I have taken liberties with Webster's definitions for the purpose of making more clear the nature of my comments. Constraint is defined as the act of holding back or repression because of external forces or conditions. Restraint is defined as control over one's thoughts, actions or feeling—reserve, to curb, check or bridle, and this is internal to the individual.

I am one of those persons who instinctively relates to plants and animals but totally freak out with mechanical devices when they do not work. This includes cars to refrigerators and everything in between. I am convinced that machines sense my ineptitude and deliberately test me. With good reason, I have a deep-seated belief in the inevitable perversity of inanimate objects such as any kind of machine including computers.

My first computer sat on the desk for a year before I turned it on. The computer was delivered to me in 1983 and turned on sometime during the Fall of 1984. It was an IBM hard disk with Word Star software. I learned word processing, period. Twelve years later I was still using the same machine and software but did change printers although the new one is still a dot matrix. Now that my credentials have been stated, I can proceed with my remarks in clear conscience. To loosely paraphrase a well known axiom, *They who fail to learn from history are doomed to repeat the same mistakes.*

This certainly applies to design, and the concept is deserving of examination as it pertains to design, typography, printing and computers. In many respects, the computer has created a similar dilemma as that faced by Victorians—the sudden decrease of constraints with a corresponding increase in options because of new technology. I think we are seeing today many of the same conditions that beset our forebears. In hindsight, we know they failed to discipline themselves when presented with a greater range of decision-making.

During the fifteenth century there were numerous constraints imposed on printers. Most of them were physical and related to available technology. Presses were primitive, paper was handmade, type was made a letter at a time and illustration was restricted to woodcuts. Every aspect of printing was
labor intensive and demanded great skill. During the incunabula period, books were precious. Most were printed with wide outside margins so that edges could be trimmed as they became worn or soiled. The combination of technological constraints, function and skills resulted in some of the most beautiful books ever printed. There was a unique affinity between handmade paper, type, woodcut and printing impression that has seldom been matched since that time. The books themselves are works of art. With each advance in the technology of printing, there were fewer constraints and lesser skills were substituted for more difficult ones. Woodcuts were first replaced by wood engraving or lithography, and later by halftone screen; text type was supplemented with decorative faces, and eventually, the hand-caster was replaced by automatic type casters. Printing presses moved from platen to drum and steam power replaced hand-operated equipment. Paper production increased through the use of wood pulp with new machines and processes.

Evolution was relatively slow until near the end of the eighteenth century, and it was the nineteenth century in which dramatic changes took place. Printing and type design were both stimulated by, and reflected, the growing industrial revolution. As options increased because of improved technology, constraints on design became less of a factor. Technology that expedited printing or reduced its cost was favored although it decreased quality. With more options, there was a corresponding bastardization of design most commonly demonstrated through complexity and mixing of styles. With greater production of marketing ephemeral and various public notices, typographic novelty became the rule rather than the exception. Even with its excesses, letterpress printing was governed by a vertical and horizontal bias because of lock-up. With the invention of lithography at the end of the eighteenth century and its perfection during the early years of the nineteenth century, the right angle constraints were eliminated. With lithography, artists could integrate illustration with type, create new letterforms, curve or bend lines of type. Conventional typographic materials could be printed letterpress and transferred to lithographic stone where it was combined with that of the artist. Other than speed of production, there were few constraints for artists using lithography.

By the 1870s, most standard typefaces were made in families of six or more styles of expanded, condensed, bold to lightface and ornamental. With the invention of electrotyping, the proliferation of designs and availability of type rapidly multiplied. By the 1880s, major type houses published specimen catalogs three to four inches thick illustrating thousands of styles, variations and sizes.

From 1828 onward, large letters for posters, announcements, marketing and various other uses were cut from wood and mass produced. These letters regularly ranged from four to one hundred pica but some were much larger. Until this time, text type was viewed as texture and ornamental display type as decoration. With the large wooden letters, shape became another consideration. With the invention of paper made from wood fiber, and reliance on wood engravings as well as finely delineated ornamental typefaces, paper surfaces were calendered and smooth. Paper was produced in an ever increasing range of sizes, grades and colors. None of them possessed the same qualities as the incunabula rag papers.

**Typography is the visual translation of verbal communication, and traditionally, the function has dictated style. With computers, typography has become movement, color, texture or shape with communication often becoming subservient to decoration.**
Near the end of the nineteenth century, all design was in a chaotic state. As constraints were eliminated by advancement in machines and processes, few restraints were imposed. Victorian values were a mix of eclectic sources. The nineteenth century was a period of exploration, archaeology and colonization by Europeans. Contact with foreign and ancient cultures resulted in an exotic array of diverse imagery integrated into the design repertory of the day. Traditional standards for value such as hand-formed embellishment by artisans were still popular. During the nineteenth century, the same decorative effects could be done by machines. Intricate relief was stamped in a second, and artificial gems substituted for real ones. John Ruskin was to say of Victorian design that "...it was done without the labor that gave it honor."

Near the end of the nineteenth century, design chaos was finally acknowledged as such, and reaction began to build. The counter action was led by various individuals and groups loosely identified as the Arts and Crafts Movement.

The revivalists, with William Morris as their principal exponent, believed that printing should return to the age of decadence for its means and values. The Kelmscott Press was established within this context. Paper and ink were handmade, type and decorative styles were based on those of the middle ages, and printing was done on a hand-press.

Another group felt that values had declined because of urban decadence, and that true values resided with peasants and were to be found in simple country life. To regain morality, it was necessary to return to basic life styles and values. Folk art, home crafts and rustic architecture illustrated their philosophy. Others believed that the source for all design was nature. Design was an interpretation and extension of nature. It was believed that the principles for design grew out of natural laws and that imagery should mirror nature.

Yet another group believed that design should incorporate and reflect new technologies, materials and the industrial age. Key elements of their philosophy were integrity of materials and substituting function for embellishment in design. These principles became central to the philosophy of the Bauhaus. During the latter years of the nineteenth and early years of the twentieth century, there was a growing understanding for the need of restraints to establish order in design. A number of books were published promoting different philosophies of design. Most books offered visual principles best described as recipes for design. In one form or another, facets from several movements were incorporated into the Bauhaus which emerged as the dominant voice for architecture and design in the twentieth century. It was the Bauhaus that firmly established restraint as essential to the quality of design by making the distinction between function and embellishment.

From around 1900 until the 1930s, there were various art movements such as Dada, DeStijl, Futurism, Bauhaus and others experimenting with type, letterform and design. Some individuals represented more than one school at different times, or followed the philosophies of more than one movement at the same time.

Constraint vs. Restraint
A diverse group of painters, poets, printers and typographers used type as visual texture, blocks of type as shape or lines of type to show movement, letterform as shape, and combined them with color. Type and letterform became design elements serving both as image and communication. Traditional use of type had always been supplemental in the sense of being separate but added to image. Graphic artists from the design movements of early twentieth century and their works are to graphic designers what French painters of late nineteenth century are to painters. Most of the precepts of modern graphic design were established during these years by these individuals. Throughout history, the introduction of significant new inventions such as electricity, automobiles, airplanes and computers went through several predictable stages. The first is as a curiosity and its use is restricted to the small group of people who have a technical understanding of its workings. The second stage is as a toy or prestige symbol, and its use is confined mainly to the wealthy who can afford it. The third stage is general acceptance with widespread usage by the population at large.

While the invention is moving through the various stages, numerous individuals are working to refine, improve, make more efficient, extend its application and reduce cost. We have certainly seen the computer go through the historical developmental patterns. Primary factors leading to adoption of new technology have been improved products that are more economical to produce; they are made more quickly and in greater quantities or new products with a predictable market. With the shift from traditional methods and products to new ones, there generally was a trade-off. As products were improved, they became more complicated and costly; as they could be produced more economically or quickly, quality decreased. As new technologies replaced older ones, traditional values and methods tended to disappear while new values were created, and they seldom were superior to traditional ones in many respects.

Adoption of new machinery and processes invariably led to worker unrest as change usually meant less workmen were required. During the nineteenth century, workers revolted and destroyed new machines as they vainly strove to preserve their livelihood. What we have seen with iron, manufacturing, logging and ranching industries is not peculiar to our times. The process has been going on throughout the industrial revolution. Today, we call it down-sizing. During the late 1880s, loggers exhausted timber resources in northeastern Wisconsin, and thousands of loggers were unemployed. Several aluminum manufacturers moved into the area and retrained loggers to work in factories. The area became the largest concentration of aluminum cookware manufacturing in the world by the turn of the century. There has been a limited revival of many industrial crafts in our century as cottage industries or by hobbyists and artists. Some combination of weaving, ceramics, paper-making, woodworking, glass-blowing and letterpress printing have been included as art courses or programs at most universities.
At the risk of sounding like a displaced craftsman from the past, I am firmly convinced that the fundamentals and values of visual design are better learned through traditional methods than can be accomplished with the computer. In our eagerness to embrace the new computer capabilities, we should not blind ourselves to those aspects of tradition that remain relevant regardless of what technology is favored. There is evidence suggesting that for some graphic design educators and students, the computer is still being used as the toy stage. As such, traditional values and pedagogy are discarded by many in the belief that they are no longer relevant. It is only when the computer ceases to be a toy that it becomes a tool and values emerge as something more than what a machine can do. When I left graduate school and began work as a teacher and designer during the 1950s, advertising design was better known than graphic design. Linotype, monotype and foundry type were the sole means for typesetting. Advertising designers relied on hand-generated concepts using pastel or watercolor for client comps. Type indication was rendered with a pencil, typesetting was hot metal, work was key-lined and a blue-line proof was the final check for offset printing and a press dummy for letterpress printing. Concepts and comps were generally made by the artist/designer; typesetting was furnished by an outside source; key-lines were done by specialists and blue-lines or press dummies were supplied by the printer. The differences between the designer’s comp and the printed piece usually were substantial.

At school, we installed a copy camera and worked with photostats; we had a film and photography laboratory; we had a hot metal type shop where students learned to set type and used hand-operated printing presses. Financial constraints were handled by soliciting subsidization from a variety of manufacturers and suppliers. With time, additional constraints were imposed which were mainly financial. We could no longer afford the new technologies, the cost of photographic materials escalated to a point that students could not afford them, and students began to use the photocopier in place of photostats. Even the cost of a Color-Aid pack required for Albers’ color classes increased so much that it became prohibitive for student use.

To the best of my knowledge, Jay Doblin was among the first to use the computer as an instructional tool for graphic and industrial designers at IIT during the 1960s. However, it was not until the introduction of the Macintosh and rapid development of its hard and software during the 1970s that computers became the significant factor in graphic design that they are today. The assimilation is so complete that it is now impractical to conceive of teaching graphic design without computers. At this time, most teaching and professional job descriptions call for computer literacy. My concerns are when and how the computer is used for educational purposes in graphic design. Students today can hardly appreciate all the benefits provided by computer technology. With a computer, scanner, laser printer and appropriate software, students can set type of choice, integrate photographs or art, draw, manipulate elements, change sizes and use color with a minimum of labor and time. Most of the traditional production constraints have been eliminated and the designer is
no longer as dependent on others in the preparation for actual production. The computer eliminates most of the constraints, financial and otherwise, associated with traditional forms of typesetting, photographic processes and printing. The cost of computer-generated design, type and proofs is viable for education.

The designer’s current fascination with the computer is easy to understand. With the computer it is possible to do easily and quickly those things that were difficult and time-consuming to do in the past. This generation of students has grown up with electronic devices and games, and the computer is another avenue for exploration and exploitation.

I have worked with upper level students using the Macintosh to do assignments. It did not take long before I began feeling that if one more layered design was submitted, I was going to be sick. Much the same was true for type zooming into the stratosphere like a comet, or curling and twisting its way through a hodge-podge of elements, or type superimposed over texture making it illegible. The computer is being milked for every bit of complexity it can produce, and much of it is visual gibberish. Complexity should not be confused with quality. Computers can depersonalize the work, and sometimes it is difficult to tell one student’s work from another. I have many of the same problems with graphic design produced on the computer found in the marketplace. Perhaps of even greater significance, I cannot always tell which work was done by a professional designer and that by a non-designer, such as a salesman or secretary.

The computer should be an excellent tool for teaching typography. However, based on what I have seen so far, the computer appears to be more destructive to the art of typography than constructive. My understanding of typography has always been that its primary function is communication based on legibility, and it is the art of the minimal. Priorities are determined through use of space, placement, visual tension and change of typeface, size and weight, and these are kept to the minimum. The typographer knows and relies on well-designed typefaces, ignoring those that are badly designed. Good typography reflects intelligence as well as visual understanding; restraint is the hallmark of good typography. During the 1950s and the beginnings of the Graphic Design program at Yale University, these precepts were understood. This was largely due to the fact that the typographic focus was on book and periodical design. The art of typography has always been associated with book design. Advertising has always been a typographic playground for the naive or vulgar with only occasional flashes of brilliance.

What I am seeing in much of computer-generated design is distortion of type affecting legibility with excessive reliance on different sizes and weights. There is an illogical mixing of styles, and designers demonstrate poor selectivity in choice of typeface designs. It is as if designers do not know how to distinguish between a well-designed typeface and a poorly-designed one.
To a great extent, the bastardization of type and its use by students is occurring because they have no models to guide them. Students are so overwhelmed with the excessive visual presentation in our society today—both type and image, through video, film, television, print advertising and the computer. Most of what they see is not worth emulation. Today, students have to unlearn much more than their predecessors of twenty years ago.

Some graphic design teachers believe that computers have freed students from traditional requirements such as hand-generated drawing, color, basic design, typography or letterform exercises. Nothing could be further from the truth. The computer relates to graphic designers as word processing relates to the creative writer. You would not teach creative writing by focusing on electronic equipment, but in principle, that is exactly what many art and design educators are proposing to do. What comes out of the computer is no better than what is put into it. My impression is that computer-generated graphic design today is based more on what the computer can do for the designer than on what the designer can do with the computer. The incredible number of options afforded by computers can be both an educational advantage or a pitfall for users. It is the teacher’s responsibility to instruct students in a manner that makes them beneficiaries and not victims of computer technology. This involves sound instruction in visual principles, high standards and teaching the value of self-imposed restraint.

In spite of the previously described conditions and practices, my reaction is that it would be wonderful if I could begin my teaching career all over again as the computer is such an ideal instructional tool.

The computer provides the student with endless options of size, arrangement, choice and color. Each option is an opportunity to make a decision. The entire process of examining options and making decisions affords an ideal learning environment. The time-lag associated with traditional processes for finalizing a design, in most instances, are reduced to minutes. This permits students to accumulate vastly more experience within the same timeframe than formerly was possible with older methods and processes.

What the student sees on the monitor is close to how the printed piece will appear. This permits changes at a point when the design is still flexible. This is compared to reaching a blueprint stage before discovering the need for change and having a major correction which is time consuming and expensive.

Image, type, design, color and proofing are now combined into one process, where formerly these were done separately. This gives designers control over all aspects of design. Under the older process, it was only when the various elements were completed and brought together that the designer had an opportunity to view the combination of elements.

The judgment to make the best use of the computer comes from values which shape design decisions, and values can be taught. Some values are acquired through knowledge of design history and knowing the various styles and movements shaping design and...
typography. Knowing the work of recognized designers, past and present, contributes to the formation of personal values. Being visually literate is critical to making sound judgments. Students must know the difference between what is creative and what is novelty; knowing what is clever and what is ingenious. In short, an awareness of the highest levels of design contributes to establishing worthy values. Values are often referred to as standards.

Good judgment in making design decisions grows out of visual values or principles, and these have not changed, only the technology that gives them form. Visual values are the basis for the critical analysis that leads to decision-making regarding the overall visual properties of design. Student understanding of visual principles is critical when using the computer.

If I could begin teaching all over again using the computer as an instructional tool, in the first year there would be very little change from what I did in the past. I am firmly convinced that visual values are best learned through traditional hand-generated theoretical exercises. This applies directly to basic design, drawing, color and letterform. I also believe handskills must precede computer skills. In hand-generated work, the student is working directly with tools and media; manipulation and results are immediate; the student feels as well as sees which facilitates understanding. The computer is an indirect tool in that the student does something here and something happens there. I do not believe that drawing on the computer is the same as working with pencil and paper. Values are best learned through working directly with the hand, and values are what determine the quality of design a student will produce on the computer.

There is a difference between kinetic and machine experience, and students should have the former before the latter. At the risk of over-generalization, I perceive the computer as essentially mechanical, the hand as related to feeling and intellect as the basis for restraint. Each plays an important role, but only when in proper sequence and balanced with one another.

During the first year of design studies, I would want students enrolled in a computer course where they learned what the computer and different software can do, and to become familiar with the machine and process. They could do exercises but I would not want students doing design problems on the computer in the first year.

My inclination would be to introduce the computer as a design tool first in typography. During the first year, students would study letterform as that is how they best learn the criteria for a well-designed typeface. With a background in letter design, spacing, margins and texture or color, students are prepared to work with type on the computer.

Most graphic design teachers seem to best understand the need for problem limitations in basic studies. Problem limitations are constraints imposed by teachers to focus students on problem objectives. Theoretically, students begin their studies in design with numerous such constraints, but as they progress through the program, constraints are reduced with the idea that students will impose restraint to accomplish the same end. Teachers set constraints to teach students the need for restraints.
The practice of teacher-imposed constraints should be used with the introduction of students to the computer. This is mainly to ensure that students use the computer as a tool and not as a play-thing. Students need to know when in the design process it is best to use the hand and when to use the computer. As one example, when it comes to generating ideas, the human mind and hand are faster and better than any computer. Often when designers use the computer to create ideas, they become so involved with the mechanics of doing it on a machine, they lose sight of the original objective. However, when it comes to making refinements, exploring options or working on variations of an idea, the computer is far superior.

Restraint is required in conceptualization as well as in visual decision-making. Concepts should relate to objectives and priorities. Alvin Lustig advised that the solution for any design problem grows out of an analysis of the problem. Analysis establishes objectives and priorities which in turn define the restraints. I once asked Armin Hofmann why Swiss typography was so consistent. He responded by saying that it was because in Switzerland they had many typographic rules. He went on to say that for typographers who were not so creative, they followed the rules. The typographers who were genuinely creative broke the rules and created new ones. Rules are a form of constraint.

Another form of similar constraint is tradition. I, as most graphic designers, have a deep appreciation for native arts whether they be Native American, Eskimo, African, or any similar cultures where imagery is passed from one generation to the next. I would speculate that traditional art is much like what Hofmann described as typographic rules. Those who are not so creative follow tradition and the unusually creative artist expands tradition. It is not my intention to advocate either rules or tradition to govern use of the computer. However, teachers should instruct students in what constitutes good typography, design, drawing and color, and these instructions lay the base for judgment and decision-making much as rules or tradition. Restraint is more important to me than constraint. It begins with the designer identifying objectives and establishing priorities. Then it becomes a form of checklist such as: What am I trying to communicate? Am I communicating the right message? Is this the appropriate concept? Is it clear? Can I strengthen it? Can I simplify the design by taking something out? Can I strengthen the visual image? Restraint is an expression of self-discipline.

The practice of restraint is not in itself an inhibitor to innovation or creative expression. Historical constraints in design, type and printing were undoubtedly perceived by contemporaries as barriers. In retrospect, constraints helped to focus design and played a beneficial role. As constraints are eliminated, restraints are needed to maintain focus and balance. Restraint is that self-discipline necessary for all professions. Sometimes we call it professionalism. Restraint is based on critical analysis that keeps designers concentrated and making considered judgments. Restraint in design, as in typography, is a true reflection of intelligence.
The computer has eliminated so many typographical, image, technical and financial constraints, that today almost anyone can engage in desktop publishing. The opportunity and means to publish are open to anyone with the appropriate hard and software. The user doesn’t require all the former technical steps of key-lining, typesetting, making images, or the various skills. When they have what they want on screen, the disk is sent to the printer.

As a result of this, computers have become an integral component of both graphic design and professional practice. I have been scanning job listings recently, and what a few years ago was an occasional reference to computer skills, is now an absolute and primary requisite for employment. Computer skills and knowledge of the latest software have become such a consistent requirement that it brings to mind a recent experience of a friend of mine.

A short while ago, I was speaking with Norman Gorbaty, a very talented designer who is a close friend. Knowing Norman’s love for drawing, I inquired as to whether he was using the Macintosh? He said no, he simply hired two young designers who were expert with the computer, and he told them what he wanted. He went on to say that a few weeks earlier at a client presentation, he noticed a group huddled in front of some panels. He went over to see what was holding their attention and it was a few marker sketches he had made early in the project. As he joined the group, one of them turned and asked him what software he had used? When he told them that they were looking at hand-generated work, they were incredulous. It is cause to wonder about design education and computer versus hand-generated design in the future.

The distinction between artists that serve art for its own sake and those that serve society as visual communicators has become pronounced as society has increasingly become more diverse and complex. In this respect, the antecedents for graphic design as a mode of communication trace back just as far, if not farther, than any of the visual arts including painting and drawing.

Periodically, the role of visual communication has undergone significant changes due to shifting priorities within society. From a historical context, the forces shaping roles originated with religion, government, industry or technical progress. There is no question but what computer technology is changing the present definition and role of graphic designers, and as of now, the nature of that change is unclear. However, regardless of change, there are factors central to visual communication that must be recognized, preserved and adapted to new technology and concepts of communication. Visual literacy with attendant appreciation for, and demonstration of, esthetic values are at the core of any visual expression whether it be individual or societal. Graphic designers must respect and understand what constitutes visual communication. This applies to direct communication such as typography or the more subtle forms such as symbolism and everything in between. The graphic designer will be expected to communicate at more levels than previously, and they can no longer work as isolated contributors.
graphic designers have to expand their problem-solving capabilities, but in this respect, they must learn to work in tandem with others. Visual literacy, visual communication and problem-solving should be retained as the basic core for graphic design education. With the number of non-designers engaged in desktop publishing, graphic designers have to use the computer differently with superior results to distinguish themselves from non-designers in order to justify their profession and to create demand for graphic design services.

To paraphrase a statement reputedly made by Marshall McLuhan, “Man shapes new tools, and thereafter, they shape man.” We are certainly seeing this occur with computers. But it is better to be a master of technology than to be a slave to it. Mastery can be achieved only by having personal criteria related to high standards and exercising the necessary restraint to meet objectives. The most relevant restraints grow out of understanding visual principles, awareness of what constitutes drawing, respect for typographic function and sensitivity for color. These qualities are best learned through hand-generated involvement without the benefit of computers. Skills required to operate the computer are not to be confused with the skills required to do by hand what the computer does mechanically. Once understanding, values and hand skills are acquired, students are then brought to the computer where the creative and mechanical are blended. The challenge for teachers today is finding the most effective means for using the computer as a teaching and learning tool. We do not return to older methods but learn to exploit new technologies without sacrificing our values. We move forward while assessing the benefits of the computer as a tool, defining new restraints and retaining formal values and communication as first priorities. Students must be instilled with an understanding of the computer as a tool, and that they should rely on themselves for imagery rather than depending on what a machine can do. Educators and professional designers should not wallow aimlessly, or become seduced, by technology as did our Victorian ancestors.