UNDERSTANDING ME

Lectures and Interviews

Marshall McLuhan

McCLELLAND & STEWART

With a Foreword by Tom Wolfe

Understanding Me

LECTURES AND INTERVIEWS

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Contents

Afterword by David Staines

Foreword

by Tom Wolfe

Come with me back to the 1990s::::::and the Silicon Valley::::::and the Intern euphoria::::::and the two w.w.w. saintly-souls who first prophesied the coming of the Wor Wide Web::::::

It was November of 1999, and I was in Palo Alto, California, the Silicon Valley's de fac capital. Right here in the Valley the computer industry had produced fourteen ne billionaires in the preceding twelve months. I saw billionaires every morning at breakfas *Every* morning; the Valley's power-breakfast scene was a restaurant called Il Fornaio, whic happened to be on the ground floor of my hotel, the Garden Court. I loved the show. Yo couldn't have kept me away.

The billionaires you couldn't miss. They all came in wearing tight jeans or khakis, shir with the sleeves rolled up and the front unbuttoned down to the navel, revealing skin ar chest hair, if any, and leather boating moccasins without socks, baring the bony structure their ankles and metatarsals …even the ones up in their fifties who had wire hair sproutir out of their ears above lobes that sagged as badly as their shoulders and backs, which wer bent over like the letter *n*. They looked like well-scrubbed beachcombers. Their clothes wer so skimpy, there was no way they could have been carrying a cellphone or even a beeper, l alone a Palm Pilot, a BlackBerry, a RIM pager, or an HP-19B calculator. Walking behind ever billionaire would be an aide-de-camp, probably worth no more than 60 or 70 millio wearing the same costume plus a sport jacket. Why a sport jacket? Why, for pockets in whic to carry the cellphone, the beeper, the Palm Pilot, the BlackBerry, the RIM pager, and th HP-19B calculator. Billionaires in baby clothes! You could get high in Il Fornaio on secon hand euphoria.

But much of the sublime lift came from something loftier than overnight IPO billions and th like, something verging on the spiritual. Cyberspace had its visionaries, and they were tellir everybody in the Valley that they were doing more than simply developing computers ar creating a new wonder medium, the Internet. Far more. The Force was with them. They wer spinning a seamless web over all the Earth that would forever render national boundaries ar racial divisions meaningless and change, literally transform, the nature of the human beas And everybody in the Valley believed it and dressed the part. Faithful devotees of the Forc didn't go about in dull suits and pale blah shirts with "interesting" Hermès neckties and ca toed black oxfords with shoelaces, the way the dreary, outmoded Wall Street workada investment donkeys did back East.

The Web – the W was always capitalized – was the world of the future, namely, the Digit Universe, and the Force had its own evangelical journals. *Upside* magazine's editor, Richard Brandt, said (September 1998) he expected "to see the overthrow of the U.S. government my lifetime," not by revolutionaries or foreign aggressors, however, but by Bill Gates Microsoft. The software Gates and Microsoft provided for the World Wide Web "w

gradually make the U.S. government obsolete." Compared to that, Gates himself was Modest in sneakers when he wrote that he was part of "an epochal change" that "will affect the wor seismically." Seismically means like an earthquake. Evolution used to be measured in units one hundred thousand years. But computer scientist Danny Hillis wrote in *Wired* magazin that thanks to "telephony, computers, and CD-ROM s," today "evolution takes place microseconds…. We're taking off…. We are not evolution's ultimate product. There something coming after us, and I imagine it is something wonderful. But we may never b able to comprehend it, any more than a caterpillar can imagine turning into a butterfly."

Euphoria, as I say, a Millennial vision – and all of it had been inspired by a Canadia literary scholar who had died fifteen years before the Internet existed. His name, unknow outside of Canada until he published the book *Understanding Media* in 1964, was Marsha McLuhan. By 1996 the cyber-faithful were looking to McLuhan's work and prophesies as th new theory of evolution.

I can't think of another figure who so dominated an entire field of study in the second ha of the twentieth century. At the turn of the nineteenth century and in the early decades of th twentieth there was Darwin in biology, Marx in political science, Einstein in physics, an Freud in psychology. Since then there has been only McLuhan in communications studies o to be more accurate, McLuhan and a silent partner. It was the silent partner who mad McLuhanism what it was: a scientific theory set upon an unseen, unspoken, taboo religiou base.

McLuhan had been raised as a Baptist in, to all outward appearances, a family typical the settlers of the vast Canadian West. They were Scotch-Irish Protestants who said *howse* an *abowt* for house and about. His father's forbears were farmers. His father himself was a insurance salesman. But his mother, Elsie Hall McLuhan, was another story. She was th cosmopolitan, the cultivated Easterner from the Maritime provinces, English in backgroun well educated, an elocutionist by training, a flamboyant figure in theater circles who toure Canada giving dramatic readings. Despite her many absences, it was she who ruled th family, and it was she who steered both Marshall and his younger brother, Maurice, wh became a Presbyterian minister, toward intellectual careers. Since not even star elocutionist much less so-so insurance salesmen in Western Canada, made a lot of money, the McLuhan lived modestly, but Elsie McLuhan would make sure, in due course, that her son Marshall, th academic star, was educated abroad. In 1920, when he was nine, the family moved fro Edmonton to Winnipeg, and he went to high school and college there, graduating from th University of Manitoba, which was about a mile from his house, with a bachelor's degree 1932 and a master's degree in English literature in 1933. His mother, however, had grand credentials in mind. At her prodding, he applied for and won a scholarship to Cambridg University in England.

At this point McLuhan was very much the traditional young scholar, "the literary man," type he would later ridicule as smugly ignorant of the nature of the very medium he studie and labored in, namely, print. As it turned out, in the 1930s the literary life at Cambridge, Oxford, and in London was anything but traditional. This was the trough of the Gre Depression, and British intellectuals had begun to take an interest in the lower orders, "th masses," many as Marxists but others as students of what would later be called popul

culture. McLuhan was drawn to the work of Wyndham Lewis and the Cambridge scholar F. R Leavis, who were treating movies, radio, advertisements, and even comic strips as a ne "language."

These were also the palmy days of Catholic writers such as Hilaire Belloc and G. K Chesterton, whose wit and sophistication had suddenly made Catholicism exciting, eve smart, in literary circles. Two of the most brilliant and seemingly cynical of the Londo literati, W. H. Auden and Evelyn Waugh, converted to Catholicism in this period. Likewis Marshall McLuhan. He became a convert to the One Church – and to the study of popula culture. Although almost nothing in McLuhan's writing was to be overtly religious, these tw passions eventually dovetailed to create McLuhanism.

After receiving a second bachelor's degree from Cambridge, he began his teaching career 1936 in the United States, at the University of Wisconsin. He returned to Cambridge in 193 and over the next three years received a master's degree and a doctorate in English literatur After Wisconsin, he taught only in Catholic institutions, first the University of St. Louis, the at Assumption University in Windsor, Ontario, and finally at the Catholic college of th University of Toronto, St. Michael's, where he joined the faculty in 1946.

By this time Marshall McLuhan was thirty-five years old and the very embodiment of Els McLuhan's appetite for things intellectual – and for the center of the stage. He was know both as a literary scholar, an expert in sixteenth- and seventeenth-century English literatu and the work of James Joyce, and as a charismatic figure who captivated groups of studen and faculty with his extracurricular Socratic gatherings devoted to "the folklore of industri man," as he called it, in which he decoded what he saw as the hidden language advertisements, comic strips, and the press. He would show a slide of a Bayer Aspirin a featuring a drum majorette wearing a military helmet and jackboots and carrying a baton th size of a mace. The caption reads, "In 13.9 seconds a drum majorette can twirl a bato twenty-five times …but in only TWO SECONDS Bayer Aspirin is ready to work!" What is the tru language of such an ad, he would ask? What does it really convey? Why, a "goose-steppin combination of military mechanism and jackbooted eroticism," the wedding of sex an technology, a recurring advertising theme he christened "the mechanical bride."

That was the title of his first book, published in 1951, when he was forty years old. *Th Mechanical Bride* had the conventional anti-business bias of the literary man, aimed, as it wa at liberating the public from the manipulations of the advertising industry; but it also le McLuhan into the orbit of his colleague at Toronto, the economic historian Harold Innis. A McLuhan himself was quick to point out, it was from two books published by Innis in 195 and 1951, *Empire and Communications* and *The Bias of Communication,* that he drew th central concept of McLuhanism: namely, that any great new medium of communication alte the entire outlook of the people who use it. Innis insisted that it was print, introduced in th fifteenth century by Johann Gutenberg, that had caused the spread of nationalism, as oppose to tribalism, over the next five hundred years. McLuhan published his first major theoretic work, *The Gutenberg Galaxy,* in 1962, when he was fifty-one. He called it "a footnote to th work of Harold Innis."

His master stroke came two years later when he brought the Innis approach forward in the twentieth century and the age of television with *Understanding Media.* McLuhan theorize

that print had stepped up the visual sense of Western man at the expense of his other sense which in turn led to many forms of specialization and fragmentation, from bureaucracy, th modern army, and nationalistic wars to schizophrenia, peptic ulcers, the cult of childhoo which he regarded as fragmentation by age, and pornography, the fragmentation of sex fro love. In the second half of the twentieth century …enter television. Television, sa McLuhan, reverses the process and returns man's five senses to their preprint, pre-litera "tribal balance." The auditory and tactile senses come back into play, and man begins to us all his senses again in a unified "seamless web" of experience. Television, McLuha maintained, is not a visual medium but "audio-tactile." This was the sort of contra utterance he delighted in making, contradicting common sense without bothering to expla or debate. The world, he said, was fast becoming "a global village," that being the end resu of television's seamless web spreading over the earth.

The immediate effects of television on the central nervous system, said McLuhan, may b seen among today's young, the first television generation. The so-called generation gap, as h diagnosed it, was not ideological but neurological, the disparity between a print-bre generation and its audio-tactile, neo-tribal offspring. McLuhan was observing the ne generation up close. In the summer of 1939 he had been in California visiting his mothe who was teaching at the Pasadena Playhouse, when he met an American actress, Corinn Lewis, fell in love with her, proposed to her then and there, married her on the spot, an took her off to Cambridge, all in such a short order that she had to wire her parents to le them know she was now Mrs. McLuhan. Marshall and Corinne McLuhan had six childre four daughters and two sons. Personally, McLuhan had little patience with television or an other electronic medium, but he looked on with awe as his children seemed to study fo school, watch television, talk on the telephone, listen to the radio, and play phonograp records all at the same time. The new generation, he was convinced, was bound to sit baffle and bored in classrooms run by print-bound teachers. This, he argued, meant the education system must be totally changed.

But then the new sensory balance was going to bring about Total Change – he used capital T and a capital C – in any case. Just as the wheel was an extension of the human foo said McLuhan, and the axe was an extension of the arm, the electric media were extensions the human central nervous system, and these nervous systems would be brought together an irresistible way. His predictions were not tentative. Human nature would now b different. Nationalism, the product of print, would become impossible. Instead: the glob village. In the global village, he predicted, it would no longer be possible to insulate raci groups from one another. Instead, all would be "irrevocably involved with and responsib for" one another. McLuhan warned that the global village was not a prescription for utopi In fact, it might just as easily turn out to be a bloodbath. After all, he asks, where do we fi the most accomplished butchers? In villages. The global village could bring all humani together for slaughter as easily as anything else.

Yet he also believed the new age offered the possibility of something far more sublim than utopia, which is, after all, a secular concept. "The Christian concept of the mystic body," McLuhan wrote in one of the few explicit references to his fondest dream, "of all me as members of the body of Christ – this becomes technologically a fact under electron conditions."

And here we see the shadow of the intriguing figure who influenced McLuhan every bit a much as Harold Innis but to whom he never referred: Pierre Teilhard de Chardin. Teilhard d Chardin was a French geologist and paleontologist who first made a name for himself throug fossil-hunting expeditions in China and Central Asia. At the age of thirty, in 1911 (the year, so happens, McLuhan was born), he became a Jesuit priest and taught geology at the Cathol Institute in Paris. His mission in life, as he saw it, was to take Darwin's theory of biologic evolution, which had so severely shaken Christian belief, and show that it was merely th first step in God's grander design for the evolution of man. God was directing, in this ver moment, the twentieth century, the evolution of man into a noösphere – that was Teilhard d Chardin's coinage, a noösphere – a unification of all human nervous systems, all human soul through technology. Teilhard (pronounced Tay-yar, as he was usually referred to) mentior radio, television, and computers specifically and in considerable detail and talks abo cybernetics. Regardless of what anybody thought of his theology, the man's powers o prediction were astonishing. He died in 1955, when television had only recently come in widespread use and the microchip had not even been invented. Computers were hug machines, big as a suburban living room, that were not yet in assembly-line production. B he was already writing about "the extraordinary network of radio and televisio communication which already link us all in a sort of 'etherised' human consciousness" and "those astonishing electronic computers which enhance the 'speed of thought' and pave th way for a revolution in the sphere of research." This technology was creating a "nervo system for humanity," he wrote, "a single, organized, unbroken membrane over the earth," "stupendous thinking machine." "The *age of civilization* has ended, and that of one civilizatior – he underlined one civilization – "is beginning." That unbroken membrane, that noöspher was, of course, McLuhan's "seamless web of experience." And that "one civilization" was h "global village."

We may think, wrote Teilhard, that these technologies are "artificial" and complete "external to our bodies," but in fact they are part of the "natural, profound" evolution of o nervous systems. "We may think we are only amusing ourselves" by using them, "or on developing our commerce or only spreading ideas. In reality we are quite simply continuir on a higher plane, by other means, the uninterrupted work of biological evolution." Or to p it another way: "The medium is the message."

Privately McLuhan acknowledged his tremendous debt to Teilhard de Chardin. Publicly h never did. Why? For fear it would undercut his own reputation for originality? That wou have been very much out of character. After all, he acknowledged his debt to Harold Inn openly and on his knees in gratitude. The more likely reason is that within Cathol intellectual circles – and we must remember that McLuhan was on the faculty of th University of Toronto's Catholic college, St. Michael's – Teilhard de Chardin was under cloud of heterodoxy. Decades earlier the Church had forbade him from teaching or publishir his theory of evolution, since he accepted most of Darwinism as truth. None of his six bool on the subject was published in his lifetime. But among intellectuals at St. Mike's, as the called St. Michael's College, there was a lively underground, a Jesuit *samizdat* in Teilhard d Chardin manuscripts, especially after he moved to the United States in 1951. McLuhan wa fascinated by Teilhard but he presented a problem. Even in death he remained out of th bounds of Catholic theology, and McLuhan took his faith very seriously, all the more s

because he was a convert from Protestantism teaching in a major Catholic institution.

But Teilhard presented a secular problem as well. McLuhan was living in an age in whic academic work with even a tinge of religion was not going to be taken seriously. Inside th Church, Teilhard may have been considered too much of a Darwinian scientist, but outsic the Church he was considered too much of a Catholic mystic. When *Understanding Media* wa published in 1964, it was loaded with Teilhard de Chardin, but it would have taken anoth Teilhard enthusiast to detect it, and a subtle one at that. Not a single theological note wa struck.

Indeed, *Understanding Media* exploded upon the intellectual world in the mid-1960s with distinctly earthly brilliance and immediately caught the attention of many of the mo devoutly materialistic and practical minds in commerce and industry. In part it was th deceptively simple title, *Understanding Media,* which came across as a challenge: "You peop who use the media, who own the media, who invest millions in the media and depend on th media – you don't begin to understand the media and how they actually affect huma beings." By late 1964, corporations such as General Electric and IBM were inviting McLuhan the United States to talk to their executives. Their attitude was not so much "He's right!" "What if he is right? (We'd better find out.)" McLuhan informed General Electric that the might think they were in the business of making light bulbs, but in fact they were in th business of moving information, every bit as much as AT&T. Electric light was pu information, a medium without a message. IBM he somewhat condescendingly praised f having finally realized that they were not in the business of manufacturing equipment but processing information. He excelled at telling powerful and supposedly knowledgeable peop they didn't have the foggiest comprehension of their own enterprises. He never adopted tone of intentional shock, however. He was always the scholar, speaking with utt seriousness. He had a way of pulling his chin down into his neck and looking down the no of his long Scottish-lairdly face before he delivered his most delphic pronouncements. H seemed to exist out beyond and above them all, surveying them from a seer's cosmic plane.

But what turned Marshall McLuhan from a University of Toronto English professor with a interesting theory into McLuhan, a name known worldwide, was the curious intervention of San Francisco advertising man, Howard Gossage. Fascinated by *Understanding Media,* Gossag took it upon himself, at his own expense, to become McLuhan's herald, bringing him to th United States in 1965 and introducing him to the press and the advertising industry on th West Coast and in New York. It proved to be a brilliant campaign. Magazine article newspaper stories, and television appearances were generated at an astonishing rate. Late 1965 both *Harper's Magazine* and *New York Magazine* published major pieces about McLuha In the single year 1966 the number grew to more than 120, in just about every importa publication in the United States, Canada, and Great Britain. The excitement was over th possibility that here might be a man with an insight of Darwinian or Freudian proportions.

As his fame grew, so did the ranks of his detractors, particularly among literary peopl whom he regularly wrote off as hidebound, reactionary, and oblivious of how even their ow medium, print, actually worked. Scientists, meantime, didn't know what to make of him o way or the other. The heart of his theory, the concept of the human "sensory balance," fal within the field of cognitive psychology or, more broadly, neuroscience. Today neuroscien

is the hottest subject in the academic world, but even now there is no way of determinin whether or not any such balance exists or whether or not a medium such as television ca alter one individual's nervous system, let alone an entire society and the course of histor McLuhan treated any and all critics with a maddening aloofness. He was not trying to crea a self-contained body of theory, he insisted – although in fact he probably was – he was pioneer heading out into a vast *terra incognita.* So little was known, and there was so litt time. His mission was to explore, to make the "probes," to use one of his favorite words, open up the territory. Others, those who came after, could conduct the systemat investigations, run the clinical experiments, organize the data, and settle the disputes. H dismissed all opposition as what Freud called "resistance," a reluctance to let go of th comfortable notions of the past in the face of brilliant new revelations about the nature of th human animal.

In the wake of all the excitement over *Understanding Media* McLuhan established the Cent for Culture and Technology at the University of Toronto. This was an imposing laborator like name for what was, in fact, little more than a letterhead, a desk, the lined paper o which he wrote, by hand, and his amazingly fertile and facile mind. In this respect McLuha was like Sigmund Freud. Very little of what Freud had to say has survived the scientif scrutiny of the past half-century. In hindsight we can see that he was a brilliant philosoph of the old school who happened to live in an age in which only science was accepted gospel truth. So by night he led his philosophical speculations in through the back door of h clinic, and in the morning he marched them out the front door as scientific findings. Thus als McLuhan at the Centre for Culture and Technology. At bottom, McLuhan remained, throug it all, a literary man in the grand tradition of Samuel Johnson, Thomas Carlyle, Matthe Arnold, and G. K. Chesterton, with the gift of brilliant flashes of insight into the era in whic he lived.

He never endeared himself to literary people, however, because so many of his witties Chesterton-like sayings were at their expense. Asked to comment on the headlong rush writers and scholars into protest movements during the 1960s, he said: "Moral bitterness is basic technique for endowing the idiot with dignity."

In the mid- and late-1970s, the mocked had their revenge. McLuhan didn't seem to reali that an academic celebrity, if he wants to maintain his worldly eminence, is compelled to a oblivious of, or at least utterly aloof from, the journalists, show biz folks, and publishers wh so merrily magnify his reputation to star status. Freud and Einstein understood this very wel In 1922 the *Chicago Tribune* offered Freud $25,000, the equivalent of $300,000 today, come to the United States and provide psychoanalytical commentary the *Tribune* could ru during the trial of the "thrill-killers" Leopold and Loeb. The bearded one wasn't about to. H came to the United States only to give an abstruse lecture at City Desk-proof little Cla University in Massachusetts. McLuhan, in contrast, published co-written books with joke titles such as *The Medium is the Massage* and let Woody Allen put him in the movie comed *Annie Hall* playing himself, in cameo, as a pun-cracking, recondite theorist. By the time h died at the age of *69* in 1980 after a series of strokes, his critics, chiefly New Yo intellectuals, had successfully nailed him as "not serious" and therefore over and done with.

Yet McLuhan had introduced a notion that the *fin de siècle's* fast-proliferating breed

young computer techies would not let die, namely, the idea that new media such as televisio have the power to alter the human mind and thereby history itself. 1992 came – bango! – new medium, computers linked up to telephone lines to create an Internet. The Internet l McLuhanism up all over again, and the man himself was resurrected as something close to patron saint. He was certainly that to the edgiest and most prominent of the new dot-co journals, *Wired,* which ran his picture near the masthead in every issue.

Dear God – if only Marshall had been alive during the 1990s! What heaven those ten yea would have been for him! How he would have loved the Web! What a shimmering Oz h would have turned his global village into! Behold! The fulfillment of prophecies made thir years before! The dream of the mystical unity of all mankind – made real!

Of course, no sooner had the third millennium begun than the dot-com bubble burst ar McLuhan's young Silicon Valley apostles awoke with a shock. They shook their heads to clea them and tried to refocus their vision of the future. Many could not. But a Gideon's army the young could make out a tiny Halogen bulb, no bigger than a traveling-size toothpaste ca still burning …and its light shone 'round about them …and they say it still does.

New communications theorists will arise, as if from straight out of the asphalt, th concrete, the vinyl tiles, or the PermaPour flooring. But one thing will not change. First the will have to contend with McLuhan.

Preface

by Stephanie McLuhan

This book is the brainchild of David Staines, who recognized the literary potential of th audiovisual material from which it is derived. Although as co-editors we approached th project from different perspectives – David is a literary historian while I am a televisio producer – we have in common an intimate knowledge of the subject. As well, ou longstanding friendship made the collaboration remarkably comfortable.

There is no first time I can remember meeting David. He visited our home many times ove the years. It seemed logical, therefore, to call him for advice about what to do with th roughly two dozen tapes of Marshall McLuhan's lectures and television interviews I ha collected over twenty-five years. I hoped that David would recommend the ideal universit communications department where I could donate them; instead, he enthusiastically said the would make an important book. I was surprised by his suggestion and insisted that we g together to screen the tapes before we made up our minds. When we had done this, h summarized the proposed book: it would consist only of primary-source material that ha never been published before, and be based on unedited lectures and television interview electronically recorded over twenty years from 1959 until 1979. It seemed straightforwar and so we agreed to commit ourselves to the venture.

After many months, much brainstorming, and a few wrong turns, we finished with ou relationship intact. There were some exasperating moments that usually occurred when w were poring over transcripts of the various lectures, which were considerably more difficu to absorb than the television interviews. It would take three or even four readings of a piec to comprehend it fully, mainly because it was packed with so many thoughts and ideas.

In the twenty selections, which are presented chronologically, there are, of course, idea that come up a number of times, but it is engaging to follow the development of McLuhan thought process through the years. His views on his own work and on the world are valuab adjuncts to his publications.

Taken together, these lectures and interviews make up a biography/autobiography enablin you to read Marshall McLuhan in the original where you will find a more accessible, eve unmediated encounter than is possible through his books.

In the footnotes we have attempted to identify every quotation. In a few cases, howeve we could not locate precise information.

Our sincere appreciation is extended to Tom Wolfe for his masterful Foreword, to th broadcasters and interviewers who created the interviews, and to the university archivis who provided background information on the lectures.

Electronic Revolution: Revolutionary Effects of New Media (1959)

On March 3, 1959, Marshall McLuhan addressed a gathering of more than a thousand educators Chicago sponsored by the American Association for Higher Education. The theme of the conferen was "The Race Against Time: New Perspectives and Imperatives in Higher Education," ar McLuhan's talk was titled "Electronic Revolution: Revolutionary Effects of New Media."

The forty-seven-year-old McLuhan had already published The Mechanical Bride: Folklore Industrial Man *(1951), his shrewd dissection of the manipulative techniques of the advertisi industry. By 1959 he had become known in academic circles and beyond as a pioneering thinker the mass media.*

In this address he speaks as an educator to an audience of educators: "So rapidly have we begu to feel the effects of the electronic revolution …that all of us today are displaced persons living in world that has little to do with the one in which we grew up." The electronic revolution of televisio has made the teacher the provider no longer of information but of insight, and the student not t consumer but the co-teacher, since he has already amassed so much information outside t classroom.

Today in the post-mechanical age, we are in the same position as horse-minded people whe confronted with the automobile. To horse-minded people the most striking fact about the c is that it is a horseless carriage. In the same way, radio appeared as wireless to those wh had become accustomed to the miracle of the telegraph. Automation to machine-minde people strikes fear as being an extreme form of mechanization; but as Peter F. Drucker sa in his *Landmarks of Tomorrow,* automation "is merely a particularly ugly word to describe new view of the process of physical production as a configuration and true entity."[1]

So rapidly have we begun to feel the effects of the electronic revolution in presenting with new configurations that all of us today are displaced persons living in a world that h little to do with the one in which we grew up. Most of us can recall the days when childre pushed hoops along sidewalks and roads. There are more hoops than ever now. But no chi will push one. For children today live in a space whose configurations are not those of thir years ago. Instead of being attracted by an outer space designed in lineal fashion, childre now nucleate their own space, ballet-style. Living, for example, with electronic imagery which the image is formed by light *through* rather than light *on* (one major differen between TV and film), children respond with new sensory configurations and new attitudes their world.

Educators naturally feel that their job is to maintain the educational establishment, and preserve and advance the values so long associated with its procedures. Right now th means, for example, that we are going to insist that Johnny acquire the art of reading, if on because print is the matrix of Western industrial method in production, and print teach consumer habits and outlook as well. Print teaches the habit of sequential analysis and fragmentation of all motion into static units. Print teaches habits of privacy and self-relian and initiative. It provides a massive visual panorama of the resources of our mother tongu

which preliterate peoples know only by ear. In fact, print is not only access to our cultu and technology, it is our culture and technology. That is why in the electronic age we a threatened by new fast-moving and flexible media – while we sit in a Maginot Line convince of the importance of our position.

Of course Johnny must read. He must follow the lines of print. He must roll that hoo down the walk. He must roll his eyes in lineal, sequential fashion. We have only to procee to engraft the old right-handedness on his new left-handedness in order to win our point. B in the meantime we shall have lost his attention, and he may be subdued, but he will b utterly confused.

Taken in the long run, the medium is the message. So that when, by group action, a socie evolves a new medium like print or telegraph or photo or radio, it has earned the right express a new message. And when we tell the young that this new message is a threat to th old message or medium, we are telling them that all we are striving to do in our united soci and technical lives is destructive of all that they hold dear. The young can only conclude th we are not serious. And this is the meaning of their decline of attention.

I have said that the medium is the message in the long run. It would be easy to explain an confirm this point historically. Print simply wiped out the main modes of oral education th had been devised in the Greco-Roman world and transmitted with the phonetic alphabet an the manuscript throughout the medieval period. And it ended that 2,500-year pattern in a fe decades. Today the monarchy of print has ended, and an oligarchy of new media has usurpe most of the power of that five-hundred-year-old monarchy. Each member of that oligarch possesses as much power and message as print itself. I think that if we are to have constitutional order and balance among these new oligarchs, we shall have to study the configurations, their psychodynamics, and their long-term messages. To treat them as humb servants (audiovisual aids) of our established conventions would be as fatal as to use an X-ra unit as a space heater. The Western world has made this kind of mistake before. But no with the collapse of the East, that is, with its recognition that no viable society can be bui anywhere except on Western modes, it would be a very bad time to allow our own ne media to liquidate the older media. The message and form of electronic information patte is the simultaneous. What is indicated for our time, then, is not succession of media an educational procedures, like a series of boxing champions, but coexistence based o awareness of the inherent powers and messages of each of these unique configurations.

In his book on *Film as Art* Rudolph Arnheim, the psychologist, wrote: "The history human ingenuity shows that almost every innovation goes through a preliminary phase which the solution is obtained by the old method, modified or amplified by some ne feature."[2]

In the past thirty years all of our traditional disciplines in the arts and sciences have move from the pattern of lineal cause to configuration. Nowhere is this more true than in biolog Yet the methods used to reach configuration are still the old Cartesian methods of classic mechanics applied to the study of living organism. And configuration concepts such as stre or metabolism ecology and syndrome are essentially aesthetic terms.

As we move into the world of the simultaneous out of the era of mechanism and of th lineal succession types of analysis, we not only move into the world of the artist, but we se

the disappearance of the old oppositions between art and nature, business and culture, scho and society. It really does not matter to which phase of our culture today we turn. The hab of simultaneous vision of all phases of process is what characterizes the articulate awarene in the field.

Thus, in the movement of information today by technological means we have by far th largest industry. American Telephone and Telegraph alone greatly exceeds the capitalizatio of General Motors. The production and consumption of information, that is, is the ma business of our time. Culture has taken over commerce. Within industry itself the growth the classroom for workers and for management receives a budget at least three times the $1 billion budget of formal education in North America. And for research also, the trend ar ratios are similar.

The movement of information round-the-clock and round-the-globe is now a matter instantaneous configuration. Decision-making in business and in education as much as diplomacy is now a matter of grasping these configurations. They have a language and syntax of their own as much as does the iconology of pictorial advertisement, so that it is n only the business of education today to teach these new languages, but to teach how we ca in our previously achieved configurations of culture be enriched by these new powers and n merely dissolved by them. There is a classic definition of science originating in the Académ française after the death of Descartes: "The certain and evident knowledge of things by the causes." Survival indicates that we grasp by anticipation the inherent causes and not th effects of the electronic media in all their cultural configurations and make a fully conscio choice of strategy in education accordingly.

The eminent French anthropologist, Claude Lévi-Strauss, in an analysis of "The Structur Study of Myth," presents us with the typical configurational insight: "We define myth consisting of all its versions …therefore, not only Sophocles, but Freud himself, should included among the recorded versions of the Oedipus myth on a par with earlier or seeming more 'authentic' versions."[3] Applied to the study of media in education, the Lévi-Strau insight, which is characteristic of the approaches of the arts and sciences in our time, mea that we have to regard our media as mythic structures, as massive codifications of grou experience and social realities. And just as print profoundly altered the structure of th phonetic alphabet and repatterned the educational processes of the Western world, so did th telegraph reshape print as did the movie and radio and television. These structural changes media myth coexist in an ever-live model of the learning and teaching process. The changin configurations of this massive structure inevitably alter the bias of sight, sound, and sense each one of us, predisposing us now to one pattern of preference, and now to another. Toda via electronic means, the coexistence of cultures and of all phases of process in med development offers to mankind, for the first time, a means of liberation from the senso enslavement of particular media in specialized phases of their development.

What Harold Innis well called *The Bias of Communication* concerned not only the forms which men have chosen to codify information but also the causal effects of stone, papyru and print on the changing structures of decision-making.

Mr. Parkinson has recently entertained us with an analysis of bureaucratic decision-makin as it exists in the written mode of the memorandum syndrome. The written forms

information movement begin to look quaint after a few decades of electronic informatio pattern. At present the co-pilots of Canadian jet fighters have to make decisions in qui another configuration, namely, that of the instantaneous. Before being assigned to the common task, they undergo a long phase of what is called "going steady." When final assigned to their plane they are publicly "married" by the commanding officer in a sobe ceremony. Today, it is felt only marriage can connote the degree of togetherness, toleranc and sympathy necessary for decision-making in the use of new technology. This new patter is the subliminal but overwhelming message of the media since the telegraph. Yet nowhere our educational establishment have we made provision for the study of these profour messages which impose their configurations on the sensory equipment of children from the first days of existence. Yet some such provision would seem to be indicated against th persistent effects of media fallout.

One effect of the commercial movement of information in many media is that today w live in classrooms without walls. The printed book created the classroom as we know it b making available exactly repeatable information. Even if the manuscript or handmade boo had been cheap enough for all, it could never have been uniform or repeatable. Moreove the best manuscripts are slow to read and create a totally different feeling for language in th student – a feeling for the multiple layers of meaning. Such a feeling has returned toda especially since television, with its light *through* rather than light *on* the image. In a word, th printed page was no more a cheaper manuscript than the motorcar was a horseless carriag And the repeatable character of print had consequences in science and industry which we a still working out.

But all previous configurations, including that of print from movable type, undergo a so of alchemical change when they meet a heavy new stress or pull from a new type configuration.

I have called the electronic age, which began with the telegraph, the post-mechanical ag For now, that which moves in our new structures is no longer wheels and shafts (exce incidentally), but light itself. We can now see in depth the shape of the Gutenberg myth a technology. Our knowledge of the causal operation of the Gutenberg configuration might no save the Indians and the Chinese a great deal of needless liquidation of many elements their cultures, which we have come to value in the West. But even more urgently we nee prescience of the full causal powers latent in our new media in order that we may do for o own print culture what we could also do to save Chinese ideogrammic calligraphy a education. A kind of alchemical foreknowledge of all the future effects of any new medium possible. Under electronic conditions, when all effects are accelerated in their mutu collision and emergence, such anticipation of consequence is basic need as well as ne possibility. For example, our present concern about closed-circuit television in education parallel to the sixteenth-century concern about whether print and the vernaculars could do serious educational job. It is actually asking whether the car can ever supplant the horse. W are losing precious time in such static retrospection.

Let me mention one central feature of the electronic configuration, namely, its stro tendency to reverse producer-consumer relationships. Print over the centuries had stabilized pattern of producer-consumer relations. But with the telegraph a century ago the reader

the press had to assume an editorial function unknown to the reader of the pre-telegrap press.

When news moves slowly, the paper has time to provide perspectives, background, an interrelations for the news, and the reader is given a consumer package. When the nev comes at high speed, there is no possibility of such literary processing, and the reader is give a do-it-yourself kit. This telegraph pattern was soon transferred to poetry, painting, an music, to the bewilderment of consumer-oriented people. When John Dewey attempted t transfer the same electronic or do-it-yourself pattern to in-school education, he failed. He ha not analyzed the situation adequately nor had he any glimpse of the media factors operativ on his own enterprise. But had he merely turned the do-it-yourself bias towards the trainin of the young in the perception and judgment of the out-of-school media, he would hav succeeded, and we would all of us be in a much stronger position educationally today becaus that is precisely the task we must now tackle – the training of the young in mastery of th new global media.

Most of my remarks so far have been pointing out the mere nature of the technologic causes which, past and present, produce change in educational patterns. These causes a mainly subliminal and non-verbal. And may it not be that the new importance that is no accorded to the arts, both in education and in industry, is owing to our awakened sense of th role of art and artists in raising subliminal and non-verbal factors of experience to the level o conscious articulation?

In a simultaneous information structure such as the electronic global community, w cannot afford subliminal factors since their operation is haphazard. The simultaneous compe us to make a social order that, like a poem or painting, is totally realized in its interrelation and in which each factor has total relevance.

To record briefly some basic educational changes which are now discernible and may we foreshadow major lines of development, let me suggest the following:

We have, in the age of literacy, educated more and more members of society. In th electronic age we shall educate more of each person. We now move from education extension to even greater extension, but in depth as well.

Is not this the drift of our new concern with the gifted child?

The meaning of the New Criticism today is not just literacy but a shift to reading in dep with total awareness rather than the single-plane approach of the older literacy.

As we extend our educational operation by television and videotape we shall find that th teacher is no longer the source of data but of insight. More and more teachers will be neede for the type of depth instruction that goes naturally with television, with light *through* rath than light *on*.

The need for more and more profound teachers because of the very medium of television shadowed in the panel show, at least to the extent that it seems more natural, even sin radio, than a single source of comment and information. Two or more teachers in dialogu with each other and with class or audience create exactly that sense of light *through* rath than light *on,* which is the nature of the television image or mosaic as compared with mov or print. In the same way with the panel, the voice comes through the audience rather than

the audience.

In the same way that industry now makes the consumer the producer by means o motivation research, do not educators now recognize the education problems to b motivation rather than consumption of packaged information? The fully motivated student creative in his consumption and cognition. He is co-author and co-producer, so that the ne teaching must increasingly cast the student in co-teacher roles. And, indeed, he is alread potentially in such a position because of his vast intake of information in out-of-classroo experience, which is only in part shared by the teacher.

Increasingly the business of education will be discovery and interrelation. And just a industrial production now depends entirely on higher education, and as culture has becom the main business of the globe, so learning and not teaching may well become the mo highly paid profession. As we begin to learn for participation, rather than for specialis applied knowledge patterns of action, we can look back and see how the growing habit o conferences already forecasts this change in the roles of teacher and learner. Applie knowledge for production is now taken for granted and knowledge shifts to the global role o community and participation in a way commensurate with the roles of the new media.

1. Peter F. Drucker, *Landmarks of Tomorrow* (New York: Harper & Brothers, 1959), p. 5.
2. Rudolph Arnheim, *Film As Art* (London: Faber & Faber, 1958), p. 146.
3. Claude Lévi-Strauss, “The Structural Study of Myth,” *Journal of American Folklore* 68 (1955), p. 435.

In 1959–60, on sabbatical leave from the University of Toronto, McLuhan served as director of t Project in Understanding New Media for the National Association of Educational Broadcasters Washington, D.C. He was an extraordinarily prolific writer of scholarly articles, and by this time h views on the electric media were already so well-known in academic circles, he was the centr figure at the third annual Conference on the Humanities on October 28 and 29, 1960, sponsored b the Ohio State University's Graduate School. The general subject of the meeting was "Popular/Ma Culture: American Perspectives."

On the first day, McLuhan gave a lecture titled "Technology, the Media, and Culture." At th stage in his career, McLuhan was unabashedly optimistic about the potential of the new electr media: "The emergence of a global community of learning is a natural outcome of a world in whic the production and transportation of commodities finally merges with the movement of informatio itself."

On the second day, McLuhan participated in a panel discussion chaired by Gilbert Seldes (1893 1970), the leading cultural critic of the day. The theme was "The Communications Revolution Joining McLuhan on the panel were two professors of communications at Ohio State Universit Edgar Dale (1900–1985), professor of audiovisual education, and Keith Tyler (1905–94), profess of radio education. During their conversation McLuhan articulates one of his most famous theorem namely, that television is a cool medium that will not tolerate hot characters.

TECHNOLOGY, THE MEDIA, AND CULTURE

A member of Harvard's faculty of Far Eastern studies was dining some years ago with mandarin friend in Peking. He was both pleased and puzzled to note that the room wa adorned with American pin-ups, with college pennants, Coke bottles, book-matches, an advertisements from American magazines. The Harvard man spoke with enthusiasm about th mandarin's broad interest in American life as here displayed. But the mandarin said he merel wished to reciprocate the courtesy shown to him in America by his many friends whose wal and mantles were filled with the coolie art of prints and domestic trash from Eastern bazaars

In the same way, we may have been baffled to hear that Picasso has always had a kee regard for American comic-strip art and James Joyce surrounded himself with materials o the most popular songs and journalism. Flaubert was Joyce's master in the poetic scrutiny o the stereotypes of the arts of mass appeal. His analysis of these new popular forms in th middle of the last century justified his saying that if people had read and understood h *Sentimental Education* there would have been no war of 1870. In the same way, Wyndha

Lewis observes that if people had understood his analysis of popular culture in *The Art Being Ruled,* there would have been no World War II.

What these men were saying about their serious scrutiny of the popular arts is now bein said by John Kenneth Galbraith in the current issue of *Horizon* [Sept. 1960]. Writing abo "The Muse and the Economy," Galbraith makes in relation to business the point that for mo than a century has been palpable to the artists of the Western world, namely, that for th decision-maker, popular taste affords no timely data. But the experimental artist is all th time building models of future situations which afford reliable beacons for the soci navigator. The social scientist can only report on current patterns of taste, he has no access future patterns such as the artist has always had. And the reason for this is simply that th artist, as Wyndham Lewis said to me, "is engaged in writing a detailed history of the futu because he is aware of the unused potential of the present."

The very next article in the same issue of *Horizon* is by Russell Lynes, who in *Life* magazin a few years ago reported a reversal of all known laws of nature and economics in th emergence of the penniless intellectuals of America as holding the whip-hand in the control design of consumer goods. Our very topic for this conference illustrates a hardening of th categories of thought and perception in terms of consumer goods. Nothing is mo characteristic of the highly literate than the assumption that the difference between popul culture and elite culture is a difference in the type of product that is consumed. He takes for granted that "by their cornflakes ye shall know them," not "by their fruits." The whole our humanities programs have been structured on the consumer assumption of value. O writers and poets and artists have had to learn producer orientation and creativity elsewher in the newspaper office, on Madison Avenue, and in Hollywood. And Europe has always bee generous in recognizing the unique power and value of our artistic production in the popul commercial areas. They had had nothing to match it and are only just now entering the wor of consumer values which we in North America are ready to abandon.

The book was the first mass-produced commodity. Print, by definition uniform a repeatable, not only created the very concept of "commodity" but made possible markets f such uniform and repeatable commodities. That the operation of the forms and matrices the print assembly line when extended to all forms of production should also have shaped o attitudes to elite activities is quite natural. In England and America alike the elites have bee lotus-eaters, elegant consumers of imported goods simply because a print-oriented world is consumer world. During the past century our mechanical print galaxy has been moving in an electric galaxy with a resulting reconfiguration of patterns even among the famili components. The electric galaxy is producer-oriented, rewiring our cultural circuit, a throws malign lustre on our traditional consumer values. This process which began wi telegraph has reached full proportions with television. Our teenagers assuming the arti outlook have rejected the consumer world. And even in business, as so popular a writer John Kenneth Galbraith has testified, the old quarrel between art and commerce has ended a wedding. We are now ready for a peripeteia in the Western drama. Having long admire the spontaneity and art of backward men in preliterate and semi-literate societies, we no find ourselves well on the road to retribalization via our new electric media. Having lo talked of the plight of the individual in a mass society we can now get ready to write abo the plight of mass man in an individualist world. Even the wheel, the basis of Weste

mechanical enterprise, may in the jet age reamalgamerge with the animal form from which originally was abstracted.

The entire drama of conflict between individual and mass is most usefully studied unde the aspect of the role of a poet in relation to his medium, because a language is a ma medium in all senses. Nobody in particular made it. Yet individuals have always to think ar dream and feel in terms of this mass medium. The poet is in a special way the custodian ar rejuvenator of language.

Wyndham Lewis, the painter and writer, devoted much of his energy to the study ar delineation of the Western drift back into the "sacred" auditory space of primitive ar irrational man. He repudiated the Spenglerian picture of this development. In place Spengler's popular notion of inner cosmic necessity, Lewis placed the responsibility for th trek from rational, visual values squarely at the door of artists and scientists and philosophe who were climbing aboard the bandwagon of popular mass media. That is to say, Lew diagnosed the fondness of the avant-garde painters and poets for newspaper and cinemat techniques as an intellectual failure and also as the abrogation of all moral responsibility Western values. The Lewis critique of Joyce and Pound, for example, does not question the high artistic talent, but it derides their readiness to go along with the popular arts and trend of this century.

In the course of his indictment of our age as willing to abandon the entire heritage of th Greco-Roman achievement, Lewis brought most of the aspects and activities of the twentie century under scrutiny. His work offers what is perhaps a more complete guide to the ar and letters of his age than that provided by any other writer in the history of literatur Recollecting in tranquility the many volumes of his work, it might be well for us to as "What avails the highest and most rigorous intellectual analysis directed to the very problem we have chosen to consider at this conference?"

When, in 1896, Bernard Berenson wrote, "The painter can accomplish his task only b giving tactile values to retinal impressions,"[1] he was not only very much aboard th impressionist bandwagon, he was advocating the television image. Unlike the movie imag the mosaic mesh of the TV bombards the viewer with tactile values. Popular technology wou thus seem to be responsive to the highest behests of art. It was precisely in this type matter that Lewis attacked his fellow artists for merely going along with technology. Lew had the utmost contempt for the *Zeitgeist* and for those artists who try to discern the grimac of the *Zeitgeist* so that they can keep in line with it. He was not misled by any idea that th effects of new art forms could be mitigated by a flourish of noble "program content." Artis have always known that any art form has the power of imposing its own assumptions on th beholder. Any medium of communication is, like an art form, an extension of one or more our senses. Speech alone is an extension of all of our senses at once. The mix or proportion our senses made external to us ("uttered" = outered), the ratio or mix or proportion of ou senses involved in speech or radio or photography, imposes non-verbally the parameters frame of all human operations. The unspoken and even subliminal assumptions in any patter of human association are dictated by the available means of codifying experience and moving information. General awareness of this quite drastic fact seems to have departed fro literate communities soon after the advent of the phonetic alphabet. When the alphabet was

revolutionary novelty, the Cadmus myth was formulated to explain the social operation o the alphabet. To wit, King Cadmus, who had introduced the Phoenician letters to Greece, ha sowed the dragon's teeth, from which sprang up armed men. Myth would seem to be qui simply the perception and statement of a complex action of causes and effects in a sing glance or gestalt. In the electronic age, when time and space factors are very much reduced information flow, it is once more natural for us, as for men in small oral communities, t think mythically. For today it is easy to perceive consequences embedded in any kind o innovation. If we don't see them, they clobber us very quickly. In industrial design today, fo example, the gap between product and consumer reaction has been reduced so far that the say with James Joyce: "His producers are they not his consumers?"[2] And instead of old fashioned concepts of making the public aware of new products, they now speak of makin the product conscious of its public, or target. The consequences of new media are perceive so fast that the dullest minds have begun to anticipate such effects by examining the forms o causes that are to be released on a public.

The largest item of industrial budgeting has for some time been the allocation for researc This is from necessity. An industrial galaxy is propelled so swiftly that it is constant invading other galaxies with resulting stress and change of configuration. Peter F. Drucke points out in his book *Landmarks of Tomorrow* that it is no longer feasible in decision-makin to exercise delegated authority, but only the authority of knowledge. When informatio moved slowly in written form, job specialism and pyramidal hierarchies of function we normal and even workable. The telephone and related electrical instruments have rendere the familiar organization patterns as obsolete as the assembly line. The latter has bee liquidated by electric tape-recorded information flow, which coordinates with precision no one but whole clusters of operations. Richard Meier, in a paper given at Ann Arbor this pa April ["Information, Resource Use, and Economic Growth"], formulated a natural law fo media when he pointed out that increased levels of information flow result in substitutabilit

> With the elaboration of electrical engineering, and the fusing of many strands of chemica knowledge, a field that was evolving rapidly in a mainstream of its own that led from mas reactions to molecular, to atomic, and most recently to nuclear reactions, the possibility o a flexible, quick-acting, autonomous economy emerged. It is capable of substituting one se of raw materials by others so as to meet virtually all foreseeable emergencies which reduc or cut off supplies.... The task that remains is one of redesigning social institutions so tha they are consonant with the revealed potentials of resource availability and technologica efficiency.

With a parallel increase of accessibility of all cultures to all cultures and of all subje matters to all others, the redesigning of the educational establishments of the Western wor is equally urgent not as an ideal but as a necessity. The older patterns of corporatio management have had to be redesigned in the past ten years. And the new pattern unmistakably nuclear or fieldlike as opposed to the old hierarchies of jurisdiction of staff an line and pyramidal functions.

The new pattern is one of small teams comprising clusters of diverse competencies wi personnel accustomed to the crossing of functional lines in a perpetual dialogue o

interpenetrating awarenesses. We have begun to see the emergence of such teams in th humanities divisions of our universities. But we have tended to assume that the overa structure of specialisms of our universities are still relevant to the tasks of teaching ar learning. Soon we shall be engaged in historical consideration of just why current partitior and divisions of knowledge came to be established. Much in the same way, moder mathematics and physics have had to detach themselves from the assumptions ar parameters of Euclidean space.

A book such as *The Sacred and the Profane* by Mircea Eliade is devoted to illustrating ho both space and time are non-homogeneous and non-continuous to archaic man. That is to sa tribal man everywhere and at any time assumes the unique structuring of all spaces and tim he encounters from moment to moment. Such an outlook is normal to painters since Cézann and to poets since Baudelaire just as much as to the nuclear physicist. Today the problem is explain that anomaly – Euclidean space, and its correlative, continuous time. Since r preliterate society ever had any experience of Euclidean space it is not too daring, I hope, suggest that the fictions of Euclidean space may in a very special way owe their ver existence to our Western experience with the phonetic alphabet. Hieroglyphic, pictographi and ideogrammic modes of writing do not tend to bring into existence the abstract fictions flat, straight, and uniform space. But the phonetic alphabet is an abstract technology fo translating the multi-sensuous modes of speech into the merely visual. Letters are th language of civilization because they translate tribal man from his complex auditory ar tactile world into a simple visual one which we have called "rational" ever since it wa invented. On the other hand, number, the language of science, has been the means translating the merely visual back into the sense of touch and sound. In his book *Number: Th Language of Science,* Tobias Dantzig tells us that "The attempt to apply rational arithmetic to problem in geometry resulted in the first crisis in the history of mathematics."[3] Today, th crisis is occurring on a massive cultural scale. Our rational Euclidean world of continuous ar homogeneous space, extrapolated by the phonetic alphabet from the resonating tribal worl has now to face the electronic challenge of its own irrelevance and superfluousness. I thin Dantzig can help us some more to get our bearings here. Just before the passage alread quoted he is explaining the crucial use made in mathematics of the Renaissance concept of th "infinite process." If this concept does not derive from the new perception of perspective vanishing point, it is at least parallel to it. "The prototype of all infinite processes," say Dantzig, "is *repetition.*"[4] And this is a facet of the concept of convergence, recession, vanishin point, perspective, infinity which is inseparable from Gutenberg technology. For uniformi and repeatability are as basic to print as visuality to the phonetic alphabet.

Dantzig continues: "The importance of infinite processes for the practical exigencies technical life can hardly be overemphasized. Practically all applications of arithmetic geometry, mechanics, physics and even statistics involve these processes directly indirectly…. Banish the infinite process, and mathematics pure and applied is reduced to th state in which it was known to the pre-Pythagoreans."[5] That is to say, without the minu segmentation, whether of alphabet or of the infinitesimal calculus, there can be r translation, no bridge from the tactile, resonating, tribal world, to the rational, flat, visu world.

Dantzig simply points out that number aided by infinite process can measure our world b