long print shirts, Lanier stood out among the corporate “suits,” defense industry engineers, research scientists, and programmers. In a room full of grey technicians, he seemed like a prophet from the land of Nintendo, a logical leader to guide the video generation into new virtual worlds. The crowd in trench coats

¹ Sarnoff was a pioneer in the development of radio and television. He began his career as a telegraph and radio operator for the Marconi Wireless Telegraph Company. Later, he became the radio operator for the largest early radio station in New York. In 1916, he proposed the concept of a “radio music box,” the basic idea behind the passive radio receivers in use today. In 1926, he formed NBC, and in 1928 he created an experimental television station. He demonstrated the new medium of television at the New York World’s Fair in 1939. He was chairman of the board of RCA until his retirement in 1970.

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from the world of *The New York Times* and *The Wall Street Journal* see him as an alien sent from some distant future. In press reports, he has come to embody the medium itself. "Don't be misled by appearances," a friend and VR journalist had advised. "Below those dreadlocks is the mind of a sharp entrepreneur."

I had heard the Lanier story. The son of a science fiction writer and an artist who escaped Nazi Germany, Jaron's early world was a geodesic dome on the edge of a New Mexico desert. Bored with high school, he left to pursue all kinds of music, especially the music of foreign cultures. Today, the triangular panes of the geodesic dome have given way to walls on which hang the more than 300 musical instruments that share his home in Sausalito, California. The high school dropout dropped into college to tinker with mathematics and computer science. Even in the electric creativity of Silicon Valley, he developed a reputation as a creative programmer—a quintessential nonconformist in a nonconformist subculture.

While at SRI, I decided to watch Lanier demonstrate the VPL system. I knew it was not going to be a dry, technical intro, but a classic Lanier show, more in tune with Ken Kesey's *Merry Pranksters* than a corporate demo.

Lanier promised he would build a world from scratch, based on suggestions shouted from an audience of razor-sharp scientists and engineers. At his side was his systems programmer, Charles Blanchard, a dark, brooding character. Blanchard looked like an amiable pirate sailing the real world in his wheelchair, but ready to set sail in a virtual world on ships of laser light. Bouncing around excitedly, like a child ready to play a game, Lanier was eager to show us how easily our imaginations could create a virtual world.

I had never seen so many smiling faces at a session in a scientific conference. Someone shouted for a desert. A desert appeared, and a few three-dimensional mountains were added at the back. Next, we had to decide on the color of the sky. Orange, purple, and red were suggested. But, in his only compromise with conventionality, Lanier settled for the traditional blue. "It creates a sense of space," he assured us.

I looked around at the audience for Lanier's tour de force and saw a crowd of neon pioneers ready to suit up for a trip into a computer graphic world. It was as if we were entering some brightly lit mind shaft deep below Silicon Valley. The VR pioneers knew they were entering a rough-hewn world, only a crude prototype of many worlds to come. But the implications of this collective creation were not lost on anyone in the room. The computer scientists were boisterously calling out and voting on their phantasms. In the corner, some military men seemed less inclined to even whisper their secret vision. Looking at my military neighbors, it was clear that we might not all be building the same virtual world. But at the back of the room there was a rabble, like those that must have been below the Bastille of the French Revolution, shouting their vision of worlds to come. There on top of the Bastille was Lanier, inciting the crowd—a combination of Marat, Robespierre, and high school cheerleader.

After putting a camel into the desert, Lanier was clearly tiring of conven-

tional suggestions. A pizza, a flying pizza, was needed in this desert world. The audience decided on a topping. A flight path was created for it, and—voilà!—the pizza flew, inside the camel and out into the sky.

David Levitt, an engineer from VPL, was to put on the head-mounted display and enter this world. The rest of us watched from the “outside” on a large, video projection screen. Looking very much like a hip sultan, Levitt was to ride the camel and fly on a pizza-shaped, magic carpet. Entering the world, he immediately got lost inside the camel’s stomach—a hollow green space—until his head poked out the side of the camel’s body. With a few keystrokes, Lanier placed Levitt on the flying pizza. The virtual world spun by as Levitt found himself on a pizza-driven roller coaster ride. Looking at the large screen, the audience was starting to get dizzy. Levitt was starting to turn green.

If you think his demo was not serious or scientific enough, Lanier will tell you that you don’t understand this medium. Lanier is no fool. Like another VR pioneer, Myron Krueger, Lanier understands the medium’s creative possibilities, the sense of exploration that is an important feature of virtual reality, and the potential scope of its entertainments. Like Sarnoff before him, he may understand the cultural difference between a radio music box and a bunch of vacuum tubes wrapped in wire. Lanier wants to build a home “reality engine.”

I was thinking about his playful SRI demo as I waited in the VPL conference room. It was bare and ascetic, as if it was to be filled with virtual—instead of real—furniture. During the interview we wore no head-mounted displays, donned no data gloves. Lanier was reflective. He wanted to be transported into a different virtual world, the world of ideas. Predicting the future of a communication medium has always been a hazardous exercise (Carey & Quirk, 1988; Czitrom, 1982; Marvin, 1988). What follows may surprise you, delight you, or appall you—but Lanier clearly wants to challenge you. It may reveal as much about the present, or Lanier himself, as it does about the future of virtual reality. But remember that Lanier’s inside look at the future may not only be his—it may become ours, too.

The Diffusion of Virtual Reality Technology

Biocca: Let me start off with a fundamental question. I’m going to talk about some of the long-term ramifications of the diffusion of virtual reality. One question immediately comes to mind. A number of people ask me, “When are the systems going to come on line? Which sectors of society will probably use VR systems first?”

As you know, there appear to be two camps on this issue. One is sort of bullish. They argue that the systems will be diffused widely in a very short period of time. In fact, your company has been successfully diffusing some of the early systems. Then there’s a bearish group who says, “Well, you know, we have a lot of bugs to work out. It’ll take a while before we have

a number of systems floating around.” They claim we will have only a few high-end systems in the short run.

At what point might we see the diffusion of what you call the reality engine, a personal, home-based virtual reality system, an appliance like TV? Could you talk a bit about how you think that technology will be diffused? . . .

Lanier: Sure. The future is always more complex than the present because we have to deal with multiple possible ends, each of which has all of the vagaries of the present. So, it’s never an easy type of question to answer. Let me start off with my working assumptions, but then I’m going to qualify them. Approximately 2 years from now,² there will be head-mounted home entertainment systems that I, personally, would choose not to categorize as virtual reality systems, but will be called virtual reality systems. Some of which might come from VPL.

Biocca: Low-end systems?

Lanier: Well, that means that they’ll be really low-end. They’ll essentially be using the head-mounted technique as a gimmick in the Nintendo-type game systems. Then, in approximately the same amount of time, high-quality virtual reality entertainment experiences will become available. I’m thinking in particular of a project [“Voomies,” see below] that VPL has with MCA,³ but there might very well be some others as well.

In 1992 there will be a much larger diffusion of systems whose cost is in the low \$10,000s. VPL is issuing a product line called Microcosm—platforms that we think are gonna get around quite a bit. We’ll have virtual reality for the Macintosh, for instance, that I think will bring virtual realities into the Macintosh community. Also, there probably will be arcade machines with head-mounted displays around in the U.S. from a number of sources. I think they’ll have moderate success, but not tremendous success. . . .

Within about 5 years medical applications will begin to be introduced, which I think will eventually be one of the largest market segments for virtual reality. That will be [the use of] virtual reality as an advanced interface for medical imaging and medical/surgical instruments.

By approximately the turn of the century, my working assumption is that there will be what I consider to be a high enough quality machine to deserve to be called the virtual reality machine available for home use. Quite possibly, it will still be at the high end of the price range for what one would consider a home product—let’s say, in the area of \$10,000 in 1992 dollars.

² September 1991.

³ MCA corporation is a major entertainment conglomerate with over \$3 billion in sales. Based in Hollywood, MCA has significant interests in home entertainment, videotape production, and compact disks. It is also the owner of Universal Television and has interests in film and television production.

Here I have to become a little vaguer. The children who were born in the '90s will grow up into a world at some point in their lives in which virtual reality will be cheaply available as a telephone-like utility. I think this is its ultimate destination. Their children will grow up into a world in which there is across-the-board use for such a utility, in which very interesting forms of communication practice begin to be explored. I think this would be a lot of fun to develop.

All of what I've been saying constitutes my working assumption about the near future. There're a lot of reasons why it could turn out to be very different. One of those reasons is obviously that the American economy is not only in bad shape, but is in debt for an amount that'll take several generations to pay. Very clearly, if we're talking about America, there are huge variables that affect the culture as a whole, and those, of course, are much larger than anything we can influence with virtual reality technology. . . . Because of the interdependence, that also casts a doubt on exactly where the Japanese economy is going and the European economy. So that's one area of doubt.

In terms of the doubts about diffusion that would be the result of the variations in the rate of technological development, I actually have more confidence in being able to predict that than economic and social factors. I believe that the hardware side of the virtual reality business is improving steadily, and in, say, 10 years from now, we'll have better quality displays, tracking systems, sensors, graphics computers. So I think we'll see steady improvement in all those areas.

I think that the bottleneck will turn out to be software. The bottleneck will be around, first of all, managing the data that defines virtual worlds well enough that it can be used, particularly providing people with tools that let them design and manipulate those worlds quickly enough to make them really useful. So, it's really the software problem or the data-base management problem that is going to be the long-term bottleneck.

Now, of course, it's also true that for hundreds of years people will still be complaining about how graphics computers aren't fast enough to make the world a sufficient quality for them, and that's a constant factor and that will never go away. There's my prediction and its complications.

Collecting Objects and Environments

Biocca: Let's go back to the software problem that you mentioned. One of the problems that you saw as a barrier to diffusion of virtual reality is software development. Warren Robinette⁴ has mentioned the emergence of a need to store and market objects, forms, and worlds . . .

⁴ Warren Robinette is a well-respected programmer and virtual reality designer who has worked at Atari and the National Aeronautics and Space Administration (NASA), and who is presently based at the University of North Carolina, Chapel Hill.

Lanier: Absolutely.

Biocca: This is an issue that also came up in the past with the introduction of photography. In this case, there was talk of a museum of forms⁵—something that Oliver Wendell Holmes suggested—and an international museum that would contain all the world's photographs. In the case of virtual reality, do you see, potentially, some sort of a large data base of objects, forms, and shapes?

Lanier: Yes. We're actually starting a separate division just to do that, to sell people things they need—robots, simulations. We're typically dealing with industrial objects now. Ours will be called virtual estates. [laughter]

Biocca: How will people travel through these data bases and find information? These things can't be just indexed simply by words?

Lanier: Yes. There's a simple problem with the current machines in that they can only show a limited amount of scene complexity at a given moment. So, you can't really simulate a hall with a million things in it off into the distance. You can only see a certain amount of complexity at once. It's much more likely that there's going to be a platform from which you sort of dial through many things that pop into existence on it.

Biocca: There'll be royalty rights protecting the use of the objects?

Lanier: That's right. There's actually already one group that has licensed models to VPL.

Virtual Reality: The Ultimate Medium?

Biocca: Let me ask a more general question. Virtual reality appears to come closest to realizing some long-term goals in the development of communication technology. I have in mind the age-old goal that appears to be motivated by the alternative reality system people enter every night when we go to sleep.

For example, Alberti, the 15th-century painter, dreamed of a painting that would disappear and become a window onto the world depicted when looked at from a very specific position in space. When photography was introduced, people saw it as nature painting with light, and in some way forming an alternative reality. Later on, of course, with the experience of film, we had the experience that film was like looking at a world through someone else's eyes—as a camera moves around and takes the points of view of various people in the space that's represented.

But virtual reality, more than any of these technologies, appears to come closest to realizing the desire for a dream machine—if we assume that the dream constitutes the model. Do you feel the technology realizes the pur-

⁵ See Biocca (1987).

suit of a dream engine in its present form or in later forms so that it may be—if you like—the ultimate communication technology?

Lanier: Well, it's striking to me that if you read the rhetoric associated with each introduction of other media technologies in the past, it seems as though virtual reality was the thing being described. I haven't read as much research in this area as I'd like to, but there's a striking similarity in the rhetoric associated with early photography, cinema, and with earlier audio recordings, and with early telephone technology. There's a sort of—let's say—technology as a route to community, an experience of infinity, as a route to a sort of social communion, and an ability to be free of physical constraints on the sources of experience. I think the direction of being interested in those things is universally human—a natural result of the human condition and the limitations of the body, and the frustrations associated with that.

But I think the idea that technology would be a route to cope with that condition is uniquely Western and goes back a long way. I think some of the early rhetoric associated with written text itself, in fact, has some similar qualities.

So, now the question is whether virtual reality comes the closest to realizing this. I think in a sense it can, but only if there's a culture of use that grows up along with it. It's very important to understand that the technology by itself doesn't necessarily have any cultural or spiritual quality. It has cultural or spiritual potential, but that can only be realized by cultural development that springs up alongside it.

So, that's a lot of why I try to be as vocal about these ideas as I can, because I consider these early years crucial. I'm hoping that it's possible to actually influence the culture in the future by just raising issues now. I'm sure that whatever develops will be completely different than anything I would expect or predict, but nonetheless, I'm hoping that it'll at least be opened up by asking the most provocative questions. So, if virtual reality is used in a way where people using it improvise the content of worlds together, collaboratively, then virtual reality would seem to come closest to providing the kind of shared dream space that makes the technology more coherent with all the marketers have promised Westerners.

If, on the other hand, virtual reality is used in a mode more like video games, then it clearly would not be doing that. Some media technologies seem to have reached their potential—more or less—and some of them haven't. So, for instance, I think television has largely been stifled by the commercial situation. . . . I think it's perhaps an inevitable consequence of television studios being so rare and expensive and being, essentially, avenues of trading power. So, it's, essentially, been too politicized.

If you compare TV and cinema, you see two media that are very, very different culturally, but have roughly interchangeable content. A movie show can be shown in a movie theater or on TV, and vice versa, and, yet, they are completely different cultural experiences. Even bad movies are really

something very different from bad television. So, you can't pin it all on the technology itself.

What Will Communication Be Within Virtual Reality?

Biocca: In your descriptions of virtual reality systems, one of the oppositions that I think is interesting is one between the cultural models of the telephone and television. The telephone, a nice interpersonal medium, has allowed individuals to collapse distances. Now we can participate and communicate in groups on the telephone.

And then there's the opposite end of the extreme, a medium which is more along the lines of television—on one end an interpersonal medium and on the other, a mass medium. In fact, you have characterized the synthesis of both: "VR is conceived of as an expansion of reality, the provision of alternate realities for people en masse in which to share experiences."

Lanier: Well, I think actually the best precedent for virtual reality would be the commons, the English commons, where there's a shared community space. What we've seen in the United States is a gradual shifting away from there being a commons. California is the worst example of this. Individuals don't even meet on sidewalks anymore. We live in our cars. One of my little ways to exaggerate the situation is to state that we live in this constant sort of fetal position where we are seated in a soft chair looking at the world through a glass square, be it the windshield of the car or the screen of a television or computer. It's sort of a constant, and we're in a little bubble.

It's very, very reminiscent of E. M. Forster's *The Machine Stops*, which is probably one of the best examples of predicting outcomes of technology that has ever been written. . . . It's the best prediction of future technology. It predicts roughly the state we're in now, and it was written in the '30s.

So, I think of virtual reality as being a combination of the telephone and the commons. The telephone is a very successful technology for a number of reasons. One is that the people who sell telephones don't make money off of the contents, so, therefore, the content is left unfettered. It's not left private, as we know. The intelligence establishment manages to scan all international phone calls in the United States, which is an astonishing achievement. Nonetheless, the content is not regulated. Therefore, it has that quality of uncharted mystery which is necessary for culture. The culture that can define its own boundaries is dead, and it's very important to have that quality of really having so much going on that you don't know what is there. So, we don't really know what's going on in the telephone, and that makes it a living thing.

It's also a genuine communication tool. What I mean by that is there's a lot of pseudo-communication in the world today. Pseudo-communication is an illusion of contact with another person that is not authentic contact. To

define what is authentic contact is a very difficult project, and I haven't succeeded in that. I think ultimately it leads into mystical territory, and that's why it's so difficult.

Voomies

Biocca: . . . What will the MCA application be? This will be one of the very first entertainment applications, and may act as a model. I heard you describe it only briefly at the SRI conference. Can you describe it some more, as this is very much a communication application in the classic sense? How will that particular application develop?

Lanier: Well, I'm a little bit constrained in details because I have to maintain the confidentiality of the project. . . . One of the reasons why I'm really pushing on the joint project with MCA for virtual reality theaters now is to try to get them started on a track that will support the development of an interesting regenerative culture, and just set the precedent correctly. The same reason holds for why I'm working with communication companies now. . . .

Let me go over the key points though. The first point is that it is not a "theme site" like a theme park. It's a theater that plays different shows at different times like the movie theater. In fact, what we call the shows are "voomies," virtual movies. There'll be different voomies at different times, just like movies in movie theaters.

Another element that's key is that there are live performers, so it's not a canned entertainment. That's a critical point. One of the real problems in the development of interactive entertainment is that it's necessary for an entertainment experience to end at a certain time, if the facility is going to make money. The traditional way that that's been accomplished is with a paranoid killer theme—something that just kills you in time to have the theater make money. I think that's unattractive and dull.

I think the alternative to having a killer strategy to end an interactive experience is to have a live performer who's part of it. We have performers who are called *changelings*. A changeling is sort of like the combination of an actor and a mime artist and a stand-up comedian and a number of other folks rolled up into one. There was a profession called a *tumbler* in the borscht belt, one who was a plant in the audience creating an atmosphere, who kept things moving. So they are a little bit like a shill. Obviously, from a commercial point of view, one of their key goals is to get the experience to move along and end at a certain time, whenever that might be happening.

The comparison to the stand-up comedian illuminates another part of their job as a changeling. A stand-up comedian has to deal with an audience that might be hostile or might be dull, might be a whole bunch of things. In the same way, this performer has to be ready to deal with all

those possibilities spontaneously and creatively. Obviously, a changeling will change into a lot of different creatures in the course of a voomie. They might look like a squid one moment and a giant Harley Davidson the next—whatever, that's them.

So having a live performer allows us to improve the entertainment value and have true interactivity, and having an unthemed facility creates the option for independent producers and a whole bunch of sources of voomies in the future. So, it creates an open medium. That's the ultimate goal of the project from a cultural point of view. Obviously, from a commercial point of view, the goal is to make money.

Biocca: Well, actually, the voomies suggest the use of the technology as an elaborate ritual space. I don't know if you're familiar with the anthropological discussion of how individuals create these various ritual spaces in other cultures by literally dressing up differently, going to a special place, maybe even stimulating the senses by changing the smell—for example, incense—or changing the light or doing it at night. They do this to create a space that is separate from the mundane world, not a secular space, but a sort of sacred space where they can experience some alternative reality. In many cases, it's been religious but it is not necessarily so.

By actually creating this commercial product, it almost seems to play into that particular aspect of the technology, a possibility where, basically, every individual can create voomies and create their own communities within virtual reality. Do you see that possibility of creating some sort of ritualistic spaces that might be commercial, may be social, may be political, or may take a variety of cultural forms?

Lanier: Yeah, and I think that might be sports-like, too. Some voomies will actually be experiences where people can come in and play dimensional versions of baseball. Our culture is more ritualistic than we let on. You know . . . clearly the Senate hearings for Clarence Thomas, the football game, the meeting with venture capitalists, are all common local ritual experiences.

Virtual Reality and Post-Symbolic Communication

Biocca: One of the points that you made that I thought was very interesting is this complaint that generally the codes of interpersonal communication are very limited. One is limited to the codes that you can use to communicate and transfer information from one person to another—language, gestures, and so on. In virtual reality all those codes are retained, but there is the potential for adding quite a few codes for signaling mood and meaning. In virtual reality many things are potentially changing at a very, very rapid rate. All kinds of codes can be devised. Can you talk a bit about that, and how you see that in terms of how you might describe this possibility within

virtual reality? This is something that might be very interesting in terms of expanding interpersonal communication.

Lanier: Yes. Absolutely. To me, it's the way you describe both what you can do on a telephone and what you might do with VR. . . .

Let me respond to your question a little bit by expanding. First of all, the way we talk on the telephone is not limited, particularly, because we're using the mode of spoken language, which is an extraordinary living construction. It is not just a technological project but a biological, evolutionary one. The species has been—I don't know exactly what the verb is—we've sort of co-sprung up with it. It's a part of our brains. It's physiologically part of us, and something that is profoundly deep and mysterious. And, the fact that it works makes a mockery of all philosophical systems that have been proposed thus far. It's just a wonderful thing.

Of course, you can talk to other people in virtual reality, and that's great. You can also turn into an octopus or whatever, and that's wonderful as a signing mechanism. But what's interesting to me is there's something even beyond the ability to have a flexibility of creating codes, as you said. There's also the ability of communicating without codes. This is a subtle distinction, but one that is very, very profound.

In the physical world, the most fundamental fact of life is that we're very limited in our power, so that we have to accept the content of the physical world as a given, and we can only change it in very limited ways and very slowly. There are very minute parts of it that we can change as fast as we think, in order to communicate with others. The tongue is a good example of that; and the hands, to a certain extent; and occasionally some machines. If we would like to erect a building, there's a change in the physical world that takes a little bit of time. There are many changes in the physical world, such as making a 500-foot-long turtle to race around, that are simply impossible, beyond the means of our genetic engineering. So, we have to accept these fundamental limitations in the physical world and the incredible slowness and limited access to those changes that we can effect.

That is why symbols and signs and codes exist. They are ways of communicating despite our powerlessness. They let us refer to contingencies by a code that we can't actually realize in the physical world.

Now, virtual reality—although it's a low-quality reality—is the only other one that's truly objective. It's the only one that's really pliant. Given the pliancy, it becomes possible to imagine a future culture of use in which people would improvise realities together as a means of communicating.

What I'm talking about is not psychically controlling virtual reality systems, I'm talking about people using their hands and their mouths, whatever, to create virtual tools to change the content of a virtual world very quickly and in an improvisational way. The example I sometimes use is having musical-instrument-like things you play that create whatever it might be. Although exactly what the tools would be like we don't know yet, because that's in the future. But we can see that they are possible. In a situ-

ation like that, it's possible to do something that goes beyond sharing codes with people, because you can just make the stuff directly with them. The codes would otherwise be used to refer to these things. So, if you make a house in virtual reality, and there's another person there in the virtual space with you, you have not created a symbol for a house or a code for a house. You've actually made a house. It's that direct creation of reality; that's what I call post-symbolic communication. That's just a huge uncharted territory. It's very difficult to predict very much about it. I just advocate exploring it, because I think mankind needs adventures. This would be a big one. I think this would take a long time to figure out.

Biocca: In fact, you mentioned somewhere, I think I have a quote here: "Style will be accentuated since form will be so cheap; since form will be so nonprecious, personality will be quite accentuated." This goes back to the exploration of identity. This means you are trying to create a kind of multi-dimensional personality. Is that one of the essential aspects of virtual reality?

Lanier: That point that you just brought up about personality being accentuated, or you might say style being accentuated, the quality of things . . . I usually end up bringing that up in response to people who say, "Oh, you're assuming that mankind is creative. Actually, we're all really dull and we won't do any of this cool stuff. We'll just watch it like it was television." This is one of the things I usually use as part of a counterargument.

Somebody decides to become a lobster when they're angry. One of the striking things about that is that they'll become very bored with that very quickly because it will be so much easier to be so many other things when one is angry. Provided the culture and the tools are there. I'm talking a couple of generations hence. Given that case, it's very unlikely somebody will just choose the same lobster each time. Just like all of us vary our speech patterns, but we each have a definite personality.

When that quality is expanded to the whole of physical sensory experience within a shared virtual world, I think what you see is a very interesting quality. Forms lose their value, they lose their preciousness, because they are the more fluid thing, but they'll be this kind of amplification of style and personality.

Virtual Reality and the Expansion of Perception

Biocca: One of the things that I think separates VPL demos from others is an attempt to play with the concept of personal identity. As you mentioned, this includes transforming [people] into lobsters and a variety of other things. Within this playfulness lies a very interesting concept in which the use of this technology is explored. Not only can VR be used to experience another identity—real or fantasized individuals—but it offers the potential experience of other shapes, forms, and objects, other modes of the self. You

appear to see this as being a major aspect of this technology, of how people use virtual reality to explore both interpersonal communication and the environment of virtual worlds.

Lanier: Absolutely. I think one of the striking things about a virtual world system in which you have the pliancy, the ability to change the content of the world easily, is that the distinction between your own body and the rest of the world is slippery. Essentially, from a virtual reality perspective, the definition of the body is that part which you can move as fast as you think. In a virtual world, of course, you could curl your physical thumb—which you are no longer directly aware of because your feedback comes from virtual objects—and you might actually be opening doors in the distance or exploding volcanoes on the horizon, or whatever it might be. At that point, it becomes difficult to really define what the boundary of the body is, and indeed, I think there will be a lot of games that have to do with merging bodies and that sort of thing. You might have sensory feedback from the world that is a merger of the input from multiple people.

There's another thing that I have to say which has to do with the current style of thinking about virtual reality. There's a tendency, when people speculate on what it might be like to use virtual reality, to not really acknowledge how really fluid the situation will be. So, somebody might say, "Well, if you're angry, you could become a red lobster for awhile," or something. In fact, that's not, in my view, a very likely scenario, because it would only happen once. The whole idea contained within the prediction that you become a lobster to express anger, that's really kind of a symbolic aesthetic. You'd be looking at the sign.

Actually—following along the lines of the lobster—in virtual reality the types of things that will be played with are the intimate details of what the feedback is like. How are you connected to the world? What if your eyes were on your fingers? What if you were crawling around inside the mouth of another person? What if you took all the measurements and the movements of your physical body and somehow put them through a mathematical function that allowed you to learn to control six arms at once with practice? These sorts of things that play games with the feedback loop . . . will be the real cutting edge of exploration of virtual reality as opposed to any particular symbolic content. The designs will become very fluid and the real action will be in playing with the feedback loops.

Biocca: So, you can almost picture a situation where people learn a variety of new cognitive skills, where you're changing the mapping of the senses in terms of the way you act, and the inferences you derive from what you're getting back from the environment. Do you see that changing people in any way in terms of their perception when they step out?

Lanier: I hope so. Because I think that virtual reality provides an opportunity to sensitize people to the subtlety of the physical world.

An experience that people often have when they come out of a high-

quality virtual reality system is experiencing the physical world as being hyperreal. The first time I came out, I noticed the individual rainbows in the weave of the carpet on the floor. You notice that sort of thing because you sort of adapt to a lower level of detail when you're inside a synthetic world. In fact, perhaps the other media have done that as well. I think that we see more of the world because photography has been around and movies have been around. I don't mean that movies have shown us distant places, which is also true, but also they've just taught us to see in a lot of ways. I'm sure they've taught us not to see in a lot of ways, too.

Biocca: For example, the slowing down of time or speeding it up as in slow motion and time-lapse photography. To experience things that are not possible by observing them. . . .

Lanier: Yeah. I think virtual reality does have a remarkable quality in that it gives people an experience that is rather angel-like, floating as the consciousness point in this variable world. I think that—if nothing else—at least it demonstrates the existence of consciousness, which is not necessarily apparent in everyday experience. I should maybe go into that a little bit more. . . .

In the everyday world, the physical world, specifically, as you go about your business, there's a very fuzzy boundary between you and the world, a boundary that can never be clearly defined. There's no definite wall between the objective and the subjective. But in the virtual world, the objective world is defined in a computer program. The objective world is completely defined. You know exactly what it is, so therefore, the subjective world is whatever else there is. Suddenly, there's a clear boundary for the first time.

Biocca: So you have two things that appear to be interacting in your discussion. On the one hand, there's a sort of a breakdown within the boundary of the subjective and objective perception, of the world's mental models and the physical models, and other related distinctions. On the other hand, there's sort of this growth—and you mentioned this in the past—this growth in one's ability for empathy. But here, as I listen to you now, I realize I was thinking more in terms of empathy in terms of modeling other people's subjective processes. You are also talking about empathizing with the physical world, of getting a sense of moving beyond empathizing just with other individuals. . . .

Children and the Use of Virtual Reality Technology

Lanier: There have been a lot of media technologies recently that are just slightly interactive, like the Nintendo machines at home. And in my view, just a slight bit of interactivity might be worse than no interactivity at all. For one thing, it forces the user into the psychology of a rat being trained to operate a maze. Also, there's a problem that it's sort of an enforced form

of compulsive behavior. There's no doubt that all of us—and let's say adolescent boys in particular—go through a period where they are interested in killing things and aggression. But I think the point is if they do it in a playground, it's part of a fluid process which continues to grow and change. But if they get caught up in a little interactive loop, in some sort of a simulation entertainment product, then they get stuck in it and relive the same loop again and again and again. And I think that's a dangerous quality of slightly interactive systems. . . .

I think another serious question, which does deserve very careful consideration in the future, is at what age children should start using simulators. My own feeling about it is that it's important for children to fully establish their motor reflexes and hand-eye skills, and a variety of other cognitive skills with the physical world, before they start using a simulator. So, what I would advocate is that in the future there should be a certain age—I don't know when it is, maybe it's 8, maybe it's 10—but there's a certain age up to which kids shouldn't use simulators. And for that matter, I prefer not to see them using Nintendo machines. In fact, I might even feel worse about Nintendo machines than I would about virtual reality machines of the future. You need to get a good grounding in the physical world.

That's probably gonna be a controversial idea, but I think that's a good idea. And it could be framed positively. There could be a nice sort of ritual for kids when they get old enough to use simulators. They could be introduced to the mysteries of the simulation world, and that could be a lot of fun. So it doesn't have to be framed as a prohibition at all. It could be actually a very nice thing, but I think something like that should be done in the future.

Redeeming Experience

Biocca: Elsewhere, I think you've said the following: "Information is an alienated experience." You criticize or put in opposition the concepts of information and experience. You've said that we have seen a "horrible substitution of information for human experience." In fact, you have claimed that "information in itself is a dreadful concept." Could you expand on that?

Lanier: I think a problem is what I find to be *information disease*. It's essentially a radical form of nonspiritualism in which people think of themselves as information entities that aren't real experiencers, and they gradually lose a sense of validity for everyday experiences. What's happened is that technology has been so overwhelmingly successful that it serves for many people as the most creative metaphor for what they are. And so, as soon as a person starts to think of himself or herself as being like technology, they lose the internal perspective, and tend to substitute an external perspective. With that goes the essentiality of life.

I do think that information and experience are opposed concepts. . . .

Information is a relatively new concept. It was a concept created in the World War II era by a small circle of scientists. One way to understand information is to look at the biographies of those who invented the idea, and I'm thinking particularly of Alan Turing.

When I was studying computer science, I took a class on artificial intelligence, as everybody else did. Without blushing they would give us this paper called the Turing Test, which is the classic paper which defines the idea of artificial intelligence. The Turing Test ends with a man in a sound-proof booth and a computer in another booth, both typing at you over a terminal trying to fool you. The moral being that if you can't tell, then there's no valid reason to assume there's a difference. That's all well and good, I suppose.

What's interesting is there's an earlier part of the paper in which one of the booths has a man and another has a woman, and they are both typing, trying to fool you. What they didn't tell us at the time was that this paper was written by Turing shortly before his suicide. The reason he committed suicide was that he was being sexually tortured by the British government. He was a national hero for saving England during the war, but he was found to be homosexual. The story is long and sordid, but essentially, there was a quack treatment for homosexuality at the time, and he was injected with large doses of estrogen and started to develop breasts and became very depressed and committed suicide. So that's the origin of this glorious idea. It's very clearly a retreat from mortality and a retreat from the body. It's a retreat into abstraction.

This quality of nerdiness . . . you see this in the Silicon Valley a lot where there's lots and lots of men, and there's this kind of asexuality which is really unique. I mean this is not easy to find in the world. This is a new phenomenon and it's rare, and I think it's this strategy of retreating into a kind of abstraction, a very clean world. Technological things, like this thing I'm holding [a video remote control]. They have clean lines, and they are black and shiny. They are as unbiological as possible. They are not wet, they are not sensual—it's cool, it's the aesthetic of the cool carried to a bizarre degree. At any rate, this is different than McLuhan's cool.

So, to get back to this, virtual reality seems to push communication technology so far that maybe it sort of turns the cycle on this whole question. Because virtual reality forces you to notice that you are experiencing things. . . .

Biocca: Is this antiseptic nature, that you described when referring to Silicon Valley, partially a result of the fact that we live in a visual culture, a culture where one's experience is seen as bits of information? There isn't this engagement in a physical and tactile way with the environment we're in. Isn't this one of the reasons why virtual reality might play a part in making a transformation? It stimulates the tactile senses. You directly move and touch objects.

Lanier: I think that's a factor, too. I think that's true. There's a physicality to

virtual reality which I think is very refreshing, since the use of computers is so highly abstract. But, I still think that the main thing that's different is a change in self-image. When you use a computer, you tend to start to think of yourself as being like a computer. . . .

With a virtual reality system, you don't see the computer any more—it's gone. All that's there is you. So, it's teaching you to be you. That's a different message.

Utopian Visions of Virtual Reality

Lanier: At this point, I'd like to interject a note of caution. I've been very disturbed recently by a kind of mindless adulation of virtual reality in some quarters. There's a Western myth that technology will save us. And there's a myth that whether it be a psychedelic drug, or an atomic bomb, or a steam engine, or really whatever the thing is—suddenly this is going to transform mankind. Even Einstein thought that the atomic bomb would make us more moral, force us to get our affairs in order, and there might be a little bit of truth in that.

It's very important to qualify these things. I don't want to play into that tendency. Technology doesn't do anything. Technology will not do anything for anybody. I guess the correlate of that is the statement that any value that technology has is purely cultural. It is only good for our culture at this time, if at all. For another culture in another time, that technology might be irrelevant. Any value has to be judged relative to where the culture is. Since I think the culture is in a dangerous television stupor, I think something of this kind could be of great value.

Biocca: I think it's good that you mentioned that, because with the introduction of each technology—radio, film, and so on—there is a utopian element that surrounds the technology.

Lanier: Yes.

Biocca: For example, because radio collapsed space with technology, some assumed that boundaries between nations would disappear.⁶ This, of course, did not occur. It seems to be part of the struggle at the very beginning of the introduction of a major technology, a struggle in terms of defining what its social reality will be, and how it will be used. Utopian camps argue for one potential application or another. . . .

Lanier: Well, you know, the thing is, though, the degree to which the utopian camp is persuasive does have an effect on technology's use in the future. So, it's important to be utopian, but you have to understand that the only excuse for utopianism is pragmatics. [laughter] For instance, it's true that telephones have helped out a little bit. They've helped open up the

⁶ See Biocca (1988).

Soviet Union a little bit, they helped keep China from being worse than it might have been recently. You know, it helps a bit. But it's not salvation.

And I think there's a very reasonable argument. Television is a case in point. There was not an adequate utopian community around the rise of television. I think it suffered greatly as a result.

Biocca: I think it was primarily perceived as just radio with pictures, and that may have limited its scope.

Lanier: I think it was perceived as even less than radio with pictures. I think that television was developed purely in a corporate environment. Maybe it was just bad luck that television arose in the decade after World War II when there was very little doubt that it was important to have centralized state control over communication because of events that had previously transpired. There were a few wonderful early visionaries in television, like Ernie Kovacs. There are some others, but in general what happened was it was created as a sort of sanitized, official, centrally originated world-view. It just never had a chance, and it's really too bad. I think television could have turned out much, much better.

Virtual Communities and Social Experiments

Biocca: With the introduction of other technologies like radio and even electricity, an assumption grew among a number of groups who suggested we would have a variety of decentralized communities—a sort of decentralization of influence. By suggesting that television in its present form suffered because of centralized development, the suggestion is that other possibilities were present.

The suggestion is that with virtual reality, it's possible to have a somewhat decentralized development. It is a hacker's product to some degree. Many of them have embraced the technology and have come to it from a highly decentralized community. . . . Is that a valid point?

Lanier: That's true. Although I have to say that the present hacker culture in virtual reality is probably not going to be very relevant to the future. It should be viewed as a temporary epiphenomenon, because there are large corporate interests getting involved in it. . . .

There's nothing that's really wrong with large corporate interest as far as centers of power [are concerned]. They're much better than have existed historically on this planet—a lot different. Sony is better than Rome. [laughter]

Biocca: Trying to predict what will emerge from the technology is very hard when you're just looking at the components. What is really more important is the interaction with the components and what emerges from that interaction.

There is a recent experiment that has offered some surprises on this score. Randy Farmer and Chip Morningstar recount their experiences in the

design of their interactive project called Habitat.⁷ They were surprised at how quickly the users—even in this primitive electronic space—began to develop their own institutions, their own laws. There were forms of greetings, rebellions, and crimes and what have you.

Do you think that in virtual worlds people might experiment with alternative social arrangements and potentially import them back into physical reality?

Lanier: Hmm . . .

Biocca: All kinds of social models are possible in virtual worlds which have no equivalent “outside.” All kinds of alternatives might be considered that will now be in three-dimensions.

Lanier: Yeah, I think that there will be remarkable communities that arise. One of the things I should point out is that I think that sometime within the next century, virtual reality will pass to a stage where the common mode of usage is an interweaving of the virtual and physical worlds, so that you might be walking down the street, and there’ll be an added fountain that wasn’t there before. In that case, there will be sort of multiple channels of reality that you can access. Of course, each one of them will have a different mixture of physical and virtual things, and so there’ll be like a Chicano version of a neighborhood.

Biocca: You’re thinking of those transparent head-mounted displays, like the ones that are being experimented with at UNC⁸ and elsewhere?

Lanier: Well, actually we will require a sophisticated type of variably transparent display for this to occur, displays that go quite far beyond the concept of transparency. . . . It’s actually an interweaving in three-dimensional space of virtual and real objects. That’s what’s required, for a number of reasons. . . .

In terms of communities, I want to get back to what I was saying about the commons. I’m going to speak about the United States specifically now and not the rest of the world. What’s happened in the United States is that there’s been a gradual lessening of the commons to the point where there almost isn’t one. In fact, the United States is turning into a very bizarre ritual community. For instance, in the Silicon Valley, where we live, there’s one very large Indian community. In fact, there are a number of them that are overlaid right on top of a large Persian community, a large African community, and a large Asian community.

I find those interesting because I’m in love with world music. So that means there are a lot of musicians to talk to here, but what’s amazing about

⁷ See Morningstar and Farmer (1991).

⁸ University of North Carolina at Chapel Hill, the Computer Science Department.

this is how all of these things are just sort of overlaid and exist as little bubbles unto themselves.

I think that will continue in the virtual world. I think the real question has to do with how do you encourage a balance between the stability of a given culture and avoiding total stratification. That, I think, is a profound question that is true whether we're talking about commons of virtual reality or outside of it.

This also has to do with the question of privacy and virtual reality. If there's a total acceptance of the right to privacy, there's also a danger of too much isolation developing in the long term. These are very profound, difficult questions. . . .

“Green” Work In Virtual Worlds

Biocca: VR satisfies the desire to objectify thought into physical objects. We do that with architecture by transforming physical space. Aristotle talks about transforming a tree to a chair by imposing a form on it and making that transformation.

Lanier: Right.

Biocca: It's been suggested that virtual reality will allow all kinds of protean forms of visual and physical expression without transforming physical reality. Like some technologies before—again this is a prediction that has occurred in the past—it is suggested that virtual reality is a green technology. It is a form of physical expression that may not use many materials. It primarily can change what is, for all intents and purposes, a large part of the physical experience of a created object but achieves this only through basic sensory illusions. And therefore, you can provide a variety of environments and changes without using a lot of physical material. . . .

Lanier: Uh-huh.

Biocca: . . . by making the technology in some degree environmentally clean. You can see elements of that as a possibility. What do you think of this position?

Lanier: Well, I might have been the first to have advanced that position. [laughter] You know, it's important not to exaggerate it. Media technology is a minor contributor to the ecological malaise of our planet. Transportation technology—to be distinguished from media technology—is a much more serious contributor. There are a number of others, too. To the degree that it might encourage telecommuting, that is probably more important than anything else.

Let me tell you why I originally advanced that argument. It's because I was listening to some of the rhetoric from the nanotechnology community. That's a community that believes that we'll have an ability to synthesize fan-

tastic materials in the future on an atom-by-atom level. For instance, just to try out new genes, we could swallow a pill that would just teach our body how to grow a tail. Then, we could take another pill, then you'd lose the tail. I was thinking, boy, the desire to escape physical bounds is certainly strong, but that sounds like a terrible idea. It's so scary!

What I want to propose is that in the future, as our ability to manipulate the physical world increases, there might be new ethics that are based on the methods of achieving experiences. So it's an experience-centered ethic as opposed to an objectively centered ethic. It's a little shift here—a little bit more experiential and a little bit more sensual, as opposed to informational.

Anyway, so the idea is if one is to have a certain experience, one should choose the method to achieve that experience that affects the rest of nature and other people as little as possible. This is just a restatement of some old ethical ideas. But what it implies is that if a certain experience is possible in virtual reality, it's probably best had there. [laughter] Of course, that will solve only a small portion of the problems, because there'll be a good number of experiences that won't be possible in virtual reality. I think there'll still be very important conflicts to resolve.

Dark Visions of the Future

Biocca: We mentioned at the very beginning that, in fact, this technology is in the process of being defined. It's in play, right now. There are images being put forward by utopian camps, various individuals who view the technology as empowering.

Then there are the potentially dark visions. Obviously, military applications are the defining example. Do you have some visions of potential ways in which the technology might evolve that profoundly disturb and frighten you, in terms of: My God, virtual reality might go in this direction!

Lanier: Of course. This is one of the most difficult areas. For me, it's necessary to take a broadbrush approach, but at the same time, I refuse to run away from responsibility. I think it's appalling to assume that one can develop technology and not be responsible for the way it's used. So, all I can say is that if I'm wrong about it being a good thing, it'll be a big drag and I'll be sorry.

I might also say that if I thought it were a reasonable program to not make more technology, I would probably favor that. But, I don't think that's a plausible program at this point, because we're in love with technology. It's important to note that we do not need more technology except in medicine and natural disaster management. In all other areas, our problems are our own at this point. So the only justification for new technology is cultural, and that's a fact, that's not an opinion. I mean there's simply no need except in medicine and natural disaster management. We make our own problems.

Biocca: And it's well agreed that we have this love of technology. It clearly is in evidence in the history of the United States, and it is very much an American phenomenon.⁹ But we have taught the rest of the world to have that same nature and desire.

Lanier: Yes, it's very striking and a little horrifying that Japan is essentially the American '50s as it would be now if the '60s hadn't happened. They are running the future of these things much more than we are, in many ways.

Well, to answer your question. First of all, I think that communication technologies provide genuine experiences of communication between people as opposed to pseudo-communication between people. An example of a good one is the telephone. The telephone has provided, overall, good things, even though there are obscene phone calls and there are people who scream fire over the intercom. I think they are still overall a good thing, because they provide a chance for promoting empathy and promoting community, which is what makes life real for people. . . .

It's important to understand the power of communication. On the one hand, communication is very powerful. Books can be extremely powerful. There's *Mein Kampf*, for instance, as an example of a book with enormous power. On the other hand, they are not as directly, immediately powerful as, for example, something like an atomic bomb. Although you can say a book can cause a bomb, but a bomb can't really cause a book. So it's difficult to say. Virtual reality is ultimately an imaginary thing, just like a book is. It doesn't directly kill you like a gun. I believe in books, even though there have been many bad books. I trust in books. I trust that ultimately it just turns into an unjustifiable faith in people. Faith in the life force. The faith in the process of intelligent dialogue. It's a kind of a faith. That's the only justification for books.

My justification for virtual reality is exactly the same. That doesn't hold for weapons, I don't think. A gun cannot be justified in the same way that a book can. Books have been used to do more good than they have evil, even though there's been quite a bit of both.

I have no doubt that virtual reality will be used as badly as books have been, but it can be used just as well.

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⁹ See Marx (1964).

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