

from *The Craft of Controlling Sound* by Stephen Solum

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Excerpt from Chapter 1...

Sound arts is the term I use for the business of creating, processing, and recording sound for artistic and commercial purpose, and this book is designed to illuminate the technical landscape of modern sound arts. It lays a solid foundation of theory and concept under the huge body of information available from other sources, as well as under any skills and experience you may already possess. It is intended to be a serious (yet readable) college-level text, but also to fill in some knowledge holes for people who work in any area of sound arts—or for anyone truly curious about what happens when music and sound encounter technology. This book really isn't designed to be a giant leap; instead, it is a level, solid place from which to leap. It is also designed with these premises in mind:

Premise One: There are several major challenges in learning about the sound arts, but lack of information is *not* one of them. Information swamps you from all directions: equipment manuals, salespeople, advertisements, books, magazines, your friend Howie, the Internet. The problem is not lack of information; the problem is putting that information into usable context, and sorting the bad from the good, the relevant from the irrelevant. The field of sound art encompasses physics, math, audio technology, electrical and structural engineering, acoustics, computer science, and music tradition; and that's just the technical—the *craft* side—before consideration of artistic, social, and business issues. Moreover, most useful information zooming at you from other sources assumes some prior knowledge in one or more of these areas—some lingo, some familiarity. To understand only four-fifths of a magazine article on mixing vocals with multi-band compression is really not to understand it at all. So we tend to read and

read and work and work on our audio gear, gaining information and experience, but never quite melding it all into one big happy pudding of knowledge of the field. The major challenge here is *organizing* the information.

Premise Two: I believe a major problem with organizing knowledge is that your brain works differently when you're learning new information than it does when you're organizing what you already know.

My father spent 30 years hand-cutting and laying limestone walls around our entire house. Now that it's finished, one can know what it looks like by driving by and viewing the front wall, then getting out and viewing the east wall, and so on. As a matter of fact, it would have been nice had he completed that front wall first, then the entire east wall. That way the house would have looked finished to the general public after only about 15 years—allowing him to work on the back in relative obscurity and leisure. But strong stone walls have their own rules. They required that he start at the bottom and go completely around the house, a foot or two high; allowing each stone and each layer to interlock in natural correlation. Then around again, then again... Our neighbors watched as the limestone walls slowly crawled up around the entire house, like water rising evenly in a bathtub. But it was worth it in the end; the house is beautiful and will last for generations. Now that it's finished we can see and understand it one limestone wall at a time. But while he was building it, Dad had to see the stones not as four distinct walls, but as one big spiral.

In my view, a course of study in sound arts should unfold in much the same way. In the Sound Arts degree program at my college we don't offer a course in recording, then a course in electrical engineering, then a course in synthesis, then a course in MIDI sequencing, then a course in mixing, then a course in signal processing, then a course in digital audio workstations, etc. Once you understand something about each of those fields it's very useful to view them separately, to organize knowledge according to topic for easy reference. However, we view the initial *learning* of sound arts as figuratively progressing around the house in a spiral, and teach in that manner. This book is thus designed to be the first layer or two of stones, providing an interlocked foundation in most of the knowledge areas required for using new technology in music and sound design.

To profit most from this book, it's important that you accept these two premises. Our high-tech, modern world has become non-linear:

in virtual time, virtual space, in our reading, watching, listening and thinking. Most information is fed to us in disjointed small bits. Our heads bounce from topic to topic, from the present to instant replay, from solemn news to goofy commercial, from an article on digital file transfer to one on recording the voice. There are other valuable books and other learning tools that allow you to access information in this non-linear manner. This book is not one of them. It is a linear trail around and through a world filled with jump-cuts, recursive double-nested loops, multi-tracked clones, webs and—believe it or not—linear trails. I considered as carefully what to *leave out* of the book as what to include. We'll discover just enough about waves the first time around to be able to understand sound in a room and later equalizers; just enough about electricity to understand audio signals, just enough about terms such as these to help us define the next terms.

OK, you may find this book doesn't follow a perfectly linear trail. Like a leashed dog on a walk, I'll meander, sniff on this side and that and apparently get distracted for a moment, but all to the purpose of arriving at our destination with the bases covered.

It's easy to use this book; just follow these three steps.

1. Start at the beginning and read to the end, at whatever speed is appropriate. Don't go right to the section of your greatest and most immediate interest (even if you can find it without a table of contents), because that chapter assumes you've read the earlier chapters. Chapter 1 (here we are) assumes you know nothing about anything about sound art, only that you can read and think at an adult level and that you are curious about this stuff. Granted, you may have extensive experience and expertise in one or more of the areas covered. Indulge yourself and read carefully through those sections of the book as well, even if most of that material is review. There may be a gap or two in your basic knowledge, and at any rate you will be able to better interlock what you already know with what you learn. Likewise, if certain topics grab your interest, by all means find out more from other sources. The idea is not to hold you down, only to be sure that your foundation is intact. *All* your learning need not be balanced throughout all relevant topics. I lied about my father's stone wall earlier, in order to make the point. Actually he did go around and around the house, but only until the interlocking was solid—about two-thirds of the way up. Then he was able to complete the more visible walls first, in between windows and roofs.

2. Summaries and key points are not formally listed at chapter ends, but they'll jump out at you along the way if you look for them. So look for them. In my experience with learning and teaching I've found that when information is summed up too neatly we tend to gloss over it because we know where it is when we need to cram for the exam.

In that same light, you're reading Chapter 1 right now. This is really the introduction to the book, but people tend to gloss over introductions, so I labeled it Chapter 1.

Trust me here. If you have a serious curiosity about the field of sound art—audio technology, synthesis, sampling, sound design, music in the twenty-first century—this material is *not* something to cram and forget, so don't merely read it, but actively incorporate the important points into your working knowledge until they become intuitive. Furthermore, all the information you read here is cumulative. Chapter 2 will help you digest and understand Chapter 9.

3. I lied about number two, sort of. In the back of the book you will find a list of terms. Technical terms in this book are carefully introduced, then later used to define more terms. Each time an important, building-block term is introduced and defined, it is set in **bold** type. If you need to refresh your comprehension when a term reappears, go to the word list to find the page in which it is defined. Don't be content to “sort of” know the meaning. That leads to “sort of” knowing about sound art in general, and that isn't your goal. After you finish the book all these terms should be comfortable in your working vocabulary; you will run across them often in your subsequent work. They are also the path back to the concepts; the means for you to access all that other varied information from all those other non-linear sources.

Three Worlds

The approach we will take in discovering the basic concepts behind the technical side of sound art centers on the notion that our job is to learn to *control* sound (when we choose) in one of three arenas, domains, or worlds:

The first is the **Acoustic World**. This is the world of sound waves in a space. It's the everyday world of people talking, cows grunting,

subways screeching, violins and drum kits performing music in a concert hall or night club... or live recording room. This is historically the first sound world.

The second is the **Analog World**. This is the world of wires, electricity, mixers, open reel tape recorders, and electric guitars. This world (as it applies to sound control) was created around the turn of the twentieth century and it became the dominant domain in our field for the next eighty years.

The third is the **Digital World**. This is the world of numbers, digital processing, sound files, MIDI, and the Internet. This world dawned early but has gained dominance with the advent of electronic digital computers, which give it great power and speed at low cost.

Fortunately, all three worlds share some traits and general principles. However, each world has its own architecture, purpose, strengths and limitations. Each has its own tricks, concepts, and keys to power. Moreover, it's possible to move sound among the worlds to suit the particular task at hand. The agenda of this book is to explore what binds the three worlds, but also to view them separately and discover their unique characteristics. With this knowledge in hand, you will develop a key skill in the craft of controlling sound:

Knowing which world you are in at the moment, which world you want to be in to best accomplish the next goal, and how to move the sound from one world to the other.

Again, this book in and of itself will teach you to *do* very few things. There are no sections here on specific tools of the trade. But it will help you to figure out what you're doing, why you're doing it, and—most importantly—how to connect that understanding with other theory, information, and practical experience in the lab or the studio/workstation. The goal is to build a universe, a context, a frame of reference for any knowledge you do or don't already have.

Of course, the best place to begin is at the beginning. So let's start our walk in the worlds of sound arts in the cozy home of Mr. and Ms. Ancient Cave Dweller...

Art and the Technology Curve

When most folks hear the expressions “sound technology” or “music technology”, they also take it to mean “*new* technology”: sound operating primarily in the Analog or Digital Worlds. This book is also about “new” technology, but it’s important to understand just what technology is and does in the world. Mr. and Ms. Ancient Cave Dweller (ACD) can show us. They are humans, they have enough to eat for the day and they’re sheltered from saber-toothed cats or whatever. So they have some free time this evening to indulge in their budding human need to express themselves artistically. Mr. ACD extends his vocal chords with a few high pitched squeaks and yelps while the Ms. establishes a heavy back beat: her hand slapping her thigh. This has gotten a bit old for her. She really needs to whack herself hard to be heard above her mate’s yowls, her arm can only move so fast, she’s getting tired of the single sound, and the welt is getting bigger on her leg. After trying other parts of her body with little success, Ms. ACD wanders around the cave in search of a better way. She trips over a pile of old rib bones and in that moment the entire history of music technology begins. Ms. ACD is fascinated by the sound of the bones clinking together as she falls on her Ancient backside. One in each hand, she returns to the fire and accompanies Mr. ACD with new enthusiasm and skill, banging the rib bones instead of *her* bones; loud, fast, facile. She has invented music technology by using *tools*. Technology is nothing more or less than using tools as a substitute for physical work—faster, more powerful, or more efficient. The advantages are obvious to her: more complex rhythms, potentially louder sounds, variety growing with her selection of different bones.

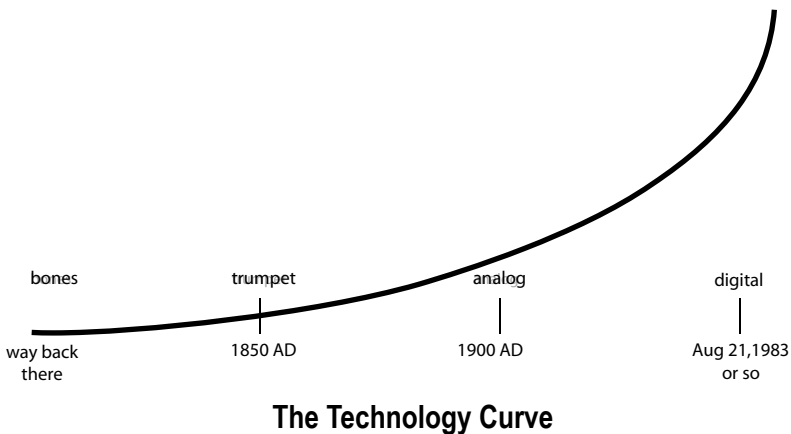
There are balancing factors to consider with this new technological power. Back there in the Cave these factors were so subtle as to be virtually undetectable—so we will march forward through history. We could march into any world culture, but we’ll visit Western Europe, because technology has been emphasized in that tradition. During the Second Millennium many musical instruments—tools for creating sound—were developed: the trumpet for example. It began as a straight brass horn, but by about 1850 it evolved into the familiar valved instrument we know today. The trumpet represents a much higher level of technology than Ms. ACD’s bones. It plays unique sounds; high, fast, beautiful and loud. A powerful tool. But these balancing factors of advanced technology are emerging:

1. There are now some procedures to learn. Granted, there aren't very many at this stage. The procedural instructions for playing the trumpet could be written on one page: Pick up the trumpet a certain way, blow through a certain end, buzz your lips, push valve buttons in a certain order to make a scale. Then at the bottom of the page it would say, "Now practice this for 10 years." The trumpet still requires physical skill and training first and foremost, but its higher technology demands that you learn a few more procedures.

2. Assuming that sound art is concerned with communication from the artist to the listener (and that is an assumption, not always a given), the trumpet is placed *between* the two, and anything between two communicators is potentially a hindrance, not an aid. Is a beautifully played trumpet less "expressive" than a beautiful human voice? I don't know, but technology sows the seed of that question, by placing something between the artist and the perceiver.

Fig. 1-1 is a chronological chart of the **The Technology Curve**. Time moves from left to right, and with it, technology grows.

Figure 1-1



My suggestion here is that as technology grows, the increased power is achieved at the expense of the need to learn procedures, and at a potential added distance—space, time, spiritual, expressive—between artist and audience. The Technology Curve shows us a very important aspect of this relationship: it's a curve! In other words, as we move through time, technology growth is not steady; the *rate* of growth has increased constantly (at least for the past 1000 years or so, in our

culture). This is not breaking news, except to note that those balancing tradeoffs—procedures and/or artistic distance—grow along with the curve.

As time moves along, technology has given us ever-more powerful tools, allowing us as individuals to produce more (and more varied) art, lowering the requirement for physical skill and training while raising it for learning procedures. The Analog World became a practical place to control sound around the turn of the twentieth century; phonographs and telephones led the way. For the first time in history, sound artists could manipulate time and space. The price of that power has been learning how to hook up the wires and run the tape machines and mixers.

We are now in the midst of the digital revolution, and the curve is getting yet steeper. The actual physical requirements for stunning, large scale work in sound are now nothing more than pushing a few buttons or moving a mouse. The number of procedures required—as well as the knowledge of the order in which to push the buttons—is even more stunning, however.

After a harrowing evening in our advanced digital lab, one of my students remarked that the Technology Curve seemed to be vertical and beginning to sag to the left: he was finding an infinite number of procedures and never getting any sound at all.

Further, as sound art passes through the Digital World on its journey between creator and perceiver, continuous events happening in what we understand as continuous time, (with continuous variation), are all approximated into discrete chunks and labeled with specific, disjointed numbers. Digital sound is a powerful, beautiful thing, but it has potential to cloud and confuse artistic communication that strives to be transparent.

My point here is that there is no best place to be on the Technology Curve. Think critically about Fig. 1-1 and you will realize that it is useful, but also that it implies less than the whole truth.

For that matter, think critically about any insight and you will find the same to be the case, including this sentence.

Technology has grown over historical time, but time and technology need not be linked as they are on the chart. We can glide back and

forth on the curve as we wish. Great sound art can be created sitting alone at a computer workstation at the top of the Curve. Sound art every bit as great can be created by an unaccompanied choir, using no technology at all. All artists eventually find their favorite portion of the Curve according to aptitude, talents, and the Muse, and then gravitate to it—but their art is served if they are able to move up or down when it suits their purpose.

And so we will take our walk up the Technology Curve, through each of the three Worlds in turn. However, before we can make any sense of it, we must understand something about the building blocks of sound itself.

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