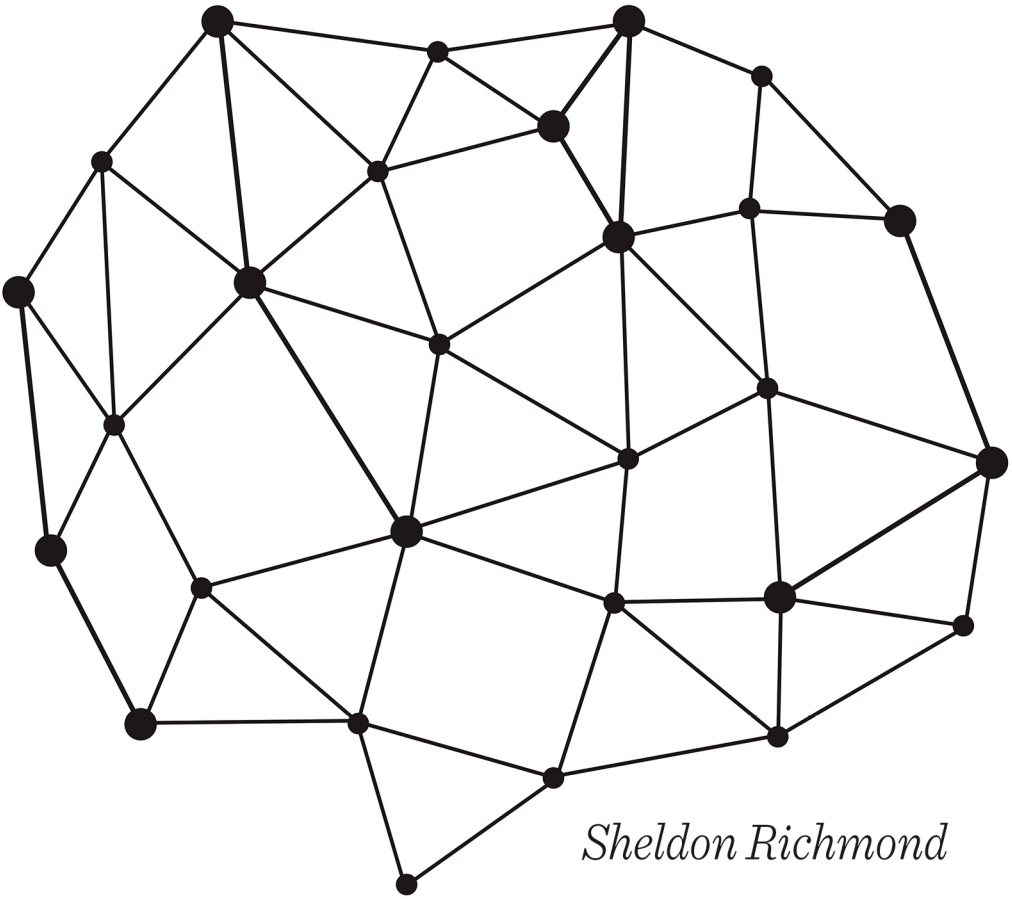
A Way Through the Global Techno-Scientific Culture



Sheldon Richmond

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By

Sheldon Richmond

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For my teachers and mentors:
Ian Charles Jarvie and Joseph Agassi

We are analog beings trapped in a digital world, and the worst part is, that we did it to ourselves.
(Donald Norman, 1998, p. 135)

...I regard the doctrine that men are machines not only as mistaken, but as prone to undermine a humanist ethics.
(Karl Popper, 1977, p. 5)

Computer science...is often largely about imaginary constructs and their exploration...In this respect computer science can be more like metaphysics than physics...
(Ted Nelson, 2004, p. 27)

We can only see a short distance ahead, but we can see plenty there that needs to be done.
(Alan Turing, 1950, p. 460)

ANNOTATED TABLE OF CONTENTS

The mystique of computer technology inhibits the widespread mastery of computers by ordinary computer users. How can we overcome the mystique of computer technology? In order to overcome the mystique we must recognize that the mystique is part of an ideology promoted and enforced by the technological elite or the techno-elite. Furthermore, the techno-elite uses the mystique of computer technology and other components of the ideology of the Global Techno-Scientific Culture to gain and maintain social control over computer technology. The techno-elite in their social control over computer technology turns users of computer technology into techno-subjects. How do we, as techno-subjects, break the social control by the techno-elite over computer technology? In order to overcome the social control by the techno-elite over computer technology, we techno-subjects must recognize that by having social control over computer technology, the techno-elite gain control over the Global Techno-Scientific Culture. How do we techno-subjects gain control over the Global Techno-Scientific Culture?

Democratic control of computer technology, the transfer of control over the computer from the technological elites to the individual users, to techno-subjects, allows non-experts to learn how to use and control computer technology. The boundary between the techno-elite and the techno-subject is dissolved; and the control of the techno-subject by the techno-elite is eliminated. Thus, we dispel the mystique of computer technology and, we gain democratic control over the Global Techno-Scientific Culture.

The monopolization of our Global Techno-Scientific Culture by digital information technology, the Technopoly, has resulted in the extinction of Knowledge, by reducing Knowledge to systems of symbols, formalized algorithmic hierarchies of symbol-systems without external reference: a totalistic virtuality, or real virtuality. The extinction of Knowledge has resulted in two mutually reinforcing situations. One situation is the rise of a new elite of technology experts. The other situation is the dummification of people. These two mutually reinforcing situations further result in an illegitimate role reversal between people and their machines. The machines become treated as smart; people become treated as dummies. The role reversal of machines and people reinforces the monopoly of digital technology over everything. The monopoly of the Global Techno-Scientific Culture, the Technopoly, becomes accepted without question and without criticism. However, there is a way to retrieve Knowledge, and that way is through restoring the (Ionian) tradition of critical discussion within all our institutions. Critical discussion can be restored by increasing democratic participation in our Global Techno-Scientific Culture, which amounts to implementing a socratic social architecture.

Many post World War II thinkers have been perplexed by the problem of how or even whether people from different cultures can understand each other. The problem arose when we started to think of culture as formative of language and thought. The common assumptions of most theorists of language are that language is fundamental to thinking and culture; and, language, thought, culture, humanity is a natural product of biological evolution. Though language and culture create hurdles for achieving cross-cultural understanding, the pursuit of technology and science transcends the limitations of culture, and indeed has created a monopolistic Global Techno-Scientific Culture or Technopoly. But within the monopolistic Global Techno-Scientific Culture of the Technopoly, there are two subcultures, the techno-elite who dominate the Global Techno-Scientific Culture, and the techno-subjects who comprehend little of digital technology. However, the traditional humanist oriented culture of techno-subjects has been overcome and virtually eliminated by the dominant Global Techno-Scientific Culture of the oligarchic Technopoly.

Dialogue is the key both to interpersonal dialogical relationships and critical enquiry. How do we alleviate the obstacles to dialogue as techno-subjects in the Global Techno-Scientific Culture or Technopoly? The

answer is: Use cross-cultural/social group dialogues as a model for dialogue as techno-subjects in the Technopoly. Cross-cultural/social group dialogue works through cultural borrowing, and then modifying those borrowed cultural elements. For cross-cultural/social group dialogue to occur, we have to treat cultures and social groups as having permeable borders that allow us to adopt and adapt elements from different cultures and social groups. Indeed, the daily reality of cultural and social life reveals that cultural/social group boundaries are not fixed. Though cultures/social groups seem (and can be made) parallel, their boundaries are fluid and porous. Individuals are able to cross cultures/social groups and simultaneously live and experience multiple cultures/social groups. Indeed, all cultures and social groups involve appropriations of other cultures/social groups and are in perpetual flux through cultural interactions and through individuals introducing cultural borrowings from other cultures. This feature of cultural permeability, living in multiple cultures and cultural borrowings, raises the question: what sort of social architecture or structure best allows for cross-cultural and cross social group dialogue? The answer is: the social architecture required both for cultural/social group development and cross-cultural and cross social group dialogue can be developed from the structure of Socratic dialogue.

The short of it is that by implementing socratic social architecture in all institutions, we create the space for dialogue within the Global Techno-Scientific Culture or Technopoly.

Philosophers can choose to leave everything as is or choose to improve the world through critical enquiry and discussion. Where we have no choice is that the world will change regardless of how we choose. I propose that philosophers, and for that matter, all of us, participate in the current radical transformation of society by acting as critical enquirers. Philosophers, and all of us, can participate in the changing world by implementing virtual dialogical interfaces in our various corporate organizations such as in

government, business, universities, in research institutes, in journals, and in conferences. Two structures I suggest are democratic relationships and interpersonal dialogical relationships. Democratic relationships occur when individuals share planning, decision-making, and intelligence. Interpersonal dialogical relationships occur when individuals speak with and listen to each other regardless of position in social hierarchies. Basically, these structures amount to the implementation of a socratic social architecture, for all our institutions.

The Global Techno-Scientific Culture makes life difficult or next to impossible for the archetypal Socrates, or the culture critic, or critical thinker, or critical enquirer, or independent thinker. Where can a modern day Socrates or current critical thinkers open their mouths?

In other words, that is the crucial question, the focal question of this chapter: can critics get a hearing in the Global Techno-Scientific Culture. But the question of whether critics have any place in modern day society, requires considering two other prior questions. First, how do Socratic teachers, thinkers, and critics function even in theory? Second, how has the Global Techno-Scientific Culture fashioned society? After discussing those two questions, I turn to the main question of this chapter: How critical enquiry or Socratic criticism can be heard in the Technopoly, the oligarchic Global Techno-Scientific Culture? The short answer is: concentrate on the serious four fault-lines of the Technopoly. To be explained.

Throughout this book I discuss how and why we have allowed ourselves to lose our sense of humanity, humanism (our humanity as creatures that seek to know, and seek to act morally), by the Global Techno-Scientific Culture. Why and how? Throughout this book I argue, in different ways, as follows: We live in a socio-technical system, the Global Techno-Scientific Culture, dominated by computer technology and other so-called "smart" devices; as well as the techno-elite who control the design, development, and implementation of those devices. We have allowed ourselves to become techno-subjects. In our modern socio-technical system we have various mistaken ideas about computers, i.e. computers are smart machines, and in many cases, are smarter than humans. Hence, we do something very strange with tools of our own making: we transfer human qualities (such as creative and critical thinking, judgment, decision-making, including moral decisions) to technology and take them from ourselves by transferring machine-like behaviour and as well transferring machine functions and attributes to ourselves. When we make such a transference between ourselves and our technology, we allow ourselves to lose both our mastery and control over our computer technology. We transfer our mastery of computer technology and our intelligence to the technology. Hence, we remove humanism, our humanity as creatures that seek to know, and seek to act morally, from and for humanity when we become techno-subjects. To regain humanism, we need to transfer back our mastery, and intelligence, from the computer to ourselves. How can we do this: regain our mastery and intelligence, our humanism? We need to open up computers to everyone so that we allow everyone to learn computer technology use and control both through trial and error and through consultation with our mentors, colleagues, and friends. Moreover, everyone needs to be given the opportunity to participate in the development and implementation of a new architecture for computer systems that conforms to humanity as analog-cybernetic creatures. Everyone needs to be given the opportunity to participate in the implementation of a new social architecture that permits universal interpersonal dialogue, universal critical discussion, and universal full participation in social decision-making.

PREFACE

> We can only see a short distance ahead, but we can see plenty there that needs to be done.
> (Alan Turing, 1950, p. 460)

Warning: this Preface has no plot-spoiler; indeed, I do not outline the book, nor summarize each chapter, nor tell you the main thesis and argument of the book. Good prefaces usually do those things.

Why do I write a Preface?

I do not need to summarize each chapter, or tell you the main argument of the book: all that information is in the Analytical Table of Contents, and in the Prologue as well as Epilogue, if you want to read any of that first rather than last.

Again, we are back to the question, why do I write a Preface? I thought I could tell the reader how this book came to me, and also, in that way introduce myself to the reader. I view this book as an attempt to get the reader to engage with the questions and proposals in it, and thereby to get the reader to engage in a virtual dialogue with me.

Some years ago after working for thirty one or so years as a systems analyst, a computer person, in a corporate institution, I retired and decided to return more fully to my first vocation: writing and reading philosophy. Though I did attend conferences, present papers, and write some articles and reviews, and have some of those published in academic journals, I did this in my spare-time as a hobby. My situation was similar to a friend at my place of work, Gorilla (his nickname that another friend at work, Pest, gave to him. “Pest” was the nickname Pest gave to himself, and his nickname for me was “Bananas and Nuts”, my main snack time and lunchtime diet at work). My friend Gorilla had a passion for wrestling, weight-lifting, and leading and singing in a semi-professional 1950s style Rock and Roll band. He did this after hours. During daylight hours, he worked as a drafts-person, first manual, and later on a computer-aided drafting system. (My doing in part, because I was assigned the task of evaluating and recommending the then leading edge technology for

computer assisted drafting.) I will talk more about Gorilla and other persons in my various corporate departments in Chapter Four, Dialogue. Gorilla loved music, but had to make a living. Bananas and Nuts, Sheldon, loved philosophy, but desired to make a living and not to work in the part-time, casual labour, philosophy workforce.

To shorten the story, I became a professional computer systems analyst on the job, taking a degree from a local university in the field, and various professional courses from private computer training companies, thanks to my managers. During this time I developed a love-hate relationship with computers. Computers made life easier, no more literal cutting and pasting that I used to do as a student and later as a philosophy professor writing essays with a typewriter. I had to use scissors and paste, or tape, when I wanted to change things around. No longer. The text processing application on the new personal computers had virtualized the functions of scissors and paste or tape. I had purchased a so-called "portable" computer for home and a desktop personal computer was provided to me by management at work, as part of my training in my development as a programmer and then systems analyst. At that time (1980s), what one could do with a word processing application, not to mention, spreadsheet, and database, as well as easy to programme Basic (MBASIC, CBASIC, and other varieties), amazed me.

I was part of the group locally or regionally, and in headquarters (or top-level management), that eventually proliferated computers and networks to every work-station (or desk, and cubicle) in the Corporation. I noticed that people became frustrated with their computers: why? computers helped us do our jobs more effectively and efficiently. I also noticed that technical people, all of we technical people, became frustrated with our own computers, computer networks, servers, and related technical equipment: strange things happened, files disappeared, computers crashed, even literally burned, everyday there was a surprise. One of the work-time French language teachers I had when I was periodically called out of class to work on the latest crisis, compared me to a firefighter. An appropriate analogy, but I had no life-threatening incidents, other than frustrated people getting angry with us due to another crazy failure in the system.

Computer machines drove us all crazy, why? They were touted as miracles that could do magic: provide automated inventories; have national conferences online where no one had to fly across country; allow us to solve computer problems of remote users, who were otherwise isolated in the far north office; and many other great things.

But why did computers frustrate us so much? Not only the novice computer user who had done everything by hand and gave written notes to a secretary to type up, or file, or compose a letter and post, but also we technical wizards had our own problems, where at times we had to call on the higher and sometimes highest level wizard to help us with a roll-out (installation) of new technology and applications. During this time I took the after-hours opportunities I had to write essays on the philosophy of computer technology to present at conferences, and to think things through for myself. Even some publications happened. But the only way I knew, given my first-life, was to write through my puzzles in order to help me understand what was going on. Also, I took courses, not just to keep up-to-date with the latest technology and applications, but other courses in cognitive science, and systems analysis and design, to help me understand philosophically what was going on with people versus technology. How come the technology that very smart people invented and developed ended up frustrating other people that were supposed to benefit from the technology? These other people were smart too: professionals in various fields, and long-time and highly skilled employees who were masters at their jobs, at least before computers landed on their desks. Where did this dissonance come from?

The question of the discrepancy between techno-experts thinking that computers will benefit everyone, and everyone who became frustrated, daily, by some computer misfire, puzzled me over the thirty-one years of work.

After retirement, one of my friends, not a philosopher, happened to mention a book that he liked by a well-known philosopher whom I actually heard lecture when I was a graduate student. I was no fan of this particular philosopher and the type or school of philosophy of which he was one of the leading exponents. However, I thought to myself, time to give a second look at various schools of philosophy and approaches that I dismissed. I decided to give those schools of philosophy and approaches that I dismissed as soon as I had become a Professional Philosopher, a second look. I could get books from a variety of schools of thoughts to review. Which I did and do.

Then one day, I ran into another retired acquaintance who knew that I had a background in philosophy, and he asked me, how's the book going? What book, I answered. You told me you were going to write a book. No, I said, I decided to write essays and book reviews, not a book. Too bad, he said, you should write a book.

His words nagged at me. I looked at what I had written over and over again from various angles, like a musical composer who repeats themes with counterpoint throughout a single composition. The essays I wrote, as a whole, were variations on themes with counterpoint, over my thirty-one years at work, and I realized here is a book. Moreover, unlike aesthetics, philosophy of art, and philosophy of science, which I wrote about in my dissertation. I actually had first-hand, real-time, real-life experience with computer technology, not just from reading books, listening to lectures, attending conferences, making up presentations and papers for conferences and journals, or attending concerts, looking at masterpieces. I had first-hand, real-time, real-life experience with computer-technology and the techno-social environment. I had first-hand, real-time, real-life experience with what I call the Corporation, basically a large corporate enterprise where budgets have to be met, and employees dismissed for economic reasons, and all that goes into running large national and international corporate enterprises, public and private, in the world of today.

I knew whereof I wanted to speak, and so I decided now is the time to break my silence. I think that I have a book here where I speak from my own life-experience in a form that is meant to open discussion with others, especially and including those who disagree with this or that, and even everything I say here. By the way, if there is anything new or original here (most of it you will have experienced yourselves, or at least read about), it is this: the choice to put up with computer frustrations or the choice to eliminate those frustrations by changing and improving the very basis of computers and the social-technical system surrounding computer technology, is ours to make and do.

I conclude the Preface with a short bit of advice for the reader: as I said, the book is contrapuntal in form repeating themes and variations on those themes, so you can start anywhere, and read in whatever order you like. The Table of Contents gives everything away, anyway. No mystery here, I spell it all out, and I hope you are willing to engage with me in discussion, at least virtually, when reading this book.

ACKNOWLEDGEMENTS

My family, Marilyn Loshin Richmond and Elken Richmond, and my friend since childhood, Garry Levman for providing moral support and alternative outlooks for everything. My friends, among whom are philosophers, intellectuals, business people, professionals, workers, artists, artisans, musicians, and all of whom are questioners, those with whom I talk with in personal face-to-face contact, and those with whom I talk with virtually in email, for discussing various thoughts with me over many years and some only very recently as new friends. My former colleagues in the *Corporation* (a fictional name to safeguard the privacy of former co-workers), managers who supported my intellectual curiosity, and colleagues who worked with me through various technical and human situations.

Some of the chapters contain and modify various themes from my previously published essays. I thank the various editors for providing me with permission to use modified versions of the essays below in this book.

Chapter One: Mystique: "The Mystique of Computer Technology and the Waning of Critical Enquiry"113-127, Encouraging Openness: Essays for Joseph Agassi on the Occasion of His 90th Birthday, eds. Bar-Am, Nimrod, and Stefano Gattei. Cham, Switzerland: Springer.

Chapter Two: Knowledge, "Post-Knowledge: The Extinction of Knowledge in our Techno-Scientific Culture". Dialogue and Universalism 29 (2): 123-145. editor-in-chief: Małgorzata Czarnocka

Chapter Four Dialogue: "How to Alleviate the Cultural Obstacles to Dialogue". Dialogue and Universalism 27 (4): 87-98, editor-in-chief: Małgorzata Czarnocka

PROLOGUE

> ...assume that we find a physical machine whose mechanism we do not understand and whose behaviour is very human. We may then wonder whether it does not, perhaps, act intentionally, rather than mechanically (causally, or probabilistically), i.e. whether it does not have a mind after all; whether we should not be very careful to avoid causing it pain, etc. But once we realize completely how it is constructed, how it can be copied, who is responsible for its design, etc., no degree of complexity will make it different in kind from an automatic pilot, or a watch, or a wall-thermometer... Objections to this view...are usually based on the positivist doctrine of the identity of empirically indistinguishable objects.
> Karl Popper (1963,1965 p. 296)

The main thesis of this book is: in our monolithic Global Techno-Scientific Culture that we have created, we have not overtly, but by default, unintentionally, unaware and even unexpectedly and surprisingly, found as part of the package deal of the Global Techno-Scientific Culture, that we are losing our sense of humanity, our humanism (our humanity as creatures that seek to know, and seek to act morally). The global loss of humanism is self-inflicted as intertwined with the whole package deal, the monolithic all-encompassing system of the Global Techno-Scientific Culture. Because our loss of humanism is self-inflicted and it is global, it cuts through all particular nationalities, cultures, religions, ethnic and gender identities. However, we can choose to change our self-inflicted loss of humanism and choose to change our Global Techno-Scientific Culture. As the title of the book says: there is a way through the Global Techno-Scientific Culture.

This book is an extended attempt to propose a very general direction through the Global Techno-Scientific Culture, so that we can gain control over monopolistic digital computer technology. I borrow the term Technopoly from Neil Postman (1992) as a convenient label that epitomizes the nature of the control that the scientific technological culture has over humanity. The Technopoly is a monopoly that has permeated and transformed all specific cultures into one monolithic culture, not to deny there are surface variations within the Technopoly that have been carried forward among particular nationalities, traditions, religions, and ethnic

groups. But the Technopoly is a tsunami wave that has flooded every culture, every nationality, every religion, every society, every institution, and almost every individual (even those who do not have smart devices).

Taking a step back: The question that has occupied me over many years was: why are so many people frustrated by digital computer technology? Moreover, whatever we have done to make computers more user-friendly, more efficient, more handy, more multi-purpose and versatile, has not lessened our frustrations, but has increased them and has made us increasingly dependent on digital computer technology. Why? Digital computers do not fit us. Digital computers are basically misfits. How? Humans are analogue-cybernetic creatures: we like to compare, contrast, and we like to use feedback to improve our comparisons and contrasts. Analogue: we seek out how we relate to each other and how everything relates to us and each other. Cybernetic: we use feedback from our attempts to seek relationships, to check those searches, our mistakes, bugs in our systems, to make corrections in our searches.

Let me take another step further back: I came up with those answers to my question as to how digital computers frustrate us by asking myself: why do so many people fascinated with computers, and who also spend their careers in computers, come to think that people, minds, knowledge, society, culture, work, and even the universe are nothing but and nothing more than a form of digital computation? (Vlatko Vedral, 2018) I thought that a computer is nothing more than a device, a machine, that uses algorithms, instructions, to transform data. However, many people fascinated by computers see the computer as something more than a dumb machine that just follows instructions, even when following instructions to make new instructions. Moreover, many people, not only fascinated but also overwhelmed by computers who are experts in the fields of computer support, development, science, treat the computer as a mythical hybrid device, that produces knowledge, that is intelligent, that may even be conscious and have a mind, and ultimately have feelings. Then, I struggled over many years, maybe too many years, to understand this: why do people think that if computers can do things that humans do, even faster, and better than humans do, then computers must be using processes that humans use, and have attributes that humans have? It took me a while to find an answer to why smart people think that computers, that they made, or other smart people made, are smarter than themselves. The answer involves the compounding of three errors. The first error is the mistaken idea that if something walks and quacks like a duck, it must be a duck. This mistaken idea is based on the principle of the identity of look-alikes,

behave-alikes, function-alikes, or work-alikes: the identity of entities that have no observable differences. The first error is due to overlooking the truism that things are more than they seem. For instance, identical machines produced on a robotic assembly line, such as the same model cars with all the same features and colours, are not identical, though they each could be impossible to tell apart coming off the assembly line if each were not stamped with a unique vehicle serial number or ("VIN"). Generally, some things appear alike or behave alike or function alike but their underlying hypothetical structures differ, or their historical, social, political context may differ, or their provenance may differ, or their genealogy or genesis may differ, even when we cannot directly observe those differences. The second error is a semantic one: we use language that is appropriate for humans and apply that language to machines. We apply such words, as "smart", "learn" and "intelligent", or in general, the language that is appropriate to cognitive attributes and functions, and the language that is appropriate to rational decision-making functions, to computers. This error is known as a category mistake, we apply words that apply to one category of entities to another category of entities. It is a great thing to do when writing poetry, or when using metaphor to reveal a new way of looking at things, but it can lead to gross intellectual errors. The third error is in treating imaginary constructs, virtual constructs and social constructs, fictions, as metaphysical entities. We do this with respect to computers when we treat artificial and fictional design elements, social decisions, and even technological elements as permanent, and inevitable features of computer technologies and of the Global Techno-Scientific Culture. For instance, we have treated the following virtual, imaginary or fictional and social constructs of both the technology of computers and the Global Techno-Scientific Culture as inevitable metaphysical realities: the digital architecture of computers; the social choice to use computers to make financial and other decisions for us; or the social choice to use computer technology to do certain highly demanding and cognitive functions for us. Once we turn these technological virtual features, technological designs, and technological social uses into fixed realities, into metaphysical entities beyond changing, we block all critical discussion of those features and we block all attempts to develop alternative non-digital technologies and alternative social uses for computers.

Computers do a lot of things that humans do, but they are not identical to humans. They simulate, they imitate, but they don't have what they simulate and imitate. Computers simulate knowledge but don't have knowledge: they are not smart, they are not intelligent. Computers simulate consciousness,

but they don't have consciousness and they do not have minds. In general, it is important to keep in mind that when something simulates another thing, it means that it is not that thing. A simulation is not the real thing. This truism is wonderfully brought home in the classic children's book, The Wonderful Wizard of Oz (1900). The Wizard turns out to be a huckster hiding in a box, pulling levers that simulate the powerful, magical operations of what turns out to be the fake Wizard.

The sum of it is: Computers are machines and nothing more. Computers do not deserve respect, nor reverence nor awe. Our Global Techno-Scientific Culture can be changed. We can choose to change our Global Techno-Scientific Culture now.

But I could be wrong about all this. In this book I make proposals, suggestions, and arguments. In other words, I am engaging with readers of this book in a virtual dialogue. Also, I am engaging with the various books I have read, and people I have encountered in places of discussion, study, research, learning, and work, in email and online, in a virtual dialogue through the book. My purpose in writing this book is to seek feedback from others. My purpose in writing this book is to engage with all and any others who choose to join with me in a discussion about the following questions: what are computers doing to us? how can we gain control over computers? how can we make a society with institutions that promote humanism for humanity?

I suggest that we can change both our social and technological architecture as follows: We implement a social architecture that is socratic where we learn through mutual critical discussion or through mutual democratic feedback. I also suggest that we fix our computer architecture, digital technology, by developing analogue-cybernetic technology. At least we could have a techno-plurality, where there are multiple alternative computer architectures, other than the exclusively digital architecture.

The short of it is: The way through our Global Techno-Scientific Culture is to open up the culture to democratic control, or implementing socratic social architecture in our social institutions where critical discussion and feedback occurs broadly, and democratically, throughout society. We can even implement technological architectures that are more suited to we analogue-cybernetic creatures. Rather than twist ourselves into becoming extensions of our machines or not just extensions, but servants to our machines and reversing roles between us and our machines, we can return ourselves to ourselves, and ensure that our machines serve us.

In general, technological developments throughout human history have had surprising results. We seem to have lost control over those technological developments. But still we hoped that the next technological developments would lead to improvement, but often they did not; or they did lead to improvements, but at a great unexpected cost that overran the benefits gained. However, I am hopeful that by developing social institutions that promote democratic controls, and by developing new forms of technology, such as analogue-cybernetic computer architectures, we will develop computers that will not frustrate us and will fit us. As Yuval Noah Harari says:

> As technology improved, two things happened. First, as flint knives gradually evolved into nuclear missiles, destabilizing the social order became more dangerous. Second, as cave paintings gradually evolved into television broadcasts, it became easier to delude people. In the near future, algorithms might bring this process to completion, making it well-nigh impossible for people to observe the reality about themselves. It will be the algorithms that will decide for us who we are and what we should know about ourselves.
>
> For a few more years or decades, we still have a choice. If we make the effort, we can still investigate who we really are. But if we want to make use of this opportunity, we had better do it now. (Harari, 2018, p. 323)

In this book, I propose that we now act in the world to change our social institutions and technology so that they promote rather than disenfranchise humanity, rather than diminish humanism, our humanity as creatures that seek to know, and seek to act morally.

CHAPTER ONE

MYSTIQUE

> It is desirable to guard against the possibility of exaggerated ideas that might arise as to the powers of the Analytical Engine. In considering any new subject, there is frequently a tendency, first, to overrate what we find to be already interesting or remarkable; and, secondly, by a sort of natural reaction, to undervalue the true state of the case, when we do discover that our notions have surpassed those that were really tenable.
> Ada Lovelace (1842, Note G)

0. overview

1. the development of the mystique of computer technology

2. the root of the mystique concerning computer technology

3. how the new elite of computer technology workers keep control over computer technology?

4. are computers a hybrid technology that is difficult to learn?

5. summing up and where to go from here: the false absolutes of computer technology

0. overview

The mystique of computer technology inhibits the widespread mastery of computers by ordinary computer users. How can we overcome the mystique of computer technology? In order to overcome the mystique we must recognize that the mystique is part of an ideology promoted and enforced by the technological elite or the techno-elite. Furthermore, the techno-elite uses the mystique of computer technology and other components of the ideology of the Global Techno-Scientific Culture to gain and maintain social control over computer technology. The techno-elite in their social control over computer technology turns users of computer technology into techno-subjects. How do we, as techno-subjects, break the social control by the techno-elite over computer technology? In order to overcome the social control by the techno-elite over computer technology, we techno-subjects must recognize that by having social control over computer technology, the techno-elite gain control over the Global Techno-Scientific Culture. How do we techno-subjects gain control over the Global Techno-Scientific Culture?

Democratic control of computer technology, the transfer of control over the computer from the technological elites to the individual users, to techno-subjects, allows non-experts to learn how to use and control computer technology. The boundary between the techno-elite and the techno-subject is dissolved; and the control of the techno-subject by the techno-elite is eliminated. Thus, we dispel the mystique of computer technology, and we gain democratic control over the Global Techno-Scientific Culture.

1. the development of the mystique of computer technology

Do we really need computer technical professionals for helping us to learn the use of computer technology and for helping us to solve our difficulties with the use of computer technology? No: non-technical experts can learn the use of computer technology through trial and error with the help of mentors (friends, co-workers, children, as opposed to computer professionals). The obstacles we have created for ourselves in mastering the use of computer technology are purely social and artificial.

It is almost commonplace to remark that we are in the early phases of a technological revolution created by the personal computer or PC. PCs and

other computing devices such as PDAs or Personal Digital Assistants, smart phones or cell phones with PC capabilities, tablets or flat and small PCs with touch screens and software keyboards, and microprocessor controlled devices in standard office equipment such as fax machines and photocopiers that can be accessed through the internet, and in homes such as thermostats, light switches and timers also with microprocessors that can be accessed through the internet or the internet of things. The internet of things are the ordinary appliances and devices, watches, activity trackers, diagnostic monitors, implants, prosthetic devices, and so on and so on, that have embedded digital processors controlled and accessed by applications or apps on PCs and smartphones. The internet of things are simply ordinary, everyday gadgets, tools, and appliances with embedded digital processors. These so-called smart devices as part of the internet of things are remotely controlled and accessed by digital agents, bots, and various applications. The internet of things are monitored and used by private corporations, and government agencies unknown to the owners and users of those devices. We are within a global matrix of anonymously monitored and controlled things, including bodily implanted devices.

What do we really know about computation, computers, digital processor and digital computer technology? What do we know about the complex system of computer technologies tied together through the internet and the cloud or banks of dedicated computer servers? What do we know about how the cloud that runs programs (apps) and stores data, whose physical location is not seen or known by the users of smart devices? What do even the technological experts, who control the access to the cloud (the physical server computers, hubs, fibre lines, Wi-Fi connections, the data and the apps), know about the complexities of the cloud, its computer servers and its users? Are these questions asked and discussed?

We have become distracted by what I think is a side issue. To my mind the side issue is the philosophical debate concerning Artificial Intelligence or AI, and the general philosophical approach called computational philosophy, and the various alternative groups called neurophilosophy and functionalism, which all take seriously the questions of whether human intelligence is a function of computation or whether the mind is a computer or whether the brain is a computer (for those who don’t like talk of minds). To my knowledge, those questions about how much we really know and understand about computing, computers, and computer technology, are not generally discussed even in computer science and mathematics. For instance, the popular and apparently serious concerns of the philosopher Nick Bostrom (2014), who argues in his work on super-intelligence, also

called the singularity (Ray Kurzweil, 2005), that computer intelligence will inevitability surpass human intelligence. Ross Ashby's (1956b) argument that computers can amplify human intelligence by solving problems beyond human capability, is a precursor to Kurzweil's and Bostrom's argument for the inevitability of super-intelligence. However, whether computer intelligence can amplify or surpass human intelligence is a distracting side issue. (I discuss how much of the current philosophy of mind and computers is a distraction to the currently more fundamental problems about humans and computers, in Chapter Five, Philosophers.) The concern about the singularity and super-intelligence presumes a pretense to know not only everything there is to know about computing but also the inevitable future development of computers. It would be less pretentious and more open minded to take for our starting point the possibility that we are at the same level of understanding in our current knowledge of computers as the ancient Greeks were concerning mathematics before and even after the discovery of the irrational number.

What we know about computation is extremely little because computation is not reducible to algorithms or moreover, not even reducible to mathematics in general. We know that real physical systems are not reducible to abstract geometrical systems, that a physical edge is not identical to an abstract geometric line, or that a physical flat surface is not identical to an abstract geometrical plane. However, when it comes to physical computers, we adopt the pretense without any thought that physical computers are identical to Turing Machines named after Alan Turing who devised a mathematical model for computation, an abstract model of a universal computer, in order to demonstrate that not all mathematical theorems or computer algorithms (programs) are computable or decidable. (Turing 1937, Alonzo Church 1936, Martin Davis 1965) However, Turing Machines are merely mathematical abstractions. A Turing Machine assumes mathematical infinity, i.e. an infinite tape; whereas, physical computational devices have limited "tapes" or memories. That difference makes a world of difference between mathematical abstractions and physical systems. Furthermore, Turing Machines, including Universal Turing Machines, are isolated or closed systems. Whereas, physical computers, including stand-alone computers that are not on the Internet or other networks, are still open physical systems that interact with their physical environment. For the integrity of their computational functions, physical computers depend on the integrity of their hardware and software. For instance, the integrity of computational functions relies on hardware such as power supplies, keyboards, disk drives, monitors, cases, silicon chips, solid state devices; and software such as operating

systems that control physical devices as well as applications, but which ultimately depend on their binary coded instructions being properly stored and acted upon by physical devices. By throwing these quirky physical systems onto networks, with a new level of hardware such as wires, switches, routers, servers and also with a new level of software such as network operating systems and communication protocols, we add a new dynamical layer where the mythical butterfly flapping its wings can change the universe.

Mathematical theorists and computer scientists of finite machines (Turing Machines that have finite "tapes" or memory) have been unable to solve Stephen Cook's famous Millennium Prize problem of P vs. NP (Cook, 1971). We cannot prove for every problem whether the solution can be transformed into an algorithm that will complete before the machines stop running. More exactly put by Oded Goldreich (2010):

> *..it is believed that P is different from NP*, where P corresponds to the class of efficiently solvable problems and NP corresponds to the seemingly wider class of problems allowing for efficient verification of potential solutions...the P-vs-NP Question has been unresolved since the early 1970s, and it is the author's guess that the question will remain unresolved for centuries, waiting for the development of a deeper understanding of the nature of efficient computation." (p. xiv, italics in original)

Another take on this dilemma is by Lance Fortnow (2013) about the limits of finite computers. Lance Fortnow very concisely states both the problem for computer science and its impact on what we think are the limits of computers and automata, in general:

> P refers to the problems we can solve quickly using computers. NP refers to the problems which we would like to find the best solution...If $P \neq NP$...then there are some problems we cannot hope to solve quickly...$P \neq NP$ means there is no automated way to solve some of the problems we want to solve. (p. ix-x)

Computational devices and automation have limits that are still unknown even in theory to mathematicians and computer scientists. In other words, one main limit in computer science or the mathematical theory of computers or automata is this: given the P vs. NP dilemma, we do not know where and how computers will fail even in theory. But we do know that they can fail even in theory because we don't know and still have not mathematically demonstrated whether or not computers must under certain conditions fail.

Edsger W. Dijkstra, who in his day was a leading computer scientist and winner of the Turing Prize, had a realistic diagnosis of the state of our knowledge about computer technology. It is a diagnosis that is more general than the specific issue of the P vs. NP dilemma. It is also a diagnosis that deals with the actual complexity of our current computer systems rather than dealing merely with abstract theoretical models of computers confronting abstract mathematical-theoretical models of complexity:

> I would therefore like to posit that computing's central challenge, viz. "How not to make a mess of it", has not been met. On the contrary, most of our systems are much more complicated than can be considered healthy, and are too messy and chaotic to be used in comfort and confidence… …You see, while we all know that unmastered complexity is at the root of the misery, we do not know what degree of simplicity can be obtained, nor to what extent the intrinsic complexity of the whole design has to show up in the interfaces. We simply do not know yet the limits of disentanglement. We do not know yet whether intrinsic intricacy can be distinguished from accidental intricacy. We do not know yet whether trade-offs will be possible. We do not know yet whether we can invent for intricacy a meaningful concept about which we can prove theorems that help. To put it bluntly, we simply do not know yet what we should be talking about ... (Dijkstra, 2001)

To my mind, Dijkstra does not quite get to the bottom line reason for the limits of computer science. It is not merely a matter of losing sight of the goal of achieving simple models of complex systems. Rather the bottom line reason for the limits of computer science is that no real computer is reducible to Turing Machines nor even finite-state machines, and so real computers are not reducible to mathematical systems. (Jean Van Heijenoort, 1967) Hence, what mathematicians know is not the whole story about what computers can and can't do.

This lesson of our ignorance about computers leads me to ask the question, are we asking the questions that will help us to achieve some real world minimal understanding of computer technology?

I think that the fundamental issue is not whether technology will and by itself take over the world, in the form of super-intelligence according to the arguments of Nick Bostrom (2014) as implicitly assumed by technological determinists whether technophilic or –phobic. Rather, the fundamental issue as Joseph Agassi sees it and which I think is in the right direction, is how to design our social institutions so that democratic control is in place, for the institutions themselves as well as for technology. (Agassi, 1985)

Reading Agassi on technology, and how we should democratically control technology, leads me to think that there is a still more fundamental question to ask about technology. What I feel is missing is asking the most obvious question to ask, and in turn, the most difficult question to ask for anyone who makes or has made their living from the frustrations created by technology. This question is not, how can we design computers and technology to be less frustrating? The design of computers to make people smart as opposed to stupid in the terminology of the cognitive scientist Donald Norman is close to what I take to be the most obvious unasked question around about technology, but still just off the mark, from my frame of reference on the issue of technology. (Norman, 1993). Rather, the very basic question which I think needs asking, but which too many people avoid asking, is: Do we need technology experts and professionals to assist us in learning the use of computer technologies? We may need experts to teach us to drive cars, or at least seasoned drivers, a friend or parent who has a driver's license. There has arisen a new professional class of computer experts, technicians, computer scientists, programmers, designers, engineers and so forth, that we do need who dedicate their working lives to developing and maintaining computers. There also has arisen a new class of technology support professionals dedicated to resolving the frustrations people have in learning how to use computers and learning how to overcome glitches they encounter in the use of computers. But why? Why are computers so frustrating to us, why are they so glitchy that we need a whole new professional class of computer experts to help us put out our computer fires, and to train us on how to use new computer systems, hardware and applications that drive us mad?

Have computer developers of digital computers chosen to develop all computer systems including computer processors, based on a computer architecture, a fundamental design for the functioning of all computers and automata, that is a misfit for humans? (Donald Norman, 1998) Have computer technology support professionals created, intentionally or worse, unintentionally, a mystique of computer technology? I discuss the first question above about the architecture of computers mainly in Chapter Six, Criticism. Here in this first chapter, I discuss the second question about the mystique of computer technology.

2. the root of the mystique concerning computer technology

C.P. Snow's famous two cultures problem of science versus the humanities (Snow, 1959), under the domination of the Global Techno-Scientific Culture has fostered two new parallel versions. The first new version of the two cultures problem is technologists (the techno-elite) versus users of technology (the techno-subject). The second new version concerns how the Global Techno-Scientific Culture as computer technology has become the dominant culture. I take up the first new version in this chapter, and the second new version in Chapter 2, Knowledge. Before going forward with the new first version of the two cultures problem, I will discuss C.P. Snow's original version that arose during the early days of the rise of big science during the Cold War, as well as the early days of the development of computer technology from the birth of digital electronic computers in 1946 until the birth of the World Wide Web in 1989.

The genius of Snow's reading of the two cultures problem (science versus humanities) is that the problem is a problem of cultural differences and intercultural communication. The problem is not merely a problem that occurs between groups of individuals with different educational backgrounds and interests. Rather, the problem is much more fundamental. Scientists and humanists view the world differently, talk differently, and interact differently. They are akin to different ethno-cultural groups. The difference lies in that for scientists, the universe is indifferent to human concerns and values. For humanists, the universe is full of colour as opposed to electro-magnetic frequencies, in the sense that what is of interest in the world is only of interest from a human perception of reality. Also, scientists talk in terms of measurable quantities, whereas humanists talk in terms of contrasting qualities, degrees Celsius versus warmth or coldness. Finally, scientists interact in terms of the presentation of objective theory discussed impersonally with respect to standards of truth and experimental validity; whereas, humanists interact in terms of stories relating to human concerns regardless of data but with special regard for moral value and aesthetic value. Of course, Snow simplifies and exaggerates. However, his simplification and exaggeration is less of a simplification and exaggeration when applied to the cultures of technologists and users of technology, or the techno-elite and techno-subjects. The techno-elite are only interested in whether the instrument works, whether the techno-subject is making proper use of the instrument, and whether the instrument is maintained. Whereas, the techno-subject is more interested in getting the thing to work

for their purpose: the techno-subject just wants to get something done with the instrument, and not have the instrument take control of them. The techno-subject doesn't care about following the rules of the instrument, but only about having the instrument fulfill their expectations and demands.

The cultural difference and the lack of communication between the techno-elite and techno-subjects is most evident when something goes wrong. The techno-subject blames the machine, and wants the techno-elite to get the "thing" working again; whereas, the techno-elite blame the user, the techno-subject, and attempt to find what the user did wrong to break the machine. When the techno-elite finally admit that something due to the machine is at fault, the techno-elite want more than anything else to fix the technical problem without regard for the concerns and questions of techno-subjects. The techno-elite want the techno-subject to basically get out of the way of the machine, and once the problem is corrected, the techno-elite is only interested in what the techno-subject is doing with the machine as a method of testing whether the machine is back in functional order. This outlook of the techno-elite is both absolutist and religious.

The outlook of the techno-elite involves a new form of idol worship and a new absolutist metaphysics. The goal of the techno-elite is to continue the operation of the machine. The techno-elite treat the machine as if it were the Absolute demanding not only service through self-sacrifice but also the sacrifice of those who hinder the operation and extension of technology. The techno-subject is seen as a device peripheral to the operation of the machine. For the technocrat there is no higher goal than serving the machine and perpetuating the continued operation of the machine. The techno-subject's goals, needs, and desires are irrelevant. Indeed, the techno-subject as a person is irrelevant. The only relevance of the techno-subject as far as the technocrat is concerned is whether the techno-subject is acting according to the dictates of the machine and whether the techno-subject is serving the operation of the machine. When the machine becomes problematic, the default hypothesis of the techno-elite is that somehow the techno-subject is the cause of the problem. Once the technocrat rules out the default hypothesis, then and only then does the technocrat look into the machine in order to find a technical problem. (Rose, 2003) The working premise of the technocrat is that the machine would function fully and properly if only the techno-subject would not hinder its operation by disobeying the absolute commandments of the machine.

Can this problem of the gap between the cultures be resolved by improving communication? One might think glossaries or even some elementary courses for techno-subjects might help them better understand the concerns of the techno-elite. Or, one might think that courses in communication skills for the techno-elite might help them better explain the issues to techno-subjects and also help technocrats to understand the concerns of techno-subjects. Yes, but, and the "but" directs our attention to a qualification. The qualification to the "yes" is that the problem is even deeper than the problem of intercultural relationships. The problem concerns the common, unspoken and unquestioned idea that the techno-elite is necessary and needed. The techno-elite is necessary because the techno-elite is needed, so it appears. The techno-elite is needed, so it appears, because technology is hard to use: we need experts to help us learn how to use technology and to help us resolve our own difficulties or problems in the use of technology.

This idea, that technology is hard to use, hard to learn, and that we need experts to solve our problems with the use of technology, is an answer, a mistaken answer, to the tacit question: how do we learn to use technology? The answer that we learn the use of all technology by passively following the instructions of experts is false. Firstly, as we all remember from our childhood, learning bicycle riding, we did not magically learn to ride bicycles by watching expert riders and by following the instructions of experts. Rather, we learned how to ride our two-wheeler bicycle by getting on the bicycle and through trial and error, as well as through allowing our "teacher", or "mentor" usually a parent or older sibling or friend, to give us pointers and help us regain our balance when about to fall. We also attempted to model ourselves on the actions of our mentor.

Notice that this common experience conforms both to Karl Popper's and Michael Polanyi's theories of learning. According to Popper we learn through trial and error; conjecture and refutation; or, hypothesis and falsification. (Popper, 1945) According to Polanyi we learn through activity and engagement with the guidance and modelling of a mentor. (Polanyi, 1966) Both theories apply to the use of learning how to ride bicycles. I generalize: both theories apply to learning the use of all technology. Hence, everyone can learn to use technology, and those who have learned the use of technology can function as mentors to their friends. The techno-elite are not needed, at least, not needed for the everyday frustrating problems of using computers, including the frustrations encountered during the time when one learns either how to use computers or one learns how to use a new application.

When we think of technology as something so powerful and complex that we need a special class of dedicated people to control it for us, we adopt a system of thought that has the illusion of a rational explanation and justification for our technocratic, monopolistic and monolithic Global Techno-Scientific Culture called by the social critic Neil Postman, Technopoly. (1992) However, the explanation and justification that technology is beyond the comprehension and competence of the the techno-subject, treats technology and our Technopoly, or more generically the Global Techno-Scientific Culture as an absolute. The Global Techno-Scientific Culture has become treated as an absolute though technology and the Global Techno-Scientific Culture are of our own making. The Global Techno-Scientific Culture is partially unplanned and unexpected, but still our choice and our responsibility to use, modify, reform or transform.

The question comes up here, how does this new elite of technology keep control apart from merely mystifying everyone about the nature of computer technology?

3. how the new elite of computer technology workers keep control over computer technology?

How come we have been unable to counter computer technology workers from forming a new elite of power and knowledge that has taken control over computer technology? The answer is glaringly simple: there are no checks and controls in place for computer professionals, the techno-elite, unlike other technology professionals such as engineers, architects, plumbers, carpenters, electricians, and most other technology workers.

No one in the computer field and no computer professional is required to join any government regulated professional association for employment as a computer professional.

The upshot of this state of affairs is that there are no codes of conduct universally sanctioned for computer professionals. There are a plurality of professional codes and professional associations, but none are state regulated. Hence, computer professionals are left to their own conscience, personal codes of ethics, and even worse,corporate codes of conduct, such as they are. Hence there are no social controls on the conduct of computer professionals: there is no personal responsibility for the consequences of the computers they implement in the workplace; and no personal

responsibility for the negative impacts of bugs, bad design, hasty implementation, and known flaws in computer systems.

Why, then, do we allow computer technologists to avoid even internal sanctions and controls as well as social controls upon their actions?

The answer to this question is that we fail to see that computer professionals are actually a political power group in our socio-technical social systems, they are a techno-elite. For instance, Ellen Rose (2003) demonstrates that there is no social negotiation between computer professionals and computer users, techno-subjects. Another way of looking at this issue is that there is an elite class of computer professionals, the techno-elite, who create a mystique or jargon, as well as technical blocks to prevent computer users, techno-subjects, from gaining knowledge about computers and to prevent those who have knowledge, but are not computer professionals from accessing their own computers.

A polite way of putting this would be that computer professionals want computers to be as easy to use as an appliance: just turn on the car or plug in the microwave and use it. There is no need for users of appliances to understand how to use the appliance (computer) or, what the electronics do, how the engine works and so forth. When we have difficulty making something work, we call in a professional to fix it or help us. The same with computers: they are supposed to be appliances and nothing more.

The bottom line is this: political action is required to legitimate and regulate professional organizations and standards of certification for professional computer workers. When this is done, limits and social responsibility will be imposed upon the actions of computer professionals. Their elite status will be removed and they will become nothing more than ordinary citizens with special skills, no different from other professionals in society, whether medical doctors, teachers, lawyers, or electricians in their social status and social responsibility. How then can we gain (democratic) control over computer technology?

Here again my idea is simple. We need more democracy, openness and freedom. The first principle of democracy is listening to people. When someone states a difficulty with a computer, one need not assume that the person is in error. The second principle of democracy is openness, and the main principle of openness is transparency of process. Rather than mystify computers by hiding functions, and by preventing access to all the functions, including operating systems level functions, we need to

demystify computers by opening everything up. In other words, by allowing people to develop mastery over computers through trial and error and sharing ideas and skills, people will not need an intermediary group whose main job function is to minimize and correct so-called user error. Finally, the main purpose of democracy is the prevention of the abuse of minorities and individuals from those who have power and control. Freedom, liberty and equality are side-effects of democratically controlling the controllers. (Karl Popper, 1945/1967)

By opening up computers, people are given more autonomy and professional control over the use of their computer. People will maintain their smarts as well as avoid abuse by the techno-elite. However, just as we have social controls over the use of vehicles by ordinary drivers, as well as social controls over the use of vehicles by professional drivers, there is a need for social controls over the users of computers, for both ordinary and professional users of computers. Thus, social controls over the use of computers are for everyone who uses computers, in order to prevent the abuse and exploitation of others by the use of computers. (Democracy is difficult, we want freedom, but also the protection of our freedom and selves from abusers; and so need regulation. But over-regulation can itself become abusive; we need to regulate the regulators.)

My argument points to a strange conclusion: The vested interests of the controllers of computers, IT (Information-Technology, or also called Information and Communication Technology) professionals, seem to be at stake here because I am advocating that they give up control of computers. However, we need IT staff to help people gain the required skills to take control over their computers. Also, we need IT staff to change the structure of computer systems so that they become transparent and open to complete access by their users. But once IT staff fulfills those functions, they will no longer be needed, at least not in the same way and to the same degree that they are now needed. They will be needed to keep the technology working and train users in the same manner that we need auto mechanics to keep our cars working and that we need driving teachers to train drivers. We only have a need for driving teachers as a convenience for not imposing on the time of mentors, friends and parents who have driving skills. But we don’t need auto mechanics and driving teachers to ride with us in our cars at all times, the way that we currently need IT staff on site (or virtually on site at remote computer call centres) at all times.

However, there is still a suspicion that computers are a special form of technology, and that they are a hybrid form of technology. Computers are a difficult technology for the ordinary person to master because they are hybrid technology that perform high-level functions. This viewpoint deserves some thought and discussion.

4. are computers a hybrid technology that is difficult to learn?

Is computer technology a beast of a different order that requires a totally new system of understanding and explanation? Is it like the centaur as described by Moacyr Scliar, the Brazilian novelist in his book, *The Centaur in the Garden* (1985):

> Psychoanalysis, dialectical materialism, nothing; laws of supply and demand, nothing...Nothing seemed applicable to my case. I was a centaur, irremediably a centaur. And without any plausible explanation. (p. 44)

There are three approaches we can take to "monsters" or facts that don't fit the ready-made, current, or traditional explanations. (Imre Lakatos, 1976) One approach involves taking an escape route by defining the apparent monster as an exceptional case and so impossible to explain. Science explains repeatable facts or events, and when there is a singular, unique, unrepeatable happening, explanation is impossible because what we attempt to explain cannot be repeated in order to test the explanation. The second approach involves taking the low road of inductive or empirical analysis by observing the monster in detail and attempting to find similarities to other cases. The centaur is both horse and human. The third approach is the high road of sceptical rejection by arguing that science explains everything and so-called monsters are anomalies to current science. When we come across a monster, we need to revise, if not reject, all current theories in order to find a new theory that explains the monster as a strange but still natural phenomenon.

For the sake of argument, I will follow the third approach for most of this section: the computer is a monster, but still natural, and so it should be explicable by current theories.

What sort of monster is computer technology? It is a special kind of technology. If it is special, can its diffusion, distribution, and/or learning be explained according to standard models? One of the most common

observations about the spread or diffusion of computer technology is that it follows the law of the diffusion of all technologies, ideologies, philosophies, and jokes (Sigmund Freud, 1963): There are people who get it right away. (We call this group: Early Adopters.) There are people who wait a bit and then get it after it becomes acceptable or tried and true. (We call this group: Late Adopters.) There are people who never get it. (We call this group: Reactionaries or Conservatives or Technophobes or Luddites.) Finally, there are people who refuse to get it because they have something like it that is better, or because they can make it for themselves, cheaper and better. (We call this group: Rebels, or Hackers, or Innovators.)

When we look at the diffusion of Quantum Mechanics, QM, we can observe the following: 1. Heisenberg and Bohr were among the first group of Early Adopters. 2. Schrödinger after having his head spun around by Bohr fell into the second group of Late Adopters. 3. Planck and Einstein were in the third group of Reactionaries with Einstein attempting to pull every trick in the arsenal to reject QM outright by using thought experiments and paradoxes. 4. Hugh Everett III, and David Bohm became Rebels and attempted to develop theories that made QM a subset of a more comprehensive and deeper physical explanation. (David Deutsch 1998, Mario Bunge, 2006, and Sheldon Richmond, 2019)

This pattern of diffusion in the case of QM is not seen as troubling, why wasn't everyone an early adopter of QM? The answer is that QM was not merely strange and paradoxical from the perspective of classical (Newtonian) mechanics, but deeply counter-intuitive. Similarly when we ask, why wasn't everyone an early adopter of what has become known as the Scientific Revolution, we get the same answer: modern science was counter-intuitive and everyone was an Aristotelian of one sort or another. Is this explanation sufficient? Or, is it really an explanation? We are saying that most people are inherently conservative, and that novelty in ideas and things is difficult to accept, and even more difficult to develop.

So far I have been repeating the observations of the obvious, and that is all that we can observe. We cannot observe what is not obvious: we would need some special instrument or theory or technique to find what is hidden behind the obvious. In general, the problem with making empirical observations, and observations can only be empirical, is that we get distracted by the obvious and forget to look for the strange, lurking behind the obvious. There is something strange about the diffusion of computer technology as opposed to the diffusion of other novelties, whether the

novelties of Classical Mechanics or Quantum Mechanics or String Theory, or the novelties of previous non-information technologies. The strange thing about the diffusion of computer technology is that it is an information technology, similar to systems of writing, or speech, or languages. There is something about information technologies and/or communication technologies such as radio, TV, film that is intimately connected with humanity, our nervous systems, minds, and cultures. However, I must revise what I have just said. The "and/or" conjunction does not hold with information technology and/or communication technologies. There is a disjunction between information technologies and communication technologies. The disjunction is that though information technologies use communication technologies, information technologies are supposed to make us smarter.

The computer as an instruction following device as are all devices that follow instructions, including humans, is supposed to be smart by virtue of the fact that it follows instructions. Specifically, processors are called the brains of the computer because they contain instructions, follow the instructions, and rely on storage or memory devices to store other instructions and store the results of following their instructions. Moreover, all devices that use processors are considered to be smart, whether watches, activity tracking devices, or sports watches, microwave ovens, cars, PVRs, and almost every modern technology. However, the computer is considered to be the smartest because similar to the human, it relies almost exclusively on its processor or brain to do its work.

Here then we come to the problem of technology learning: Everyone wants to be smarter and the adoption of computer technologies will make everyone smarter. Computer technologies should be exempt from the law of the diffusion of technology. The immediate response is that computer technologies are difficult to use and difficult to design. This response is understandable and fundamentally different from the response to why the law of diffusion applies to other technologies and to novel theories such as QM. People are generally conservative and fear novelty. This explanation does not work with computer technology: everyone should want to learn computers because everyone knows that computers will make them smarter. The resistance to the use and adoption of computers is not due to people but to computers. Computers are difficult to design, and so they crash, or have bugs, or are difficult to learn and so forth. The problem is with computers and not with people.

I think all this is mistaken, from the perspective of computers as a hybrid creature, a centaur. (I take the hypothesis of computers as hybrid, provisionally and temporarily for the sake of developing the argument and developing a more simple and straightforward understanding of computers. I later reject the provisional hypothesis of computers as hybrid.) The problem is neither people nor computers. Though most observers and critics of computer technology say the problem is with computers. Most defenders of computer technology say the problem is with people. It is mistaken to think that computers are at fault for being difficult to learn, and difficult to use, though computers are centaurs as a hybrid technology. Rather, I think the problem of frustration with computers and their difficulty to learn and use is with the socio-technical system we have adopted and chosen. We have chosen and developed a particular socio-technical system for developing, maintaining, distributing, teaching the use of computers, and using computers in the Technopoly (our monopolistic Global Techno-Scientific Culture) that drives us mad. In spite of this universal insanity created by our socio-technical system, we put up with it as if it were an inevitability, a force or law of nature.

Computers are centaurs (hybrid technology) in two respects. The hardware of computers is the horse part (computer as centaur) and the software performs human-like functions, the human part, such as calculations. Hence, computers are exceptional. Unlike other communication technologies, computers perform smart-like functions. If they perform smart-like functions, how can we explain the fact that some people get them immediately, others wait and are slow to get them, and some don't get them, and a few always work to improve the computers or tinker with the standard programs and operating systems. There are three obvious explanations that I must consider. Though, as I have mentioned there is danger in concentrating on the obvious, and in relying solely on empirical observation, there is also danger in not giving the obvious its due. By critically examining the obvious, we can find the contradictions, exceptions, and errors that point the way to the new and improved as well as to the hidden lurking behind the obvious.

The three obvious explanations of why everyone does not adopt and/or learn computer technology immediately form three exclusive and exhaustive alternatives to explaining at best and justifying at worst why computers are the cause of our frustration, why they are difficult and poorly designed. The first explanation is that we need to use trial and error to learn computers because of the horse-like aspects of computers (as centaur-like): they are foreign to us, at least the hardware part, and the

software is usually written in obscure languages. (This is an application of the philosophical approach of Karl Popper. 1959, 1963/65, 1994.) The second explanation is that we need to adopt mentors who are experts in the use of computers because of the person-like or human-like aspects of computers (as centaur-like): computers are very clever, and too clever to be learned by ordinary people without reliance on master-users of computers. (This is an application of the approach of Michael Polanyi. 1958.) The learning and use of computers is done by participating in a special culture or activity or language game where we learn how to play the game, not by reading the rules because the rules are implicit or tacit or inarticulate. Rather we learn the game by imitating the master players, click on the icon, scroll down, click on the next icon, scroll up, click using the right mouse button, click on item 3 in the pull-down or pop-up. The third explanation is that we need to adopt a new paradigm because computers and centaurs are indeed monsters. They are totally exceptional. (This approach stems from Thomas Kuhn. 1962) If you don't adopt the computer paradigm as a special entity unto itself you will never learn about computers.

Popper's approach will have to be incorporated into the correct theory because it accurately describes the work of one group, the techno-elite or technical experts, in the socio-technical system of computer technology. But this is saying that Popper's approach is only partially true and thereby false as a total explanation.

Kuhn's approach and Polanyi's approach are partially true in different respects. Kuhn's approach has become the ideology used by those promoting and implementing computer technology. (Don Tapscott, 1993) It is used to persuade people into adopting computer technology and to silencing critics, as well as to make people who have difficulties using computer technology believe that they are stupid or they are Luddites. Polanyi's approach describes the de facto cultural situation or aspect of our socio-technical society: the Global Techno-Scientific Culture. Polanyi's approach is mistaken in the respect that it assumes in its description of how things are, that we have no choice but to passively accept our current situation as fixed or deterministic. Contrary to the Polanyi approach, computer learners and users do not have to treat computers with mystical respect and do not have to treat computer experts as the high priests of computer culture. In philosophical terms, the de facto situation of computers is given a metaphysical status as absolute (more on this in the next section of this first chapter) and the de facto situation of the relationship between computer users and computer technologists is also

given a metaphysical status as absolute. Both are mythical and mistaken.

My point here is that the mistake of the approaches of Kuhn and Polanyi differ from the mistake of Popper's approach. Popper's approach applies to how one sub-group in the socio-technical system of computer technology actually works, thinks, and learns and so, how other sub-groups, can make the social decision to adopt the same strategy, heuristic, or methodology. Kuhn's and Polanyi's approaches describe what is taken as permanent, as absolute, rather than as dependent on social decisions.

We are responsible for the current structure of our socio-technical system, but we have been misled into thinking that our socio-technical system reflects the nature of computers and the nature of how we must learn computer technology.

The computer world we live in, in the Technopoly where the system of computer technologists and of computer users live, is most accurately described by a Polanyian approach. C.P. Snow (1959) once talked about the two cultures, but in his discussion of the culture of scientists and the culture of literary types or humanists, he argued that the culture of scientists is part of the power elite, whereas the culture of humanists is on the fringe. Moreover, he argued that the two cultures do not talk to each other: both are illiterate with respect to the other culture. The cruelest thing that could happen, according to Snow, was that the literary or humanist culture could become irrelevant or at best a minority report of the state of things. However, there is something more cruel in the socio-technical world of the computer technology revolution. Everyone must become part of the same culture, but the humanists (or the computer users) will never understand this culture. They will be forced to adopt its jargon, its rules, and its tools, but they will always be inadequate users of this jargon, rules, and tools. The humanists become techno-subjects subservient to the techno-elite in the Global Techno-Scientific Culture that is monolithic and monopolistic. Moreover, techno-subjects (formerly humanist-oriented people) will always be subservient to the techno-elite (or the technology experts). Even C.P. Snow did not envision this totalitarian oligarchic rule of the Technopoly. (More in Chapter 3, Cultures.)

For understanding the oligarchic situation of the Global Techno-Scientific Culture, the Technopoly, Polanyi's approach seems more apt than Snow's approach. Polanyi's approach more adequately explains the social and intellectual hierarchy. Though we have one Global Techno-Scientific

Culture, there are two factions in this culture. The technical experts, the techno-elite, have gained a degree of understanding of computer technology that the ordinary user, techno-subject, does not have. Moreover, the language or jargon that the computer technology experts have developed in this new world is the language we must adopt. It is as if the computer technologists have colonized our world and have prevented us from using our customs and speaking our language. At best, we can become hidden humanists and practice our mode of thinking and speaking in a private and hidden world. However, we get caught out every time we are frustrated with computers. We dutifully call the computer expert, the hotline, the help-desk, the geek down the hall, to show us how to use such and such application or to stop the computer from crashing, freezing, flashing pop-up windows telling us about strange errors. We are techno-subjects who rely on the techno-elite to set us straight.

When the computer freezes or crashes or produces some strange and unexpected error, it is not the computer per se that is at fault, at least, so computer users are told by the techno-elite. Computer users are told that they do not understand and do not know how to use this strange monster or beast. The only way one can become somewhat proficient with the use of the beast is by playing the game of the technology experts who have found the hidden and inarticulate rules of the game in the mind of the beast. Indeed, given the current socio-technical structure of how computers are used in our various institutions, the main method of survival is the adoption of a master-apprentice approach to computer technology. Unlike the world of C.P. Snow's two cultures, if one attempts to escape into the humanist culture, one becomes obsolescent, redundant, and unemployable. At best, computer users, techno-subjects, can talk among themselves about how nasty and brutish computer technologists, the techno-elite, are; and techno-subjects can complain about how computer technologists are not as client-oriented as they should be; and techno-subjects can complain about how the same problems keep coming up no matter how often the computer technologists come around to solve them.

This then is our epistemological or cognitive plight or delight, depending on whether you are a techno-subject or a techno-elite. The computer expert has tacit knowledge of computers and the only method of gaining this tacit knowledge is to use computer technology under the guidance of computer experts. How one bridges the gap and becomes a computer expert is almost a mystery. At best, if you have a knack for computers, you can take courses and then join the computer expert culture. However, if you don't have the knack, no matter how many courses you take, you will at best

learn how to become proficient in some of the functions of some of the software. For instance, you can become a super-user in a word processor or in a presentation software, or even in a database system, but you will never cross the gap to become a computer expert who truly understands what's hidden to you in the system. That is so because the ability to become a computer expert is of the same order as the ability to become a concert violinist: you can practice, but you can never get beyond the hobby player because you don't have the innate talent (according to a Polanyian viewpoint that has become embedded in our socio-technical systems).

The question that comes immediately to mind is: if you are suspicious about this institutionalization of a Polanyian epistemology into socio-technical systems, how did Polanyian epistemology or theory of knowledge become institutionalized or naturalized? Why do many people become tacit Polanyian epistemologists in the world of computer technology? Here is where we can turn to Kuhn.

Applying Kuhn's model to understanding the situation of the hierarchical and oligarchic Global Techno-Scientific Culture dominated by the techno-elite as masters of the hybrid computer-machine that is centaur-like with its humanoid (inter-)face, we get the following scenario. The centaur-like computer is an unruly beast even though the centaur-like computer has a human-like face or interface: You can talk, as it were, with the centaur, but you cannot understand it unless you learn its paradigm. Once you learn its paradigm, you own it. Those who do not adopt the paradigm are alien or outsiders and can become critics without an audience except for other critics.

The paradigm of computer technology is quite simple, but strange. Firstly, computers to be of any value for communication must be on a network. Secondly, the network enhances the power of isolated computers. Thirdly, because the individual computers that are on the network are individually weak, they must have their processing power and storage capacity both distributed and shared through the network, or have the weak computers served by more powerful computers hidden away in a data centre. Fourthly, computer systems are interchangeable, i.e. sometimes called "open" and "portable". Unfortunately, the main operating systems for computers and computer networks are not "open", they are proprietary. Though there is a fringe group of users of Linux; however, Linux has been incorporated into proprietary systems as well, reducing the small fringe to a micro-fringe.

What is strange about the dominant paradigm is that it is deceptive. Everyone should have access to everything from everywhere and at every time with computers distributed on networks. However, the deception lies in the fact that networks decrease access even to one's own individual computer. When computers are placed on networks, they become controlled either through remote and automated access by software/hardware management computers, or by computer network administrators.

For instance, in most institutional computer systems, when you login to the system, control or access policies (and *policies* is the technical word used by IT systems people) are automatically passed to the computer. These access policies are designed to limit access by the user; to prevent the user from installing or modifying various components and modules.

The paradigm seems to involve the development of systems where everyone with access to a computer on a network has gained control and power. We are supposedly in the Global Knowledge Economy, and the computer is a knowledge machine. Those who have access to a network computer and who have control over a networked computer, have access to Knowledge, and Knowledge is Power, not only in Francis Bacon's (1906) weak sense of the ability to predict and control nature, but in Thomas Hobbes (1907) strong sense of social, economic, and political power. However, and this is a crucial feature of the paradigm: the paradigm is a political lie and an even worse lie than the political lie Plato created. Plato advocated spreading the myth of the three kinds of people, bronze, silver, and gold. Plato advocated using the lie for the greater good of keeping stability in the Republic by encouraging people to stay in their assigned social roles. (Popper, 1945/1967) However, the current lie of the paradigm of open computer systems is as follows: Firstly, the paradigm is false, computer systems are not open. Secondly, the paradigm is intentionally advocated as a paradigm. All critics who question either the paradigm or whether systems are indeed what the advocates of the paradigm have supposedly implemented, are ignored as people who either misunderstand computer systems or who want to maintain the position they will lose once computer technology makes those critics redundant in the workforce. Thirdly, social, political, and economic power lies in computer technology or the use and access to computer technology. But computer experts control access. Indeed, controlling access is even more important than ownership. For instance, for an institutional user of computers, you can only use what is on your computer but the systems administrators control what gets on your computer. Even the home computer is subject to control by computer companies: to avoid the bugs,

Trojan horses, and viruses, you need to allow computer companies to automatically check your computer for what is installed on your computer, and you need to approve the automatic installation of the fixes and updates. Though you have the choice to deny the automated checking and installation, once you deny that checking, you leave your computer open to attack by the nasty world of Trojan horses, viruses, worms, ransomware and hackers.

Adopting Kuhn's approach to computers, networks, the digital universe of technology, also known as the internet of things, and the Global Techno-Scientific Culture, turns a faulty and deceptive paradigm into metaphysics. Computers are the kind of thing that have to be controlled by experts (technical, managerial, even political), the techno-elite. That is part of the nature of computer technology. Furthermore, people who fail to understand the paradigm, accept the lie, and allow control of their computer technology by experts, are people who fail to grasp the difficult hybrid nature of the beast we know as a computer. The computer is a centaur and very few can understand and even less can master the beast, the new leviathan.

I think there is something wrong with this model of the computer and the new paradigm surrounding computer technology, as a hybrid technology, as a centaur-like creature. What exactly is wrong with the idea of the computer as a centaur or hybrid technology?

At the beginning of this section, I adopted the idea that the computer is a special type of technology, a smart-like technology, for the sake of argument. As a smart technology, it should not follow the Law of the Diffusion of Technology (early vs. mid vs. late vs never adopters) because everyone wants to be smarter and so everyone should want to immediately adopt computers. However, the adoption of computers does appear to follow the Law of the Diffusion of Technology, and so either there must be something wrong with computers or the Law of the Diffusion of Technology is false. Everyone seems to think that computers are the exception to the rule. How can that be? What is so exceptional about computers? I have argued that three approaches more or less explain what is wrong with computers. However, because all three have part of the truth, and none have the whole truth, we still have to find out what is the truth.

The computer world can be described by three alternative and incompatible approaches, though logically all three are false. All three are mistaken in different respects.

1. Trial and error learning is available to everyone not only technical experts. This approach is an application of Popper's philosophy and is false in the current socio-technical situation because access to computers is limited and controlled by the techno-elite.

2. Learning by talking with and imitating the practice of computer experts is the most effective means of learning by those who don't have enough time available for the use of trial and error learning; and whose access to resources is restricted. This approach is an application of Polanyi's philosophy and is false. In the current socio-technical situation the techno-elite use trial and error learning because there is still much that we don't know and understand about computer technology and infrastructure (social, physical, educational, theoretical) concerning computer technology. We are pretty much still in the forest, and need to find our way through the forest by trial and error.

3. Understanding the paradigm or culture of technical experts assists ordinary users of computers in appreciating the tacit rules and norms of the current socio-technical system of computer technology in the Global Techno-Scientific Culture. This application of Kuhn's philosophy is false: computer systems are closed and inaccessible to most, and the techno-elite know little about those systems, and can barely keep pace with all the failures and limitations in computer technology. The centaur-like creature we know as the computer, I think is a mistaken model of the computer. At best, computational devices are smart-like, but not smart. I have been using the idea of the computer as a hybrid technology, a centaur-like creature, only for the sake of argument; but it is false, and we need a better model. I discuss what's wrong with the idea of the computer as smart in some detail and propose a better model, later, in Chapter Two, Knowledge.

What is the truth about computers?

The truth about computers, I conjecture, open to discussion and refutation, is that the physical and socio-technical architecture of computer technology is anti-humanistic because computers are digital and humans are analogue-cybernetic (feedback) creatures. (Chapter Six, Criticism) The truth about our current social architecture, I conjecture and open to discussion and refutation, is that our social architecture, where the techno-elite (technological elite of experts, managers, computer industry, computer

corporations) dominates, is hierarchical, and anti-democratic. (More about this in Chapter Four, Dialogue.)

5. summing up and where to go from here: the false absolutes of computer technology

On reviewing my remarks so far, I have attempted to expose and criticize how we think about technology and how we treat the users of technology in our society. I have discussed how our Global Techno-Scientific Culture has become a monopoly of digital technology where the techno-elite, including not only technical experts, but their managers and the political leadership, is oligarchic. However, because the techno-elite apply Kuhn's model of the paradigm to the Global Techno-Scientific Culture where criticism is silenced as inherently or by default misguided, critics have a problem. How can critics be taken seriously rather than automatically dismissed as a lunatic fringe, or more politely, as simply people who don't get it, either as Luddites, or as social misfits? It as if we are in a social gathering where everyone understands it would be impolite to discuss politics, religion, or sex. It is as if a tacit taboo against talking about those subjects has become normative, and those who talk about such subjects are shunned. How, then, can we break the taboo and openly discuss the Global Techno-Scientific Culture, and how this culture silences critics? I discuss the problem of how critics can get a fair hearing, can break through the walls of tacitly enforced silence by developing a theory of criticism in the final chapter, Chapter Six, Criticism. However, as a first approximation let me refer to the writings of Octavio Paz and how he describes critical enquiry: When reason became self-critical, "…reason renounced the grandiose constructions that made it synonymous with Being, Good, or Truth; it ceased to be the Mansion of the Idea and became instead a path, a means of exploration" . (1990, p. 33) Moreover, "…Differentiating itself from ancient religious and metaphysical principles, criticism is not an absolute; on the contrary, it is the instrument to unmask false absolutes and denounce abuses." (1994, p. 40) Furthermore, Octavio Paz says in another essay: "…Criticism tells us that we should learn to dissolve the idols, should learn to dissolve them within our own selves." (1972, p. 325)

In other words, what I have been saying so far, following the cue of Octavio Paz in his discussion of the critical thinker, is that it is very difficult to critically discuss the mystique of computer technology. It is very difficult to discuss computer technology; computer technologists; the

new techno-elite; the socio-technical system of computer technology with techno-subjects and the techno-elite, technologists; in the world in which we now live, dominated by computer technology, the Technopoly. It is very difficult to discuss all this because of the mystique surrounding computer technology. Unfortunately, many philosophers for the most part unwittingly reinforce, rather than expose and critically discuss the mystique. For instance, the book by the philosopher Aden Evens, unabashedly argues that the digital has become an an absolute that is outside and opposed to the rest of the world, especially humans. Though Evens admits there is a politics of the digital, he only asks as a so-far unanswered question, whether there can be a "rapprochement" between the ontology of the digital and the rest of the world, while arguing, intimating, pondering upon throughout the entire book that there can be none. His book turns the gap between the digital and the rest of the world, into an abyss without any awareness of any hint of a possibility for an alternative route that avoids the abyss. Evens implicitly reifies the mystique into an ontology, an absolute; unintentionally abetting the treatment of computer technology as idols. (2015)

The mystique of computer technology has made absolutes or idols out of computer technology and the Global Techno-Scientific Culture. I have asked the question, do we really need technical professionals, the techno-elite, for helping us to learn the use of technology and for helping us to solve our difficulties with the use of technology? My tentative answer is No: if we were to implement both Popper and Polanyi, we could learn the use of technology through trial and error with the help of mentors, or others who have managed to learn how to ride the bicycle.

My tentative solution reveals the artificiality or the social nature of the obstacles we have created for ourselves in mastering the use of technology. However, more is needed than proposing a tentative solution, open to discussion and refutation, for replacing the idols or the absolutes or the mystique of the Technopoly (the Global Techno-Scientific Culture) with a more realistic view of ourselves, technology, and society. How can we not only improve our world view, of ourselves, technology, and society, but also improve our lives, improve our sense of humanity and humanism, improve our actions? I propose that we need to do the following: We need to see how the Technopoly works, in preventing Knowledge (Chapter Two), in monopolizing Cultures (Chapter Three), in inhibiting Dialogue (Chapter Four), in side-lining Philosophers (Chapter Five). Most important for the task of breaking the Mystique, is to develop the theory and practice of Criticism that opens the way for implementing a

new social architecture that is more humanistic-oriented, more humane (Chapter 6).

Let me end this chapter and provide a segue to the next chapter with an adaptation of a quote from Plato though originally about the technology of writing, a few thousand and more years before the development of computers. I have modified the quote to apply to computer technology. Where Plato refers to writing and letters, I substituted words that refer to computers and the internet. Also, where Plato refers to memory, I substituted words that refer to intelligence. Apologies to Socrates and Plato. This modified quote from Plato basically captures what I have said in this chapter about the mystique of computers, and what I say about Knowledge in the next chapter.

> The story goes that Thamus said many things to Theuth in praise or blame of the various arts, which it would take too long to repeat; but when they came to computers and the internet, "This invention, O king," said Theuth, "will make the Egyptians wiser and will improve their intelligence; for it is an elixir of intelligence and wisdom that I have discovered." But Thamus replied, "Most ingenious Theuth, one man has the ability to beget arts, but the ability to judge of their usefulness or harmfulness to their users belongs to another; and now you, who are the father of computers and the internet, have been led by your affection to ascribe to them a power the opposite of that which they really possess. For this invention will produce stupidity in those who learn to use it, because they will not practice their intelligence. Their trust in computers...will discourage the use of their own intelligence within them. You have invented an elixir not of intelligence, but of seeming smart; and you offer your pupils the appearance of wisdom, not true wisdom, for they will read many things on the internet without instruction and will therefore seem to know many things, when they are for the most part ignorant and hard to get along with, since they are not wise, but only appear wise. (Plato, *Phaedrus* 274e-275a)

CHAPTER TWO

KNOWLEDGE

> Technology now encourages ignorance.
> Paul Feyerabend (2011, p. 134)

0. overview

1. what has computer technology done to knowledge?

2. what's so wrong with the technopoly?

3. people have become dummies in the technopoly

4. how to understand why people have become dummies

5. how the technopoly turns people into dummies

6. restoring knowledge in the technopoly, or dummies no longer

0. overview

The monopolization of our Global Techno-Scientific Culture by digital information technology, the Technopoly has resulted in the extinction of Knowledge, by reducing Knowledge to systems of symbols, formalized algorithmic hierarchies of symbol-systems without external reference; a totalistic virtuality, or real virtuality. The extinction of Knowledge has resulted in two mutually reinforcing situations. One situation is the rise of a new elite of technology experts. The other situation is the dummification of people. These two mutually reinforcing situations further result in an illegitimate role reversal between people and their machines. The machines become treated as smart; people become treated as dummies. The role reversal of machines and people reinforces the monopoly of digital technology over everything. The monopoly of the Global Techno-Scientific Culture, the Technopoly, becomes accepted without question and without criticism. However, there is a way to retrieve Knowledge, and that way is through restoring the (Ionian) tradition of critical discussion within all of our institutions. Critical discussion can be restored by increasing democratic participation in our Global Techno-Scientific Culture, which amounts to implementing a socratic social architecture.

1. what has computer technology done to knowledge?

When computer technology becomes ubiquitous, what does that do to Knowledge? The short answer is that Knowledge becomes extinct. To be explained.

Neil Postman, the unrelenting media critic, argued in Technopoly (1992) that the ubiquity of electronic technology has resulted in the dearth, if not death, of literacy or culture and its consequent dependencies, such as independent and critical thinking, as well as Knowledge. That is so because the Technopoly is monopolistic and monolithic. Neil Postman sums up how the Technopoly washes out all differences:

> Technopoly eliminates alternatives to itself….It makes them invisible and therefore irrelevant. And it does so by redefining what we mean by religion, by art, by family, by politics, by history, by truth, by privacy, by intelligence, so that our definitions fit its new requirements. Technopoly, in other words, is totalitarian technocracy. (Postman, 1992, p. 48)

How about human consciousness? What happens to human consciousness when literacy suffers a scarcity if not fatality in the Technopoly? David R. Olson argues (2016) that consciousness and rationality developed historically in humanity and developed psychologically in the individual with the learning of literacy. With the dearth, let alone death, of literacy in the Technopoly, consciousness, and critical thinking will cease. Moreover, since the growth of Knowledge both individually or personally and socially or historically depends on consciousness, and critical thinking, then both personal Knowledge and public, and shared, Knowledge, will also cease to develop, and become extinct.

Bound up with the pervasiveness of informatics and information technology in the Technopoly is the subliminal replacement of objective Knowledge with nominal Knowledge. Objective Knowledge attempts to represent an independent reality including our Global Techno-Scientific Culture as it really is. Or more simply put, Knowledge is about something other than itself, even when about other Knowledge, or about humans, or about society, or about the natural world. However, objective Knowledge (or Knowledge about something other than itself) in the so-called information economy has been transformed and self-subverted into a nominal Knowledge where we only attempt to represent by use of symbols, at most a meta-linguistic description of the syntax or grammar of symbolic systems. Nominal Knowledge occurs when Knowledge becomes only about symbol systems and nothing else. Moreover, nominal Knowledge occurs when Knowledge that at one time used to be about something is transformed into nothing other than symbol systems that are about nothing else other than symbol systems. This type of Knowledge or nominal Knowledge is also only nominally Knowledge when treated as the entirety of Knowledge. Nominal Knowledge involves the transposition and representation of symbols for no other purpose than transposing and representing symbols.

Nominal Knowledge as not about anything (other than nominal Knowledge) is indifferent to the truth. The indifference of nominal Knowledge to the truth, reinforces the so-called post-truth condition where truth is reduced to whatever is said to be the truth by those in positions of power or control. Literally, the condition for the truth of a statement is not that the statement corresponds to what it is about. In the post-truth condition, statements are not about anything. The truth of a statement depends on whether it corresponds to the statements of those who have power or control. Metaphorically, the post-truth condition is a social dysfunction, where whatever the victors as opposed to the losers, in the social game of

gaining power positions, declare as the truth, thereby becomes the truth. The post-truth condition is not only when Might makes Right, but when Might makes Truth, creating a dysfunctional state of society and of the members of that society. (Steve Fuller, 2018, Sheldon Richmond, 2019) Historically, all totalitarian societies invent truth, and whatever is opposed to the ideologies of the totalitarian society is taken as not merely fake but dangerous. As Postman realizes, the Technopoly is totalitarian and operates according to the same principle as historical totalitarian societies operated, inventing truths and an ideology that shuts out all critical discussion of the invented truths and ideology. Totalitarian societies, including the Technopoly, eliminate critical discussion, and so can never find out which of its supposed truths are mistaken; and the supposed truths (enforced by those in power) become a web of lies and illusions, impossible to criticize and counter.

How does the replacement of objective Knowledge with nominal Knowledge impact our quotidian practical lives in the here and now?

The impact of this replacement of objective Knowledge with nominal Knowledge on our day-to-day lives is what Herbert Simon (1972) advocated and Postman (1992) diagnosed. In the (nominal) Knowledge economy or information society, or Technopoly, people become automata in a network of automata, and Knowledge becomes nominal, exclusively a system for transmitting signals and transposing symbols among the automata. All attempts to transform the fundamental axioms or principles of the system by contradicting or speaking and acting against those principles are treated as syntactical errors and system violations. Technopoly monopolizes.

The problem is when Technopoly monopolizes and Knowledge has been converted into nominal Knowledge, how do we, or can we, regain and maintain objective Knowledge?

2. what's so wrong with the technopoly?

The subtitle (after the colon) of Neil Postman’s book, Technopoly: The Surrender of Culture to Technology (1992), tells the entire story. Computer technology, euphemistically called “information technology” and the products of this so-called information technology, symbols and also euphemistically denoted as Knowledge, and referred to collectively by the misnomer “Knowledge economy” or “Knowledge society”,

permeates the Global Techno-Scientific Culture. Computer technology also subordinates current culture to digital processor based technologies. Digital processor based technologies include PCs, MP3 players, hand-held PDAs, Wi-Fi, wearables, router and switch controlled networks, servers, and soon every manufactured object in the internet of things (including implanted devices such as hearing aids, pace-makers, and all sorts of chip implants).

There would be no problem if Postman's explanation of the domination of culture by computer technology were true: computer technology as the new media determines our thought, perception, and social forms. According to Postman, this is how it is and there is no choice about it. However, in general, technological determinism as sociology and history is empirically false. (Phil Rose, 2017 selects various critiques of Postman's culture critique of the Global Techno-Scientific Culture in terms of Postman's theory of the Technopoly, as well as both applications and critiques of Postman's theory of the Technopoly.) For instance, Postman himself unashamedly adopted a personal techno-phobic life-style, and so at least at the individual level, one has a choice to live in a different world. In other words, because there is a choice, we have a problem. The problem is: how does computer technology subvert humanistic culture? Moreover, this problem is a sub-problem of the problem enunciated by C.P. Snow in 1959 that he called the two cultures problem: how does the scientific culture dominate society and make the humanistic culture both socially irrelevant and intellectually vacuous? Only now the problem has deepened: the sciences and humanities are both dominated by computer technology and whatever humanistic value existed in the humanities itself has been subverted and evacuated by the diffusion and dispersal of computer technology. Everything resolves to one culture, the Global Techno-Scientific Culture of computer technology, and hence, there is a monopoly of all culture by technology: the Technopoly. (Chapter Three, Cultures, discusses the monopoly of the Global Techno-Scientific Culture in more detail.)

The short of it is that though Postman sees the Technopoly as pervasive, subversive of humanism, and monolithic, Postman is wrong about the inescapability of the Technopoly. We have a choice; we can exit; we have a way through. You can jump to Chapter Six now to see my outline of our choice and the way through; and then return here; or wait, as you prefer.

In the Technopoly, symbol systems devoid of Knowledge have become an all encompassing Real Virtuality, in the terminology of Manuel Castells

(1996, 2000):

> In all societies humankind has existed in and acted through a symbolic environment. Therefore, what is historically specific to the new communication systems, organized around the electronic integration of all communication modes from the typographic to the multisensorial, is not its inducement of virtual reality but the construction of real virtuality (p. 403)… It is a system in which reality itself (that is, people's material/symbolic existence) is entirely captured, fully immersed in a virtual setting, in the world of make believe, in which appearances are not just on the screen through which experience is communicated, but they become the experience. All messages of all kinds become enclosed in the medium because the medium has become so comprehensive, so diversified, so malleable that it absorbs in the same multimedia text the whole of human experience (p. 404)….What characterizes the new system of communication, based in the digitized, networked integration of multiple communication modes, is its inclusiveness and comprehensiveness of all cultural expressions (p. 405)….Who are the interacting and who are the interacted in the new system...largely frames the system of domination and the processes of liberation in the informational society. (pp. 405-406)

Real Virtuality occurs when we take symbolic systems and media to constitute reality. Virtual reality computer games such as a flight simulator is treated as the real thing, even though we are physically not flying, and fortunately for the sake of our lives, physically not crashing. However, the tie in between symbolic systems and real virtuality is even stronger than simulation games: symbolic systems as real virtuality become "it" or "being", and outside symbolic systems there is "nothing". Moreover all relationships of power are determined by levels of access within the closed universe of the real virtuality. In plain language, there are those who are in the know and those who are outside the circle; and those in the know rule because those in the know are the ones who manipulate and control the real virtuality.

So, what? What is wrong with the Technopoly and its "Real Virtuality"? Every gain, and computer technology is a gain, results in a loss. We don't ride around in horse and buggy, use gas lights on streets, send personal letters by post, so what? What's so bad about that? In other words, technological shifts create technological losses, jobs, skills, and may increase the pace of life, population density, and so forth, but those are just the price we pay for the benefits and as long as the benefits, such as new jobs, more leisure time, increase in lifespan, outweigh the costs, we are ahead.

In this chapter, I focus on the cost of the Technopoly because I think we have a choice, and can change the Technopoly into a more humane and culturally pluralistic society, where again we are in control of computer technology and computer technology is not in control of us. I focus on one cost: the subversion and replacement of objective Knowledge by tokens or symbol systems that are enclosed and refer only to themselves and other symbol systems, nominal Knowledge.

3. people have become dummies in the technopoly

Knowledge, that is, objective Knowledge, is central to how we are as humans. How important objective Knowledge is for us as humans is open to question. However, the Technopoly, the monopoly that we have unwittingly chosen of both the scientific and humanistic cultures by the technology of multi-purpose digital processors, has turned symbol systems into engines for syntax exclusively. The technology of multi-purpose digital processors as engines for syntax, transpose symbols devoid of reference. Symbols devoid of reference have made objective Knowledge impossible. Someone without objective Knowledge, is, in idiomatic language, called a “dummy”. Hence, the Technopoly and its real virtuality (or the evacuation of reference from symbol systems) has turned us into dummies: machines for processing tokens.

But we do seem to know a lot in the Technopoly. We seem to have more Knowledge than we have ever had in human history, and this Knowledge seems to be growing exponentially. How then can we be dummies? How can (objective) Knowledge be impossible?

I think we can gain some understanding of how (nominal) Knowledge in the Technopoly is Ignorance with the following example:

A person who only speaks one language as opposed to a person who speaks ten languages is not any more or less ignorant by virtue of knowing the one language than the person who knows ten languages. The type of Knowledge in knowing a language is basically a mastery of symbolic systems. Similarly, a person who knows more about the world, but speaks only one language is more knowledgeable than a person who speaks ten languages and knows next to nothing of the world. Though we are language-using and symbol-using animals, and that feature of humanity is important to us, it is the purpose of using language as a means or tool for conveying (objective) Knowledge of the world that makes language and

symbol systems important to us as humans. That is to say, using the terminology of David R. Olson (2016), language in its ordinary referential (or denotational) uses is transparent. However, with the development (both historically and psycho-socially) of literacy, we became aware of the sense of language, its semantic values and interconnections, and its grammatical, syntactical, and logical structures. We developed systems of meta-representations for language. We developed meta-language systems that developed into systems of logic, and later computer programming languages. Meta-languages, systems of logic, computer programming languages, languages for mathematics as formal axiomatic or proof systems, are meta-representational systems. Meta-representational systems govern how we use symbolic systems; how we manipulate the tokens of symbolic systems. Extrapolating from Olson's view of the meta-representational function of language: In the Technopoly with the monopoly of digital technology, all we have are hierarchies of meta-languages and have even turned our natural languages, once transparent languages into meta-representational languages. Consequently, the fact that one is only proficient in using computers, and searching the internet, and in mastering the use of the information-systems of modern computer technology, implies that one is only a master of symbolic systems. Such a person could know nothing: If that person has chosen only to master a variety of symbolic systems and not attempt to test those symbolic systems for what they say about the world in the real world (outside of real virtuality), then that person does know nothing. Indeed, the Technopoly as a real virtuality has the potential to turn everyone into people who know nothing beyond the computer skills for using symbolic systems.

The irony is that people who are proficient with the use of computers are thought to be “smart”; and people who are frustrated with the use of computers are thought to be “dummies”. Though, a computer “dummy” could be knowledgeable, as long as that person lacks proficiency in the use of computers, that person is still considered to be a “dummy”. Something has gone awry. Computers are nothing more than information-processing systems, and proficiency in their use elevates one to the elite of the knowledgeable. Even so, why should lack of proficiency in the use of a symbolic system machine turn one into a “dummy”? A slight of hand is used to transfer the supposedly smart quality of computer technology to those who are proficient in the use of computer technology; and thereby, to deny the quality of having Knowledge from those who are less proficient in the use of smart technology. In other words, the illusory and mistaken attribute of so-called computer intelligence is transferred to the users of computer technology, only if they are proficient. But the point is

missed that the quality of smartness when applied to computers is a social decision. Gilbert Ryle, (1949), famously called such a mistaken transference of attributes, a category mistake. However, Ryle's category mistake concerns a conceptual error; whereas the mistaken transference I am discussing, though at the least concerns a conceptual error, a semantic error, also concerns a social, political and moral error. A social, political and moral error can have the effect of perpetuating a mystique (as argued in Chapter One) that both rationalizes and conceals a social tyranny. (Karl Popper, 1945 and Sheldon Richmond, 2017a) Moreover, people allow themselves to become seduced and enchanted by the spell of the mystique of computers because the mystique shifts individual and social responsibility to the system of machines and their guardians and rulers, the new elite of technologists and technocrats in the Technopoly. Popper's famous critique of Plato, Hegel, and Marx, argues that their philosophies have functioned as totalitarian ideologies where individuals and society are seen as subject to the totalistic control of external powers, laws of historical development, and responsibility for our social conditions are transferred to those totalistic external forces beyond individual and social control. (Popper, 1945) Similarly, the mystique of computers lures people to transfer social choice and responsibility to the matrix of machines and their elite guardians, the technologists and technocrats.

Most critics of computers, including Neil Postman, are subject to the illusion of the supposed smartness or supposed intelligence of computers, though Postman argues against their imposition (in *Technopoly*) on society, especially in schools. His argument is that computers and television “amuse us to death” (as in the book with that phrase as its title, *Amusing ourselves to death : public discourse in the age of show business*, 1985). Computer technology inhibits the learning and use of important human skills such as reading, writing, and arithmetic. Moreover, computer technology does not add anything new to what we can do without it. However, there is a tacit assumption behind the argument of these critics, including Postman. The tacit assumption behind their argument that the use of computer technology dumbs us down is: computers are smart, and we can only protect our smarts by avoiding the use of computers.

Even the deniers of AI (artificial intelligence), including those of the deniers who were among the pioneers of AI such as Terry Winograd (1987) and Joseph Weizenbaum (1976), argue that whether or not AI can ever be achieved, we ought to make the social decision to limit the use of AI, particularly in areas where AI can replace humans. Though these deniers of AI argue for the impossibility of genuine AI (such as is

involved in judgments, pattern recognition, understanding, and so forth), they are wary about the temptation to redefine “intelligence” in terms of what computers do. If a computer plays chess in a certain manner, or if a computer solves problems in a certain manner, those means used by computers can become the definition of intelligence.

However, even with the warning that we ought not to let computers replace us in doing intelligent activities, and we ought not to redefine intelligence in terms of what computers can do, there is a tacit assumption that computers are smart, or at least can do smart things. Furthermore, the logical consequence of this assumption is the idea that computers might be able to help us do smart things as well when we use them, and that when we don’t understand computer smarts, it is because we are stupid, or at least, not as smart as computers. Do computers make us dumb? Or, at least, when we become frustrated with the use of computers, is it because we are dumb? Furthermore, the new wave of deep learning machines and general artificial intelligence, (Geoffrey Hinton, 2014) where algorithms are developed so that the machines adapt to new data on their own, has created a situation where the developers of these machines do not know how the so-called learning machines have used the data to produce the results of the learning-machines from the data. (The pioneering text book on the use of parallel processing for the basis of the new AI of learning machines, Rumelhart, 1986, and Joseph Agassi's 1988 nutshell history of the development of connectionism, the precursor of today's learning machines.) We don't know how these deep learning machines are functioning, how they are using the data given the initial algorithms that they modify on their own with the data, so we attribute to them smartness and intelligence. The intellectual basis for attributing intelligence to machines is due to Alan Turing's classic paper of 1950 where he famously invented the imitation game. In simple terms, the imitation game amounts to saying that a digital-duck that walks and quacks like an organic duck is a duck. If X can simulate or imitate the properties of Y, it is a Y. We know that ducks are biological and have evolved biologically to become ducks, and so we recognize that digital-ducks, if we could make them, are not ducks. There is more to being a duck than walking and quacking like a duck. Turing's argumentation rests on the idea that there is no more to intelligence than functioning intelligently, so if digital-machines function intelligently, then they are intelligent. Turing was intellectually honest enough to admit that his argument was largely conjectural, and that its main support was his ability to refute the objections to it: “...I have no very convincing arguments of a positive nature to support my views. If I had I should not have taken such pains to point out the fallacies in contrary

views."(1950, p. 454) Turing also said about science in general, including his own argumentation: "The popular view that scientists proceed inexorably from well established fact to well-established fact, never being influenced by any unproved conjecture, is quite mistaken. ... Conjectures are of great importance since they suggest useful lines of research." (1950, p. 442)

Nowadays, computer scientists, various private and public AI research institutions, and various universities, especially those allied with corporations that are working on AI, are claiming to have accomplished the building of intelligent machines, expert systems. This claim is in line with part of Turing's vision. Also computer scientists in AI research, are implicitly working on another aspect of Turing's vision, on Artificial General Intelligence and learning-machines. Though as Turing again with great intellectual honesty admitted, we can not know what goes on inside the learning-machine: "An important feature of a learning machine is that its teacher will often be very largely ignorant of quite what is going on inside...", (1950, 458) Some computer scientists in AI research expect that one day computer science will achieve super-intelligence and create a new singularity. (Ray Kurzweil, 2006 and Nick Bostrom, 2014).

I propose that computers in the way that they are used in society today do make us dumb. My point is that computers are not naturally smart: there is nothing in their design, or in the use of processors, that makes them smart. Moreover, there is nothing in our design, or in the nature of things that makes humans stupid. Computers perform functions that we think are properties of intelligent functionality. But there is nothing in computers that automatically/naturally deserves to have intelligence attributed to computers by humans. Computers are like digital-ducks, that walk and quack like a duck; and so we decide to call them "duck beings"; or, more literally "intelligent". But both metaphysically and in reality, there is nothing in computers that makes them "intelligent beings". They are only machines, metaphysically and in reality. That we call such machines "smart" or "intelligent", that perform functions that we deem to require intelligence, is a social choice.

I am not arguing against the very possibility (physical, logical, conceptual) that the plans of computer scientists and AI researchers can be achieved. One day, AI developers may indeed build machines that are able to perform general ability tasks that we think are the peak of adaptable, all-round intelligence (Artificial General Intelligence) and even perform tasks that outwit human ingenuity (super-intelligence). For now, I leave aside

the inevitability of unintended consequences and the unpredictability of extremely complex systems. For now, I do not argue against the claims for the inevitability of the achievement of machines that mimic highly intelligent behaviour, including super-intelligent behaviour. Rather, I only argue that we are intellectually confusing virtuality with reality, when we apply the attribute intelligence to such machines, along the same lines as it would be to call virtual digital-ducks, real ducks.

Furthermore, there is nothing in the design of computers including computers that might some day perform tasks that are indicative of all levels of intelligence, from ordinary general intelligence to super-intelligence, that makes those machines intelligent. Similarly, there is nothing in our design, that makes humans stupid. Rather, the social choice has been tacitly made, to use computers in a way that can make us dumb. Ellen Rose (2003), discusses in detail how in our culture, the use of computers in current society makes us dumb. In short, the way computers are marketed, the way documentation is developed, the way computer technical support treats computer users, and so on, result in making computer users dumb. However, her point is not that this is the way things must be. Rather, the dumbing down of computer users is the result of social negotiation. To reverse this situation, we would have to resist , we would have to rewrite the social contract. The point is that we have tacitly made the social, political and moral decision, without open discussion, to treat computers as smart and people as dumb. We have reversed the role between machines and people.

We have a choice about how we use and even design the very core of computers. There is no inevitability that computers need to turn us into dummies, and no inevitability that computers need to be designed as multi-purpose algorithmic computing devices. We can appreciate that best by briefly revisiting the early days of the theory and design of computers, even before universities introduced computer science into their curriculum, Norbert Wiener (1948, 1950) and those among his circle such as J.C.R Licklider (1960, 1968) and Robert W. Taylor (1968) argued for a symbiosis between people and computers. Ross Ashby (1956b) on a parallel track argued for a symbiosis between people and cybernetic automata with respect to how cybernetic automata could amplify intelligence. Their thought was that the computer is a partner to humans, with computers serving humans and assisting humans with their trial-and-error efforts to solve problems. Also, Douglas Engelbart (1962), the inventor of the mouse, seemed to be expanding and elaborating the ideas of Licklider. However, in Engelbart's report (1962), Engelbart changed the

thrust and force of Licklider's symbiotic relationship between computers and humanity. Engelbart's idea about augmenting human intellect reduces to improving the current symbol structures and procedures that humans use to solve problems and only then using computers fixed up with similar symbol structures to solve problems according to the same methods or procedures that humans would use with their own improved symbol systems. Engelbart and those who followed up on his work, replaced the idea that computers will do the routine tasks for humans in their trial-and-error approaches to problem-solving, to computers will enhance high level human thinking capacities. (Thierry Bardini 2000, Jay Hauben 2006, Peter Skagestad 1993, 1996 and Mitchel M. Waldrop, 2001) However, the model of computer systems as enhancers and symbiotic partners to humans, became overshadowed by the dominant information-processing and Artificial Intelligence model of John von Neumann, Alan Turing, Herbert Simon, and Alan Newell. Von Neumann, Turing, Simon, and Newell even borrowed and subverted some of the ideas and innovations of their intellectual competition. (The story is more complicated. For instance, Thierry Bardini 2000, argues that Engelbart developed an alternative approach that differs radically from Licklider's approach. Licklider's approach was adapted into the mainstream AI approach, and later into the PC and Internet. Whereas, Engelbart's approach, though influential for the development of the graphical user interface and also the Internet, was never fully implemented by the mainstream. The issue where those two approaches, Licklider's and Engelbart's, apparently part company is over whether the computer is a partner and at times a replacement for humans, or whether the computer is an extension and amplifier of various human functions. (Joseph Agassi, 1988, for the early days of the link up between neuroscience and AI, 1943-1988; Hector J. Levesque, 2017, for the symbolic tradition in AI that began with John McCarthy, 1959.)

Summing up the argument so far for how the Technopoly has turned us into dummies:

The qualities of the user of the tool, computers in specific, have been transferred from the user to the machine. This illegitimate transference, because it is so patently wrong, requires reinforcement with firstly a mystique or ideology, and secondly a new elite to reinforce, protect, expand and implement the mythology into the design and architecture, as well as into the science of computer technology. Filling in the framework, we get the following result for the Technopoly. The smartness of people has been illegitimately transferred to computers, turning people into

dummies. The obvious stupidity of computers and the patent mistake of the illegitimate transfer has been reinforced by the elite information technologists and computer scientists in their theory and practice, and particularly, in the architecture and design of both computer technology and the socio-technical subsystem of computer technology. A secondary effect of this process has been to turn Knowledge (of the world) into complex nominal Knowledge that is self-enclosed and so is protected from tests, criticism, and critical discussion of fundamentals. This secondary effect reinforces the primary effect of turning people into Dummies and machines into Intelligent Beings.

4. how to understand why people have become dummies

The problem is fairly straightforward and even uncontroversial. Information Technology advocates expected that by the introduction of computers, people would become smarter and more powerful. Furthermore, Information Technology advocates expected that organizations would become less hierarchical, more open, and more democratic in terms of a greater distribution of power and responsibility. (Tapscott, 1993) However this did not happen. Firstly, people found computers frustrating. Secondly, decentralization and distribution of power or the so-called 'delayering' happened and then eroded and reversed. Thirdly, PCs entered the workplace surreptitiously, and without central planning or control from the bottom-levels and without input by traditional IT who lived in the glass-enclosed data centres with mainframes. Before long, PCs became terminal emulators attached to mainframes, then they became part of Local Area Networks, and Wide Area Networks connected to distributed servers. Next, applications and policies were distributed to the PCs from servers, and PCs were controlled and locked through procedures that were distributed from the servers. Now, servers are in the process of consolidation to fewer servers in data centres, central servers with mirror servers for fail-over (if and when main computers fail, clone computers are automatically activated and take over the operations of the main computers): the cloud. The consequence is that we have come not quite full circle, but that PCs are completely under the control of IT staff.

What went wrong? Was it the complicated nature of PCs? Was it the bad design of PCs? Was it the inability to focus on the user or client? Was it the too frequent occurrence of hacking, bugs, and viruses? Was it the too frequent mistakes made by the so-called and apparent dumb users who too often damaged their PCs or downloaded nasty software, or visited naughty

Internet sites, or jammed the networks by playing music and videos?

Those questions presuppose several faulty ideas. Some of the questions presuppose that people are malicious. Other questions presuppose that computers are inherently complex or are currently so poorly designed that they are beyond the comprehension of ordinary humans. Other questions presuppose that IT support are inherently nerdy or asocial and inherently lack people skills.

In short, all those ideas share the common mistake of turning what is a contingent or transient event into a permanent state of nature, or a natural condition of both computers and humans. The mistake involves projecting temporary, or even long standing circumstances that can change, into the natural world as impossible to change through human decisions and actions. Another way of putting this point is that the mistake is to identify the conventional or institutional with the natural.

The problem we are facing then is one that cannot be explained away by a search for underlying natural or quasi-natural laws. The problem is one of failed social expectations: the explanation needed is not a reductive explanation to quasi-natural principles. Rather a relatively systematic understanding from a social perspective is needed of the failed social expectations. However, we now face a methodological question: how do we understand failed social expectations? There are two main methodologies for understanding failed social expectations. In the words of Karl Popper:

> I owe the suggestion that it was Marx who first conceived social theory as the study of the unwanted social repercussions of nearly all our actions to K. Polanyi, who emphasised this aspect of Marxism in private discussions (1924)…It should be noted, however, that in spite of the aspect of Marxism which has been just mentioned and which constitutes an important point of agreement between Marx's views on method and mine, there is a considerable disagreement between Marx's and my views about the way in which these unwanted or unintended repercussions have to be analysed. For Marx is a methodological collectivist. He believes that is the 'system of economic relations' as such which gives rise to the unwanted consequences…. As opposed to this, I hold that institutions (and traditions) must be analysed in individualistic terms, that is to say, in terms of the relations of individuals acting in certain situations, and of the unintended consequences of their actions. (1945, 1967 Vol. II, pp. 323-324)

However, contrary to Karl Popper, I think neither methodological individualism nor methodological holism applies to the social situation of computer technologies. Computer technologies are part of socio-technical

systems that have no fixed boundaries and no fixed procedures. However, for methodological holism to work, we need to identify fixed institutions with a fixed logic. For instance, we understand holistically that when we build faster and larger highways, we unintentionally evacuate cities. The institutions governing the highway system are fairly fixed including the design of highways and the function of highways. Speed shortens time allowing for traveling further distances in the allotted time. Traveling further distances allows for building cheaper homes on larger and cheaper lots of land, and also building the parking lots for the cars needed to go to the shopping centres on the cheap and large land lots. The holistic understanding refers to the interaction of entire systems, such as economics, transportation, and suburbia. We can also understand why highway deaths increase when gas prices are cheaper and speed limits are higher by the use of situational logic and methodological individualism. For instance, a car driver could say: "I use the highway rather than the back roads to get from point A to point B faster, so when I do not need to worry about the increased expense of driving faster or getting an expensive speeding ticket, I will drive faster and pass as many cars as I can. I don't intend to increase my chances of getting killed, and no one else does: I am a good driver; I drive defensively; and so I will be less subject to a collision than others who are not as good drivers as I am." The unintended and unexpected upshot of this quite logical and rational approach among enough individual drivers unintentionally and unexpectedly results in a greater number of collisions and hence deaths.

My point is that both methodological individualism and holism require a relatively stable system, institutions, and norms. Though, the relatively stable system as all human systems can change. However, socio-technical systems are not merely inherently unstable but are inherently dynamic. They are in constant flux. You cannot step into the same river of socio-technical systems twice; moreover, you cannot even find that same river. When you are about to step into that river, it has already moved to another location. However, if instead you take an ecological view of the water system, and look at sub-systems, such as river systems, lake systems, ocean systems, and their interaction, you can find appropriate sub-system principles for behaviour. Similarly, when you look at the various sub-systems of socio-technical systems, you can find appropriate sub-system principles for behaviour.

I am adapting the methodology of systems analysis that has been developed for both corporations and Information Technology: the main job of systems analysts is to understand, more than explain what is going on

inside a corporation, business, government organization, institution, and to develop the appropriate processes whether involving computer systems or not. (Please see the following entries in the Bibliography if you are interested in some of the important developers of practical systems analysis not metaphysical, philosophical, theoretical, but the real methodology that is actually used in places of work: Northcote C. Parkinson, L,J. Peter, Herbert A. Simon, and G.M. Weinberg, and Scott Adams for the absurdities that abound in places of work.) The main question for practical real life systems analysis is: what procedures, methods, heuristics, strategies are used to manipulate inputs/resources to produce the desired and intended outputs/results? (Stuart Umpleby, 2002) I should mention, alternative methodologies are used to gain an understanding of the culture of the place of work, such as a version of participant-observation that is used in cultural anthropology. (Chapter Four, Dialogue) However, in this chapter, I stick to practical systems analysis and ask, how can we understand the place of work undergoing transformation due to the implementation of Information Technology? What strategies, heuristics, rules of thumb, processes were used to move towards an automated workplace?

For instance, we have many rules of thumb principles to understand different sub-systems in socio-technical systems. Here are two examples of well-known principles that are used to understand oddities and unexpected features of traditional bureaucratic social organizations. One example is the Peter Principle (L.J. Peter and R. Hull, 1969) that discusses how incompetence tends to increase in organizations. The second example is Parkinson's Law (C. Northcote Parkinson, 1958) that discusses why bureaucratic systems tend to increase the levels of hierarchy and the number of staff. Both the Peter Principle and Parkinson's Law are principles that help us to understand unexpected results of rational activities. The Peter Principle assumes that only competent people are promoted, and then answers the question, why are there so many incompetent people in organizations? The logical answer is that people stop getting promoted when they become incompetent. Similarly, Parkinson's Law derives from the common sense assumption that people want to rise in the bureaucracy. It answers the question, how come bureaucracies rapidly increase in staff? The answer is that if you can increase the size of your staff, you can increase your importance, and have a higher status and pay without actually changing jobs.

My first point about the Peter Principle and Parkinson's Law is that both attempt to understand the unexpected or surprising in terms of a logic deriving from common sense assumptions and rationality. We don't expect bureaucracies to grow geometrically, but they do. We don't expect incompetent people to work at high levels in organizations, but they do. Unexpected events are understood as the logical result of the use of common sense and (means-end or instrumental) rationality. People want to rise and only competent people get promoted. My second point about the Peter Principle and Parkinson's Law is that they are examples of the attempt to understand the unexpected by developing and using system-specific principles. They are essentially rules-of-thumb as opposed to absolute laws, or they are not even laws, but are extensions of pattern-descriptions, and principles for behaviour.

The methodology that I want to use involves the development of principles or rules-of-thumb for understanding the unexpected outcome of the introduction of computer technology into society at large. Now, I can turn to my problem of why we have become dummies in spite of using supposedly smart computers.

5. how the technopoly turns people into dummies

Computers do things that look intelligent such as perform tax calculations. Computers contain components that seem to work the way brains work. For instance, computers have a processor (or many processors in parallel distributed systems) where calculations or symbol manipulation occurs, or where instructions are followed. Computers have short-term memory in the form of what is called volatile memory stored in chips or solid-state circuits. Computers have long-term memory in the form of what is called storage stored in magnetic and optical media. The short of it is that computers process instructions.

However, hammers also process instructions in the sense that hammers incorporate or embed a design. The design is nothing more than a set of instructions. The instructions can be in the form of a pictorial representation or in text. The point is that hammers perform according to the design or instructions. Moreover, when computer instructions were hard-wired into the computer before the days of stored programs (as developed by John von Neumann), computers like hammers embedded a design. However, when instructions could be stored, the computer became a multi-purpose machine that changed its function depending on the change in the stored

instructions or programs or applications. Computers are not a special kind of technology of a different order from hammers and other technologies. They are not smart, but are only tools that can be used for multi-functions.

We mistakenly expected computers to be smart for us in the development of Artificial Intelligence. Though, the alternative approach (developed by Ted Nelson, Tim Berners-Lee, and others) was to help us think in smarter ways with the development of special structures for the computer. Ted Nelson invented the concept of hypertext in 1965:

> Let me introduce the word "hypertext" to mean a body of written or pictorial material interconnected in such a complex way that it could not conveniently be presented or represented on paper. It may contain summaries, or maps of its contents and their interrelations; it may contain annotations, additions and footnotes from scholars who have examined it. Let me suggest that such an object and system, properly designed and administered, could have great potential for education, increasing the student's range of choices, his sense of freedom, his motivation, and his intellectual grasp. Such a system could grow indefinitely, gradually including more and more of the world's written Knowledge. However, its internal file structure would have to be built to accept growth, change and complex informational arrangements. The ELF [Evolutionary List File] is such a file structure. (1965, p. 96)

Tim Berners-Lee invented the hypertext markup language and the client or app to read this language, which he called the World Wide Web in 1989. The WWW is the fruition of Vannever Bush's hypothetical memex:

> Wholly new forms of encyclopedias will appear, ready made with a mesh of associative trails running through them, ready to be dropped into the memex and there amplified. The lawyer has at his touch the associated opinions and decisions of his whole experience, and of the experience of friends and authorities. The patent attorney has on call the millions of issued patents, with familiar trails to every point of his client's interest. The physician, puzzled by a patient's reactions, strikes the trail established in studying an earlier similar case, and runs rapidly through analogous case histories, with side references to the classics for the pertinent anatomy and histology. The chemist, struggling with the synthesis of an organic compound, has all the chemical literature before him in his laboratory, with trails following the analogies of compounds, and side trails to their physical and chemical behaviour.
>
> The historian, with a vast chronological account of a people, parallels it with a skip trail which stops only on the salient items, and can follow at any time contemporary trails which lead him all over civilization at a particular epoch. There is a new profession of trail blazers, those who find

> delight in the task of establishing useful trails through the enormous mass of the common record. The inheritance from the master becomes, not only his additions to the world's record, but for his disciples the entire scaffolding by which they were erected. (1945, p. 108)

However, the goal of building a dumb machine such that it will enhance our memories and research capabilities has been subverted by the transference of the properties and qualities of those who use the machine to the machine itself. How does this transference occur?

We are given a dumb machine. We expect the machine to be smart. When something is smart it understands our intentions and actions. However, the computer is dumb. It doesn't understand our intentions and actions. When the computer fails to work the way we expect because it doesn't understand us, though we think it does, we blame ourselves. We are mistakenly led to conclude that the computer is not at fault, it is we. Consequently, in order to help we dummies from botching up the computer and for getting our jobs done, Information Technology (IT) staff is hired. Furthermore, smart computers supposedly replace certain people and certain job functions, such as data correlation, analysis, and report design and production. But computers fail to maintain productivity. They are never smart enough to completely and adequately replace those functions. Then the people who are not familiar with those functions are asked to help the computer perform those functions but those people have no understanding of those specific functions. Consequently, people asked to perform functions for which they are ill-equipped, are given detailed instructions to follow for performing those functions. But the people who use those instructions have no understanding of what those instructions are supposed to accomplish. In other words, people perform jobs of which they have no understanding according to rote procedures and thus their work becomes dumbed down. Furthermore, people who do the jobs of which they have no understanding require more supervision. More layers of supervision are created in order to manage people who appear dumb when doing jobs by rote.

Supposedly smart computers are not merely deskilling workers. The mistaken idea of computers being smart when they are actually dumb, leads to frustrating smart people and deceiving them into believing that they are dumb. Management and IT staff reinforce this deception unwittingly, because they too believe that people must be dumb if they cannot use smart machines. Furthermore, control of computers is transferred to IT staff in order to prevent the dumb workers from

destroying the technology. The dumbness of people is further increased because they are prevented from experimenting with their computers and from learning how to manipulate the computer through trial and error.

How then can we escape the self-reinforcing and vicious cycle of dumb computers being treated as smart and smart people being treated as dumb? In other words, how can we restore and maintain (objective) Knowledge in the Technopoly? The simple answer is: break the practice of illegitimately transferring the intellectual qualities of people to their tools including dumb computers.

6. restoring knowledge in the technopoly, or dummies no longer

How in detail can we break the, practice, that has become a rule of thumb or law-like sub-system principle of the socio-technical ecological niche of computer technology, of illegitimately transferring smartness to dumb machines? How can we make fundamental changes in the Technopoly? Such change will be by necessity radical. My task in the following is to provide practical strategies for making radical changes within our Technopoly.

I hope to explain in the following how our Global Techno-Scientific Culture, the Technopoly, as literally a social construction, can be literally socially reconstructed. As Ellen Rose argues (2003), what we do in culture, including our Global Techno-Scientific Culture, is done through social negotiation. How then can we renegotiate our "social contract", though in actuality much of what we do in culture in only metaphorically done through negotiation? Indeed, the metaphor of negotiation is somewhat misleading. There are no specific groups who can sit across a table to hash out matters. Rather, there is an idea afloat that computers are smart, and this idea is mistaken, and there are institutions built on this mistaken idea, and there is a mythical treatment of the idea as part of the Computer Technology Mystique, and finally there are various groups, especially the IT world, who benefit from the propagation of the myth in the Mystique surrounding computer technology, The Computer Technology Mystique (discussed in some detail in Chapter One). The more exact way of phrasing the question of how to renegotiate the social contract of the Global Techno-Scientific Culture, could be: how can we undertake making social change?

The first logical step would be to expose and criticize the mystique of computer technology. The second logical step would be to replace the mystique we have about computers with a realistic view of computer technology, at least a less mistaken view and less mystical view. The third logical step would be to change our institutions to conform to the less mistaken view. I have already attacked the mystical and mythical idea that computers are smart (in this chapter, as well as in Chapter One). So what: what could be some of the consequences of replacing a bad idea of the nature of computers with a better idea of the nature of computers? In other words, what would we accomplish with the second logical step of replacing a mistaken view with a more realistic view of computer technology?

Here is a rough and ready answer as a starting point: Though computers are no smarter than other tools, unlike other tools their design or set of instructions can be changed without remaking the tool. A computer can run many different applications and thereby perform many different functions. Frustration with the use of the computer is not because the computer is supposed to understand that person and for some reason that person is failing to get the computer to understand that person. Rather, the frustration is due to a lack of skill in the use of the computer. This sounds strangely simple, if not simple minded. When someone becomes frustrated by a bicycle it is not because the bicycle is smart and the rider is stupid by not getting the bicycle to understand the rider. Rather, most likely the rider does not have the required skills. The question of how to learn how to ride the computer, to obtain the skills, is just a question of pedagogy, no different from how to learn how to use a pencil, or from how to learn how to fly a plane, or from how to learn how to use a microwave oven. We need to develop the appropriate pedagogical principles. Moreover, those pedagogical principles may differ for different technologies, just as they differ for learning languages versus learning history or mathematics, or other subjects in the arts, humanities, and sciences. However, how one learns how to program computers may also involve pedagogical principles on the same order as learning to read and compose music, or write poetry as opposed to learning how to ride a bicycle.

The general point is that there is no special art for the mastery of computers. There are simple skills needed to use a mouse, keyboard, and so forth, and how to get the applications to do the functions they are supposed to do. However, all the skills required could change when computers become redesigned. A pointer and tablet, as in tablet PCs of

whatever brand, could completely replace the mouse and keyboard. Imagine a tablet PC where the application that is used would be called up by what the user is doing on the tablet, i.e. graphics applications when drawing, or word processing when writing sentences, or email when writing an address, and so on. The activity of the user drives the application, as opposed to the application driving the activity of the user. You put the pen or stylus down; the file is saved. You write an address at the end of the picture or words; the file is mailed. You write a question mark with a few words following; you get a Google search on the internet.

The point of my discussion of an imaginary tablet PC is that we don't know what can be created or what skills will be needed for using the next breed of computers. For instance, Ted Nelson, (2004) has suggested computer scientists go back to basics, and look at his proposal for an entirely new architecture for computer systems:

> The computer world, and software design, have always been to some considerable extent about the design of imaginary constructs and their ramifications. Such concepts as "desktop" and "clipboard" are not reality, but imaginary constructs that become familiar and come to seem like reality. The same holds for text files and directories, imaginary constructs of an earlier generation. There is no right or wrong about imaginary software constructs, save for such criteria as usability (the pragmatic aspect), comprehensibility (the cognitive aspect) and aesthetics (the art aspect)… When you select a construct you select ramifications; reworking the construct to improve the ramifications is extremely hard." (pp. 26-7)

The gap between what is and what we can imagine for the architecture of computer systems underlines the rigidity in the architecture. This rigidity is reinforced by a similar rigidity in the architecture of organizational systems. For example, Charles West Churchman, a philosopher and pioneer of systems analysis in management, outlined alternative approaches to problem solving in existing organizations. (1971) Though he and others talked about the use of dialectics (the posing of contradictions and paradoxes), the function of dialectics (criticism of fundamentals) is subverted to the solving of puzzles within the current system. The framework of the Knowledge system is not challenged. Rather, this form of dialectics is used as a heuristic for thinking up alternative perspectives that fit within the current framework and organizational system and result in the entrenchment of the current system. The point is that we need to reclaim dialectics, restore it to its original mode of operation, and use it for its original function of challenging the very framework of current systems. What we need to do is use dialectics and alternative "enquiring systems"

as tools for rethinking the architecture of organizations, societies, and institutions, and computer systems. But another problem arises. Even if we are able to rethink our architectures for organizational and computer systems, how do we implement the new systems? This problem presumes an even more fundamental problem: how do we regain (objective) Knowledge, the very ability to use dialectics to challenge fundamentals? Discussing this question brings us to the third logical step mentioned above that involves making our social institutions, that is our techno-social institutions, conform to our more realistic view of computers, as dumb machines that are easy to learn how to use.

The answer to the question of regaining Knowledge cannot be found in the interface between technology and us. Better interfaces or ergonomics merely entrench the current digital architecture, both technical and social. For instance, Donald A. Norman argues that the more we understand about the cognitive and emotional requirements of people, the better our designs will be; and, the smarter we will act. It is bad design that makes us stupid. He goes further and proposes that we design computers as information appliances such that their design becomes invisible to us. The invisibility of computers as pieces of equipment will allow us to focus on the usability and functionality of the information appliance. (Norman, 1988/2002, 1993, 1998) The main drawback of this approach is that the better design only allows us to more easily transpose symbols. Regardless of the ease of use, the internal structure of the symbolic systems encapsulated in the information appliance remains unchanged. Ironically, the more user-friendly the equipment is, and even the more humane it is, the more the real problem is disguised and even harder to detect. The pretty face of the information appliance seduces us into thinking that now the dumb-making or stupid-making nature of computers has finally been extricated from our information and information systems. But the real problem is not in the design of the technology, but in the architecture of the information systems: the architecture only allows for information systems that transpose symbols and lock us into the real virtuality of closed symbolic systems. Hence, it is not the design of the technology, but the architecture that imposes an artificial simulation of Knowledge that amounts exclusively to the manipulation of tokens.

How we can regain Knowledge, how we can regain the ability to rethink and to be critical about fundamentals in technological society involves two approaches. The first approach involves changing the technical part or inner core of the technology, the architecture of information and Knowledge systems, or our socio-technical culture. (To reiterate, changing

the socio-technical is the third logical step mentioned above, in making general social change.) This architecture is mainly symbol oriented as opposed to relationship or process oriented. Ted Nelson (2004) points out, for instance, as previously discussed, that the dominant architecture, including his own development of hypertext (1964) is based on files and hierarchies of files (which includes directories and virtual objects). Moreover, Ted Nelson points out that all these objects are virtual, or symbolic, including such artefacts as the "desktop". However, relationship architecture would build in how the Knowledge system is related to the people using the system and how the Knowledge system is related to the world. But this is merely a criterion for a new architecture. It merely tells us what we should be able to ask of any specific architecture or any specific structure for Knowledge systems: we should be able to ask how the architecture or structure relates to both the user and the world. For the function of any Knowledge system is to provide Knowledge to the user about something related to the world. Symbolic or virtual object structured systems tend to be self-enclosed. Whereas relational systems such as the various cybernetic systems envisioned by Norbert Wiener, Douglas Engelbart, and J.C.R. Licklider, allow us in principle to test how their architectures relate Knowledge systems to the user and the outer world. Donald Norman realizes that there is an inherent limitation with digital systems, the mainstream design of computers. As Donald Norman says, "We are analogue beings trapped in a digital world, and the worst part is, that we did it to ourselves" (1998, p. 135). However, what he overlooks is the possibility of the more widespread development and implementation of analogue and cybernetic computers. (Alcibiades Malapi-Nelson 2017, Sheldon Richmond 2018a) The short of it is that we can change the digital world, admittedly of our own making, and just because it is of our own making. Moreover, we don't merely have to ameliorate our misfit with the development of so-called information appliances and user-centred or human-centred design. Rather, we can radically and fundamentally change the digital artificial world into an analogue world, and develop technology with an architecture that adjusts to our human capacities and abilities. But in order to get this architecture developed and implemented, we need to have an audience, or in economic terms, a market, at the minimum. Getting an audience, involves the second approach of my answer to the problem of how to regain Knowledge or how to transfer smartness back from computers to people.

The second approach is social and political. The second approach involves changing the social part or the social architecture of information and Knowledge systems, our socio-technical culture. (Changing the social part

of our socio-technical culture is part of the third logical step mentioned above, in making general social change.) For instance, Joseph Agassi (1985/2005) identifies the problem of controlling the technology that threatens to destroy both our quality of life and life itself, as a political problem:

> …..we have to implement a drastic change in our policy towards the implementation of technology, and centre less on the physical and more on the social side of technology: we should prefer the change of the organization of a system to the introduction of a new piece of machinery. And we should study the social side effects of technological innovation and decide whether they are desirable or not, and if not, what to do about it. Such decisions are political, and the chief political question is, what political machinery should exercise such controls. (p. 8)

This second approach of my answer to how we can regain Knowledge, expands or generalizes the answer Joseph Agassi proposes for controlling dangerous technology, which is to increase democracy in all our institutions and to improve education in our society. (Agassi, 2014a) Thus, an audience for discussing alternative Knowledge systems and alternative architectures for Knowledge systems can only be created through fundamental institutional changes, through changing our social architecture for all institutions.

The main wheel of democratic politics is participation. When someone states a difficulty with a computer, one need not assume that the person is in error, and one can enlist that person to become part of the audience for the discussion of alternative architectures. But, how can one get an audience who can fully participate in the critical discussion of the alternative architectures? How can one find an audience outside the small group of experts? Currently, computer technology has been made into a mystique (as discussed in Chapter One). Rather than make a mystery of computers by hiding functions, and by preventing access to all the functions, the demystification of computers has to occur by opening everything up. In other words, by allowing people to develop mastery over computers through trial and error and sharing ideas and skills, people will not need an intermediary group whose main job function is to minimize and correct so-called user error. Thus, everyone who uses computers will be able to participate in the critical discussion of alternative architectures. (Chapter Six, Criticism) Finally, the main purpose of democracy is the protection of the freedom of individuals. Freedom is enjoyed through the participation in social decisions. We maximize participation in social decisions by implementing a socratic social architecture, for all institutions,

we replace isolated and monolithic cultures/approaches/philosophies with interacting multiple and alternative cultures/approaches/philosophies; where top-down flow of power and information is replaced with bottom-up flow of power and information; and where insider-outsider barriers and structures are replaced with two-way interaction and discussion among all. (Chapter Four, Dialogue) Similarly, by opening up access, both socially and technologically, to computers, individuals are given more autonomy and control over the use of their computers: they will maintain their smarts as well as attain freedom, in both senses of freedom as the Knowledge of necessity, and as the ability to choose. Knowing what is necessary for the use of the computer is freedom: having the choice and responsibility over what one does with the computer is freedom. Whatever social regulations occur for the access to and the use of computers, applies across the board, for professional and ordinary computer users: in order to protect us and our freedoms, from those people who use computers maliciously and harmfully.

My argument points to a strategy for the development of a techno-plurality. This strategy demands the end of silence on the part of those who are the so-called knowledge workers. We need to firstly admit that if we treat Knowledge as only a real virtuality, as closed symbolic systems where nothing exists outside those systems, we will lose one of the central features of our humanity: the quest for Knowledge about the world and our place in it. Secondly, the way to regain and maintain Knowledge is to think critically about our symbolic systems: not merely debug them for syntax, and their algorithmic functionality; but also to test them against the world and to question our fundamental premises. Do our symbolic systems tell us anything that we don't know? If not, they need to be improved. Ironically, to restore and maintain Knowledge in the Technopoly, our task is to become critics of Knowledge including becoming critics of the current architecture of information or computer systems. (Chapter Six, Criticism)

What Bertrand Russell said is the task of philosophy still applies not only to philosophers, but also to all people who are interested in the resuscitation of Knowledge:

> The essential characteristic of philosophy which makes it a study distinct from science is criticism. It examines critically the principles employed in science and in daily life; it searches out any inconsistencies there may be in these principles, and it only accepts them when, as the result of a critical inquiry, no reason for rejecting them has appeared. (1912, p. 12)

Moreover, going beyond Bertrand Russell when speaking not only of philosophy but of science and indeed of all endeavours, we may have to retrieve, as Karl Popper advocated, the Ionian tradition of criticism:

> ..the Greek tradition of philosophical criticism had its main source in Ionia. It was a momentous innovation. It meant a break with the dogmatic tradition which permits only one school doctrine, and the introduction in its place of a tradition that admits a plurality of doctrines which all try to approach the truth, by means of critical discussion. It thus leads, almost by necessity, to the realization that our attempts to see, and to find, the truth, are not final, but open to improvement; that our Knowledge, our doctrine, is conjectural; that it consists of guesses, of hypotheses, rather than of final and certain truths; and that criticism and critical discussion are our only means of getting nearer to the truth. It thus leads to the tradition of bold conjectures and of free criticism, the tradition which created the rational or scientific attitude...(1959, p. 21/ 1963,1965, p. 151)

Thus, to retrieve Knowledge, we need to restore democratic participation in all our institutions and in every aspect of our Global Techno-Scientific Culture. Restoring democratic participation amounts to restoring the tradition of critical discussion, for philosophy, for science, for all endeavours, and now more than ever, for our Global Techno-Scientific Culture monopolized by digital technology. Restoring critical discussion, amounts to implementing a socratic social architecture. (Chapter Six)

How to regain Knowledge? In a sentence: the first logical step is to critique the mystique of computers; the second logical step is to redesign our socio-technical culture, The Global Techno-Scientific Culture, by rebuilding our social institutions so as to conform to a more realistic view of computer technology; the third logical step is to develop with the democratic participation of both computer technologist and computer users, an alternative architecture for both the technical and the social aspects of the Global Techno-Scientific Culture. Figuring out the three logical steps for regaining Knowledge in the Global Techno-Scientific Culture opens up the questions: How does the techno-scientific culture interact with the marginal humanistic culture in the Global Techno-Scientific Culture? (Chapter Three, Cultures) How can we have dialogue among cultures including the dominant culture of the Global Techno-Scientific Culture? (Chapter Four, Dialogue)

CHAPTER THREE

CULTURES

> Between the two a gulf of mutual incomprehension, sometimes...hostility and dislike, but most of all lack of understanding.
> C.P. Snow (1959, p. 4)

0. overview

1. do we understand people from different cultures?

2. how does science create scientific knowledge?

3. how do science and the humanities or arts form distinctive cultures?

4. how do scientific and artistic creation allow for breaking the two cultures barrier?

5. six mistaken ideas about cultures and subcultures

0. overview

Many post World War II thinkers have been perplexed by the problem of how or even whether people from different cultures can understand each other. The problem arose when we started to think of culture as formative of language and thought. The common assumptions of most theorists of language are that language is fundamental to thinking and culture; and language, thought, culture, humanity are a natural product of biological evolution. Though language and culture create hurdles for achieving cross-cultural understanding, the pursuit of technology and science transcend the limitations of culture, and indeed have created a monopolistic Global Techno-Scientific Culture or Technopoly. But within the monopolistic Global Techno-Scientific Culture, the Technopoly, there are two subcultures, the techno-elite who dominate the Global Techno-Scientific Culture, and the techno-subjects who comprehend little of digital technology. However, the traditional humanist oriented culture of techno-subjects has been overcome and virtually eliminated by the dominant Global Techno-Scientific Culture of the oligarchic Technopoly.

1. do we understand people from different cultures?

Many post World War II thinkers have been perplexed by the problem of how or even whether people from different cultures can understand each other. The problem arose when we started to think of culture as formative of language and thought. The main solutions to this problem have followed either Noam Chomsky's (1979) approach or Ludwig Wittgenstein's (1953) approach. Chomsky's approach is to think of language and thought as fundamentally universal because they are based on innate and deep linguistic structures.

Wittgenstein's approach is to think of language and thought as fundamentally variable. For Chomsky, all people have an ability to understand each other regardless of language and culture because all languages are based on the same set of deep grammatical rules. For Wittgenstein, people from different cultures cannot understand each other because culture and language construct reality. In both cases, the problem of how people from different cultures can communicate dissolves. In the case of Chomsky, the problem dissolves because the difference is not fundamental. In the case of Wittgenstein, the problem dissolves because cross-cultural understanding is impossible: understanding and reality are relative to cultures and can only occur within cultures.

The common assumptions are first, that language is fundamental to thinking and culture; and second, that language, thought, culture, humanity are a natural product of biological evolution. Two other philosophers Karl Popper (1959) and Michael Polanyi (1958) who are seen as diametrically opposed, both independently criticize those assumptions. Moreover, both provide alternative theories of humanity (i.e. culture, thinking, and language) whereby cross-cultural understanding is a real problem that can be broached through engaging in the pursuit of science. Though language and culture create hurdles for achieving cross-cultural understanding, the pursuit of science transcends the limitations of culture. For Popper, science follows the methodology of rational dialogue which transcends culture; for Polanyi, scientists use tacit knowledge to make scientific discoveries as members of the culture of science.

Many dismiss Popper's views for being too naive. (Joseph Agassi, 2014b critically discusses Popper's critics.) They argue that science is part of Western culture, and as part of Western culture, it produces knowledge which is relative to Western culture. Science does not transcend culture. Rather, science is an artefact of a specific culture and as an artefact of Western culture produces a language and form of thinking that constructs a reality relative to Western culture. However, beginning during the Cold War, science and technology have become a global culture, subsuming all previous civilizations. Popper replies to his critics in his essay, "The Myth of the Framework". (1994) Popper's argument is that frameworks can be criticized in the same way all theories can be criticized. However, Popper seems to miss the main point of his critics' argument which is that frameworks both define theories and set the procedures for criticizing theories within the frameworks. All criticism occurs within frameworks, and hence both depends upon and reinforces the framework. (Menachem Fisch, 2011, 2017) The question here is whether and to what degree, if at all, theories are formed by and within frameworks?

Ironically, it is Polanyi's theory of how science creates knowledge through the use of personal knowledge that provides an answer to that question. Science forms a distinctive culture with a distinctive framework that transcends Western culture. Science is an autonomous culture. Those who want to break the barrier of the framework, need only to join the culture of science and thereby transcend ethnic cultures. However, as an autonomous culture with a distinctive framework, science again re-creates the barrier of the framework in the form of C. P. Snow's two cultures problem. (1959) Science is a distinctive culture which is not understood by literary people; and literary people form a distinctive culture which is not understood by

scientists. Have we returned to the original problem, if only in a slightly altered form? How can people, if at all, from different cultures, specifically, science as opposed to the humanities and the arts, talk with one another?

The situation surrounding and formative of C. P. Snow's two cultures problem has changed. The culture of science has changed into a Global Techno-Scientific Culture. The forms of thinking and acting of the limited and bounded culture of science have become globalized through the merging of digital technology with science. Rather, the situation now that is formative of a new two cultures problem, is that digital technology is in everything and is everywhere. Moreover, digital technology is under the control of a techno-elite that has transformed the traditional culture outside science into a subculture of the Global Techno-Scientific Culture; and those who are members of this culture have become techno-subjects. Techno-subjects use digital technology with little comprehension and suffer much frustration with the complexities of digital technology. Can the new version of the two cultures problem be at all resolved? How can the techno-elite and techno-subjects come to a better understanding of each other? How can the frustrations that techno-subjects suffer with digital technology be minimized? How can the mystique of digital technology, the myths about computer technology, developed and propagated, partially intentionally and partially unintentionally, by the techno-elite, become transparent to techno-subjects?

I think the resolution to this new problem of the cultural impasse between the techno-elite and techno-subjects can be developed by adopting a new way of understanding Polanyi and Popper. Polanyi's and Popper's philosophies of science can be seen from a new way of understanding that takes their philosophies as complementary theories of scientific knowledge and the Global Techno-Scientific Culture.

Polanyi's theory of the culture of science, often overlooked, differs from the more well-known theory of T. S. Kuhn (1962). Kuhn thinks that scientific revolution is the replacement of incommensurable paradigms. Science in a revolutionary state consists of competing paradigms where one paradigm becomes dominant, usually the paradigm of the younger generation. However, from the perspective of Polanyi's theory of tacit knowledge (1966), the theory of paradigms is at best a partial description of how scientific knowledge is created. Polanyi's theory of the creation of scientific knowledge through the use of tacit knowledge, views scientific knowledge as rooted in personal knowledge. But scientific knowledge

transcends persons and their specific ethnic cultures. Scientific culture is global.

Though Polanyi's theory of tacit or personal knowledge is seen as opposed to Popper's theory of objective knowledge, Polanyi views objective knowledge and rational criticism as part of the explicit or articulate dimension of science which is guided by the tacit dimension. Hence, from the perspective of the tacit dimension, Popper's theory of objective knowledge is a description of how the explicit aspect of personal knowledge functions. However, I think that Polanyi mistakenly minimizes the role of objective knowledge in his explanation of scientific discovery. By fully explaining the function of objective knowledge and its relationship with tacit knowledge, I suggest that we will find a path through the barriers and walls formed by frameworks or paradigms. In particular, we will find a path through the cultural wall surrounding the dominant Global Techno-Scientific Culture. The Global Techno-Scientific Culture and its cultural wall is controlled by the techno-elite. It is a cultural wall that shuts out techno-subjects and that transforms the humanist-oriented subculture of techno-subjects into a culture of subservience to the Technopoly.

By integrating the views of Popper and Polanyi, there can be found a solution: a solution to the particular problem of how to open the gates of the dominant Global Techno-Scientific Culture so that techno-subjects may find a way through; and a solution to the general problem of cross-cultural understanding. The easy part to this integration of Popper's and Polanyi's views is that both agree that it is not language but science which is the key to understanding thinking. All knowledge follows the pattern of scientific knowledge. Language is a tool for thinking: a very important tool, but only a tool. Also, both agree that science, thinking, and culture, form a distinctive realm or ecological niche for human evolution. Culture is not a mere organ like the brain or eye but forms an ecological niche for human physical or biological evolution. According to Popper's (1977) theory, culture is part of the world three of theories and institutions which interact with the physical realm. According to Polanyi's theory, culture forms an upper hierarchical level that has its own operational principles, but whose principles are conditioned or restricted by the lower levels. Hence, both Popper and Polanyi agree that human culture is distinctive. However, Popper and Polanyi have alternative views on how human culture interacts with the lower levels. The difficult part of the integration of their views is that both seem to disagree over the nature of scientific discovery and the role of methodology. For Popper, explicit questions, theories and argument are what constitutes science. For Polanyi, personal

knowledge or commitment to one's views in the face of difficulties is what constitutes science. Popper seems to be for critical detachment; and Polanyi seems to be for a-critical attachment or personal commitment. (Sheldon Richmond, 1994) However, I suggest that both theories of science are interdependent and need to be integrated in order to fully explain how science creates knowledge.

There are three questions concerning my attempt to integrate the views of Popper and Polanyi with respect to the new two cultures problem, of how techno-subjects with culture centred on humanism (our humanity as creatures that seek to know, and seek to act morally) can find a way into and through the dominant Global Techno-Scientific Culture centred on digital technology:

First. How does science develop scientific knowledge? (Discussed in section 2 below.)

Second. How does science with a culture centred on digital technology and a human-centred (analogue/comparative-cybernetic/feedback) culture conflict? Though the techno-scientific culture is dominant, and the human-centred culture is more of a subculture within the dominant techno-scientific culture, how do the two cultures conflict? (Discussed in section 3 below.)

Third. How does an integration of Popper's and Polanyi's philosophies of science into a new framework for viewing this cultural conflict allow, if at all, for resolving the conflict and/or removing the barrier between the culture of techno-scientific oriented technocrats (the techno-elite) and the culture of humanistic-oriented techno-subjects? (Discussed in section 4 below.)

2. how does science create scientific knowledge?

Here I discuss the question: How does science develop scientific knowledge?

Popper holds that knowledge develops through a process of conjecture and refutation: questions, alternative theories, and critical discussion. (Popper 1959 and 1963/5) However, this viewpoint best answers the question of how knowledge as objective grows. This approach intentionally does not address the question of how people produce alternative theories. The question of the genesis of theories, and criticisms, is a question of psychology or sociology or history as opposed to a question of philosophy.

Philosophy poses questions about the logic of knowledge: whether a scientific inference is logically valid. Popper solves the problem of induction where generalizations are invalidly induced from singular statements by arguing that scientific inference is deductive, not inductive. General theories are refuted by singular statements when predictions are mistaken. The problem with this approach is that when we concentrate on the objective dimension of knowledge, we really cannot explain the growth of knowledge. Though we want to explain the growth of knowledge, by focusing exclusively on the objective side, without looking at how individuals produce theories, we can only explain the logical structure of science, not its process.

Polanyi looks at the process of science: how do scientists find new theories? Scientists generate new theories by applying their tacit knowledge. The explicit or objective dimension of scientific knowledge can only be understood from the framework of a body of tacit or personal knowledge. The scientist relies on tacit knowledge to understand the articulate theories and formulae. Also, the scientist uses tacit knowledge to resolve difficulties, puzzles, and problems. The scientist makes discoveries by using tacit knowledge as the means for extending the known to understand the unknown. The problem with this approach is that the role of the objective side of science is made peripheral to scientific knowledge. However, scientists communicate through publications and conferences. They discuss and criticize each other's views. By concentrating on the tacit dimension, the importance and function of theories are overlooked. But this is what the genesis of theories is for: the production of theories for presentation and discussion. Hence, by concentrating on the tacit and personal side of science, Polanyi leaves out the purpose for the genesis of theories. The purpose for generating theories is for the solution of problems that incrementally lead to the growth of knowledge and increasingly approximate the truth.

Popper and Polanyi both fail in their goal to explain how science grows. Popper does not explain the genesis of scientific theory nor the flow of science. Polanyi does not explain the purpose or function of creating scientific theories. Popper is concerned about what scientists do once they create the new ideas. Polanyi is concerned about how scientists can create those new ideas at all. Popper and Polanyi commonly suppose that science forms a special culture where the goal is to create scientific knowledge. The overall question for them both is: how does science create scientific knowledge? Once we take the viewpoint that they are discussing different dimensions of this creative process, we see that their views on their own

are incomplete. But together and as complementary, their views form a comprehensive theory of how science creates scientific knowledge. Polanyi looks at the origin of knowledge: how science as a culture creates its theories. Popper looks at the function of knowledge: how science as a culture processes its theories.

Popper, more so than Polanyi, explicitly adopts and adapts Darwin to develop an evolutionary epistemology. (Popper, 1994) Scientific theories when refuted are eliminated in the way that maladapted species are eliminated through natural selection. Likewise, those theories that incorporate the verified elements of refuted theories and explain the events that were used to empirically refute the failed theories, are better adapted theories. Moreover, theories as part of the objective dimension of scientific knowledge provide an ecological niche which implicitly contains features unknown to their inventors. Here is where Popper, ironically merges with Polanyi. Polanyi's motto is that we know more than we can explicitly say. (Polanyi, 1966) This knowledge is tacit and lies in the subjective sphere of our subsidiary awareness, of our embodied skills, and embodied understanding of traditions. This is akin to what Popper refers to as the implicit contents of objective knowledge. It is in both Polanyi's tacit dimension and Popper's implicit contents of objective knowledge that we find the solution to the Darwinian problem of how novelty is generated.

According to Darwin, new species form because individuals who are born with slight differences produce off-spring who inherit those differences. If they are better able to adapt to their environment, they survive and continue to multiply with off-spring. The Darwinian problem is to explain how those differences arise in the first place. Darwin explains the origin of species, but not the origin of mutated individuals. This was explained by genetic theory: there are random changes in the genes (DNA) which produce individuals with differences; also, various traits are dominant or recessive; hence, those once recessive traits or those random genetic changes which allow the off-spring of individuals to better adapt, originate the new species. (Dawkins, 1976, 2006)

Similarly, Popper's Darwinian model of how theories evolve by trial and error faces the Darwinian problem of explaining how new theories are generated. (Popper, 1994) The solution lies in, on the one hand, Polanyi's notion of the tacit dimension, and, on the other hand, Popper's notion that the contents of objective knowledge exceed the awareness of individuals.

When individuals become aware of implicit problems and implicit consequences of theories, they use their tacit personal knowledge to generate new theories to solve the problems and incorporate the consequences. The implicit dimension of objective knowledge and the tacit dimension function together to produce novel theories. The implicit dimension of objective knowledge contains the hidden problems and consequences of explicit theories. The tacit dimension contains the subsidiary and bodily aspects of what we explicitly know. Both dimensions, the implicit dimension of objective knowledge and the tacit dimension, interlock to produce novel answers to our emergent problems. The problems that emerge from the implicit contents of objective knowledge direct our subjective knowledge to produce solutions. As Popper, among many others, says, finding the problem is fifty-percent of the solution. The aha or eureka experience is an indicator of how finding the problem is fifty-percent of the solution. Firstly, finding the problem invokes the process of making explicit the implicit contents of the objective dimension and guides the discovery of solutions from one's subsidiary awareness. Secondly, discoverers who have an aha or eureka experience when coming up with the solution to a problem feel as if they knew the solution all along. Indeed, one does know the solution all along because the germ of the solution is just beyond one's focal awareness. As one shifts one's focal awareness, the solution pops into awareness.

For instance, after Albert Einstein discovered the theory of special relativity, Henri Poincaré claimed that he was the real discoverer of that theory. It is unlikely that Einstein was a plagiarist and less than the original genius that he was. However, Poincaré should not be dismissed as a disgruntled and ungenerous egomaniac. Rather, Poincaré and Einstein independently articulated the same implicit content of the objective dimension of knowledge. However, Einstein's deeper tacit understanding of electromagnetism led him to produce the more direct and complete articulation of the theory of relativity. Similarly, though Hendrik Lorentz was able to produce the mathematical equations for the transformations of distance and time between different frames of reference, he did not have a full grasp of the meaning and function of his formulae. Moreover, he did not see the problem as Einstein and Poincaré saw it. Lorentz thought that he was working on the problem of how to explain the lack of any difference in the measurement of the velocity of light through the ether. Einstein and Poincaré saw the problem as whether measurement has any independence from the observer; and also for Einstein, as how the laws of physics maintain uniformity throughout nature.

The implicit content of this objective problematique is part of the implicit content of the objective scientific knowledge of the day. Indeed, the implicit content of the objective scientific knowledge during the time of the early twentieth century when Einstein, Niels Bohr, Erwin Schrödinger, Werner Heisenberg, and others were conducting their debates, has guided the formation of the main problems of physics since then and until now. Most of my thumb-nail sketch of the history of early to mid-twentieth century science can be found in Paul Arthur Schilpp's, *Albert Einstein, philosopher-scientist*, 1949 volume of essays that includes Einstein's autobiography and responses to his critics. The book is rich in civil critical dialogue, humanity, and wisdom.

Indeed, at this very moment of writing, we still want to know to what degree measurement is independent of the observer and how the laws of physics maintain uniformity throughout the universe from sub-nuclear particles to black holes. (Sheldon Richmond, 2019) During this period, dozens of theories have sprung from the minds of scientists; and most have been eliminated. But these theories arise from the subjective dimension: from bringing subsidiary awareness into focal awareness; and, from realigning the scientists' embodied skills and knowledge.

Integrating the theories of Popper and Polanyi results in the solution of the Darwinian problem of how novelty is created in science. Though scientific theories evolve through a process of elimination through trial and error, how are new scientific theories created in the first place? The solution is that the implicit content of objective knowledge when articulated produces new problems; and subjective knowledge is the source of potential solutions when the focus of awareness moves along the horizon of tacit knowledge. We create new knowledge by articulating what we implicitly and tacitly know. But this knowledge is bound within science as a distinctive culture with its own traditions, instruments, implicit contents in its objective theories and problems, and embodied in skills and personal knowledge. Both Polanyi and Popper agree that science forms a culture and that the cultural element of science is crucial to the functioning of science.

Though the cultural element is crucial to the functioning of science, which makes science human, we are in a situation, where the humanistic side of the culture of science has transformed into the behemoth of the Global Techno-Scientific Culture. The situation of science is now the singularity of the dominant techno-scientific culture where those who are humanist-oriented are on the fringe as a subculture. How can those in the fringe

subculture who are human-centred in their thinking and actions, find a space in the dominant Global Techno-Scientific Culture?

I think we can come up with a solution to this difficult problem by posing it in a more abstract and simplified way, the way that stems from C.P. Snow's original, but now outdated formulation of the two-cultures problem. How do science and the humanities or arts form distinctive cultures?

3. how do science and the humanities or arts form distinctive cultures?

Here I discuss the questions: How does science with a culture centred on digital technology conflict with a culture centred on the humanistic analogue/comparative-cybernetic/feedback? Though the techno-scientific culture is dominant, and the humanistic-centred culture is more of a subculture within the dominant techno-scientific culture, how do the two cultures conflict?

Those questions are a part of the complex problem that this entire book is about: how can we regain our humanism in the dominating Global Techno-Scientific Culture that has become a behemoth in eliminating alternative cultures and even technologies? The complex problem is hard to grasp, and therefore hard to solve. The simplified problem involves a return to C.P. Snow's original formulation of what he called the two-cultures problem. Grasping the simplified and abstract form of the complex problem is, I suggest, easier. Grasping the simplified, abstract form of the complex problem can act as a step ladder to grasping and to solving the more complex problem. Logically speaking, C.P. Snow's simplified form, though a precursor to today's more complex problem, is more general. From a strictly logical point of view, the solution to the more general problem can be used to develop a solution to the more complex problem. Here below goes then the discussion of the simplified, abstract, and general form of the complex problem of how can we regain our humanism (our humanity as creatures that seek to know, and seek to act morally) in the behemoth of the Global Techno-Scientific Culture?

C. P. Snow brought to our attention what he named the two cultures problem. (1959) The problem is that artists, or more generally, humanists, and scientists form two distinctive cultures and so cannot understand or talk with each other. Is this a genuine problem? If so, can we resolve this problem?

This problem assumes that people from distinctive cultures either generally misunderstand each other, or must always misunderstand each other. Moreover, this problem assumes that for the most part, membership in the two cultures is mutually exclusive. These days very few challenge Snow's assumptions about cultures and about scientists and humanists. However, there has been a strong reaction to Snow's description of the problem; especially to his thesis that if literary types do not make an effort to understand science, they will be left out of modern society and politics which tends towards dominance by the technology of technophiles and technocrats, the techno-elite. (F. R. Leavis, 1962)

It seems that Snow's theory of the two cultures has turned into a prediction of contemporary current society where techno-science and technocracy dominate. Humanists, in the broadest sense of the term meaning those who place a high value on human dignity, responsibility, and freedom, and who think that science and technology should serve and enhance humanity, are on the periphery of contemporary society. Firstly, the main model of humanity, social organizations, mind, and cognition is the information-processing model. (H.A. Simon, 1969) Secondly, as the astute criticisms of some former AI theorists, Terry Winograd (1987) and Joseph Weizenbaum (1976) reveal: we first redefine human characteristics such as judgment and thinking in terms of computational models, and then we say that humanity is nothing more than computational machines. Everything that cannot be redefined is eliminated as folk psychology or as mythology. Thirdly, most cultural commentators are unwitting Marxists because they tacitly adopt Marx's theory of technology leading social change. Karl Marx proposed the theory that when the means of production and the mode of production conflict, the mode of production is redesigned to fit the means of production. Today every major management theorist and economist, including neo-classical economists, has noted that the means of production is Knowledge, which they define in information-processing terms (as discussed in Chapter Two), and the mode of production is industrial. This form of social organization involves the creation of a temporary workforce who sell their services to global corporations, and who change jobs and careers according to the dictates of the market. Corporations are flat (horizontal), as opposed to vertical, and floating teams are formed across divisions on the basis of temporary projects. Furthermore, corporations are learning systems that create Knowledge and this Knowledge as opposed to the hard consumer products which are based on this Knowledge is what they really produce and market. (Argyris, 1957, Bennis, 1989, Bridges, 1980, 1984; Castells, 1996, 2000; Hammer, 2001, Handy, 1994, Jaques, 1996, Peters, 1982, Tapscott, 1993)

C. P. Snow's two cultures problem is now more severe than when he discovered it: humanists are not only unable to communicate with scientists, but are marginalized by contemporary techno-science. Let me give a concrete example of this marginalization of humanists in current corporations. Middle managers are being removed from corporations and replaced by information-processing functions. Middle management functions as humanists within corporations: they prepare reports for upper management; and interpret the policies and regulations developed by upper management to lower management. Front-line staff generally do their own report preparation by using canned electronic forms, spreadsheets, and report generating software. Upper management leave more discretion to front-line staff for interpreting policy and even provide opportunities for front-line staff to contribute their own views about the corporate "mission" and "vision". However, the bottom line is that front-line staff are expected to understand and use computer technology. But what front-line staff often complain about to technology support staff is that the software is cumbersome, doesn't do the job of the older manual (or even mainframe) systems, and is unreliable. Technology support staff usually complain that the end-user misuses the computer systems, misunderstands the functions of the systems, and expects the computer systems to perform tasks that were not built into the systems. Here I think is where we have a concrete example of the classic two cultures problem: front-line staff are tacit humanists, they expect technology to serve them; and technology support staff are tacit scientists, they expect humanists to follow the impersonal laws of physical systems which are algorithmic and universal. That is, computer systems are designed to function according to fixed and finite procedures without deviation; but, human systems are designed to be open and infinite. The two systems clash. In effect, humanists as techno-subjects, and technocrats as the techno-elite form two subcultures within the Technopoly of digital technology where the techno-elite dominate. (Ellen Rose, 2003)

4. how do scientific and artistic creation allow for breaking the two cultures barrier?

Here I discuss the question: How does an integration of Popper's and Polanyi's philosophies of science into a new framework for viewing the cultural conflict allow, if at all, for resolving the conflict and/or removing the barrier between the culture of techno-scientific oriented technocrats (the techno-elite) and the culture of humanistic-oriented techno-subjects?

My proposal is that an integrated Popperian-Polanyian theory of scientific knowledge, or more specifically, scientific knowledge creation, can solve both the specific problem of the lack of communication between computer technology support staff, the techno-elite, and computer-users, the techno-subjects, and the general problem of the lack of communication between scientists and humanists/artists. I use the discussion of this simplified, abstract, and general version, the lack of communication between scientists and humanists, as model for a solution of the complex and difficult problem: how to regain our humanism in the face of the behemoth of the techno-scientific culture.

Scientific knowledge creation must cross cultures because of the implicit contents of the objective dimension of Knowledge and the tacit dimension of embodied, subjective, personal knowledge. The implicit content of scientific knowledge as objective, and as open to the discovery of everyone regardless of background, transcends culture. However, created scientific knowledge is only originated through an intensely personal subjective or psychological process of changing one's focal awareness, of using and extending one's subliminal awareness and understanding. The scientist is culturally bound when the scientist creates knowledge because knowledge creation partially depends on culturally embodied knowledge. This process of knowledge creation ironically embodies the traditional or stereotypically humanistic or artistic processes of commitment, subjectivity, illogical leaping to conclusions, imagination, recognition, metaphor, irony...and so forth. Whereas the process involved in the evolution of objective knowledge conforms to the traditionally or stereotypically scientific processes of detachment, neutral criticism, logic, analysis, and so forth. Thus, in some respects, the two cultures problem rests on misleading stereotypes; for the processes of knowledge creation and knowledge evolution apply both to the scientific and humanist cultures.

The two cultures problem in the current setting of techno-science has evolved into the problem of how the techno-elite (computer professionals, experts, technocrats) and the techno-subjects (computer users, computer consumers) can communicate with each other. The Popper-Polanyi theory of scientific knowledge creation and scientific knowledge evolution requires that humanists and scientists must communicate with each other. The objective problems implicit in the objective contents of scientific theory are open to everyone and transcend culture. These objective contents guide the subjective process of knowledge creation: the development of multiple theories which attempt to solve the problems. Thus to gain a better understanding of the driving problems of a situation,

the more people there are who discuss and elaborate the problems, the more chance there is for the creation of new solutions. With respect to the lack of communication between those who support technology systems, the techno-elite, and those who use technology systems, techno-subjects, it is up to technology support staff, the techno-elite, to listen to the complaints of users or techno-subjects and to interpret them as possible design flaws. The problems or bugs in technologies which in the terms of Donald Norman (1988), "make people stupid", can only be solved by technology developers who adopt the goal of attempting to "make people smart": to develop systems which enhance our abilities rather than curb them. (Donald Norman, 1993).

Hence, the Popper-Polanyi theory of knowledge creation and evolution solves the C.P. Snow two cultures problem in our techno-science culture as follows: First, the cultures of scientists and humanists are not polar opposites. but are subcultures within the monopolistic culture of techno-science, the Global Techno-Scientific Culture. However, the two subcultures, the techno-scientific culture of the techno-elite, and the humanistic culture of techno-subjects, have commonalities. Scientists are humanists when they create knowledge: they rely on subjective, analogical processes of irony, metaphor, focus or perspective switching and so forth. Humanists are scientists when they elaborate problems, and critically discuss interpretation: hermeneutics, history, and philosophy, involving problem posing, debugging or problem resolution, and criticism. Second, the problems of contemporary society are implicit in our socio-technical systems as well as in theories, scientific and humanistic. These problems transcend cultures (the subcultures of the Global Techno-Scientific Culture dominated by digital technology). The more widely the problems of contemporary society are discussed, the more chance there is for us to solve them. Third, the common goal in our technology imbued current Global Techno-Scientific Culture is to become smarter: to create knowledge and use knowledge. Given that the two subcultures (of the techno-elite and of the techno-subjects) have a common goal, this provides a direction for conversation among the members of the two subcultures. Technology developers must listen to technology users when technology users mention the failures of specific systems. Technology users must attempt to be specific about the failures of specific systems. Fourth, since most people to some degree are knowledge creators and knowledge users, most people are steeped in both cultures and have a tacit ability to understand people from the other culture.

Does this view of the problem of C.P. Snow's two cultures problem, as a problem of communication between two subcultures within the Global Techno-Scientific Culture apply to the more complex problem we face of regaining our humanism in the monopolistic Global Techno-Scientific Culture of today?

The situation now is that C.P. Snow's two cultures has transformed into the dominant techno-science monopolistic culture of the Technopoly where digital technology dominates. However, the Technopoly has two subcultures, made up of commonalities that allow for communication or dialogue (to be discussed more fully in Chapter Four, Dialogue). However, I realize that the Global Techno-Scientific Culture is not really composed of the two subcultures of scientist-oriented people and humanist-oriented people. Rather, in reality there is one culture, the Global Techno-Scientific Culture, that suppresses humanistic-oriented thinking and action.

But apart from the two (sub) cultures problem that I have discussed so far and its theoretical solution that I have gleaned through integrating the philosophies of Karl Popper and Michael Polanyi, there are other various common ideas that have reinforced the false understanding of cultures and subcultures as isolated. The false understanding of cultures and subcultures as isolated creates artificial barriers to dialogue among cultures and subcultures. I would like to poke holes in that false understanding of cultures and subcultures, here and now.

5. six mistaken ideas about cultures and subcultures

1. Society, cultures, and subcultures are a burden and because we cannot bear the burden of responsibility and cooperation, we form exclusive cliques.

Wrong because societies, cultures and subcultures provide people with identities in terms of languages, values, and shared histories. However, societies encompass pluralities borrowed from many cultures and subcultures. One’s identity as a member of a specific society involves a plurality of aspects.

2. Elites are natural: some people are smarter and better than others.

Wrong because we are all in the long run, equally ignorant. An expert uses heuristics or rules-of-thumb that the expert is constantly testing and correcting in practice.

3. Cultures are distinctive and wholly separate from each other.

Wrong because cultures cannot avoid interacting with each other, in the global Technopoly of digital technology (and even before, throughout the evolution of hominids and human history during peak periods of migration, travel, and trade). The boundary lines are loose and somewhat arbitrary depending upon the decisions and choices of both “insiders” and “outsiders”. The definition of one culture depends upon what one selects as a key point, and there are multiple key points and dimensions.

4. Subcultures are distinctive and wholly separate from each other.

Wrong because subcultures are hybrids. However, subcultures as smaller units than cultures are easier to define in a more singular fashion based on a unitary dimension. Even so, subcultures are usually hybrid, and even an apparent unitary dimension can be a composite from various cultures, such as a subcultural artificial dialect or jargon containing idioms and jargon borrowed from various subcultures. (Appiah, 2006)

5. The dominant means of cultural understanding whether holistically or individually are treated as an exclusive and opposite means of cultural understanding.

Wrong because circumstances determine the most appropriate means for understanding a culture, whether to look at the culture as a whole or to look at the culture in terms of the individuals. An holistic view is more appropriate for looking at the general problems a culture faces such as the transmission of its traditions or the confrontation with global technological change. An individual-based view is more appropriate when dealing with how people decide whether or not to use traditional approaches in their daily life, or whether to adopt practices from other cultures.

6. Aggression instead of dialogue is the norm among subcultures competing for attention and resources.

Wrong because we don't have to play the competitive game of win-lose in dialogue, including critical discussion. Often what is called dialogue can be seen as a form of aggression where the two people, groups, subcultures, cultures, engaged in dialogue aim to defeat the opponent. However, genuine dialogue does not aim to defeat the apparent opponent. Rather genuine dialogue involves mutual learning through civil discussion of alternative viewpoints, and a shared goal of debugging, or eliminating the errors in the alternative viewpoints. (Joseph Agassi, 2014b, Sheldon

Richmond, 2017c)

Basically our situation in the Global Techno-Scientific Culture is of two people lost in a forest (or maze, or complex situation) where we are equally ignorant, and equally at a loss. Some pretend to know more, and trusting those people will just get us deeper into the woods. However, those who admit that we are all ignorant, and need to help each other through dialogue to find our way out, can be trusted. Indeed, this returns us in a recursive cycle where I can reformulate the six mistaken ideas into what I think are six improved and less mistaken versions of those ideas, and that is how I will conclude this chapter:

1. Cliques are not needed, but cultures and subcultures are humanizing.

2. Elites are artificial: we are all equally fallible, and equally capable of uncovering and removing mistaken ideas, and improving our society, and institutions. Ironically, when we trust in artificially created elites, we entrench our mistakes.

3. Cultures borrow and learn from each other. Walls are artificial, and break down.

4. Subcultures are mirrors of cultures in borrowing and learning from each other. Boundaries are artificial, and in reality are porous.

5. Understanding cultures involves self-understanding; and self-understanding involves understanding cultures. The boundary between the individual and the culture is an interface, a place and means for the individual and culture to interact.

6. Mutual civil discussion is the heart of genuine dialogue where we engage in mutual learning through removing errors from alternative, plural viewpoints.

All the above is open to continued discussion and improvement. (Chapter Six, Criticism) I think this entire chapter on cultures is captured in the following parable paraphrased from S. Y. Agnon, (1948) and attributed by him to the nineteenth century Rabbi Hayyim of Zans):

> ….Walking for hours, lost in the forest, a person was on the verge of total collapse. Then as if by a miracle, he spied another person some distance away. Running until the lost caught up with the other person, the lost one fell at the other person's feet and said desperately, “Can you help me? Do

you know the way out of this place?"

The second person nodded. "Yes, I think I can help! I, too, have been wandering in this forest for some time. And while I don't yet know the way out, I do know the paths that are definitely not the route we seek. Together we can eliminate the wrong paths and find a road that leads us to freedom.

Ironically, Paul Baran (1964), the pioneer of the design of communication networks that became the model for the design of the global internet, coincidentally stated in terms similar to the story told by the nineteenth century Rabbi Hayyim of Zans, how distributed networks promote "heuristic learning" (eliminating our mistaken rules-of-thumb, theories, practices including cultural practices, through trial and error):

> The underlying concept of distributed networks is as old as man. Any interconnected grid of paths or roads may be considered as being a distributed network. When one drives to work over a distributed (or grid) road system and encounters a potential delay, it is possible to turn off, bypassing the traffic jam or obstruction. Thus, the actual route taken depends not only upon a predetermined route, but also upon the happenstance of encountering necessary detours which take us off the preferred shortest path. In spite of this uncertainty, and regardless of the number of detours, we almost always manage to get to work. On some mornings when we have a little extra time, we may chance to try a route that we have never taken before. If we find that this new route is quicker because of less traffic than our old route, we will probably take this newer route in the future. By this process, we learn in a relatively short time the quickest route between home and work. We may say that we have used a "heuristic" process to learn a "best" path in a network. (p. 10)

CHAPTER FOUR

DIALOGUE

Meno: ...what sort of answer would you have given him?
Socrates: I should have told him the truth. And if he were a disputatious philosopher and of an antagonistic sort, I should say to him:You have my answer, and if I am wrong, your business is to take up the argument and refute me. But if we were friends, and were talking as you and I are now, I should reply in a milder strain and more in the dialectician's vein; that is to say, I should not only speak the truth, but I should make use of premises which the person interrogated would be willing to admit. And this is the way in which I shall endeavour to approach you.
—Plato's *Meno* (75d)

Socrates: You, Gorgias, like myself, have had great experience of disputations, and you must have observed, I think, that they do not always terminate in mutual edification, or in the definition by either party of the subjects which they are discussing; but disagreements are apt to arise. Somebody says that another has not spoken truly or clearly; and then they get into a passion and begin to quarrel, both parties conceiving that their opponents are arguing from personal feeling only and jealousy of themselves, not from any interest in the question at issue. And sometimes they will go on abusing one another until the company at last are quite vexed at themselves for ever listening to such fellows. Why do I say this? Why, because I cannot help feeling that you are now saying what is not quite consistent or accordant with what you were saying at first about rhetoric. And I am afraid to point this out to you, lest you should think that I have some animosity against you, and that I speak, not for the sake of discovering the truth, but from jealousy of you. Now if you are one of my sort, I should like to cross-examine you, but if not I will let you alone. And what is my sort? you will ask. I am one of those who are very willing to be refuted if I say anything which is not true, and very willing to refute any one else who says what is not true, and quite as ready to be refuted as to refute. I for one hold that this is the greater gain of the two, just as the gain is greater of being cured of a very great evil than of curing another. For I imagine that there is no evil which a person can endure so great as an erroneous opinion about the matters of which we are speaking and if you claim to be one of my sort, let us have the discussion out, but if you would rather have done, no matter.

> Let us make an end of it.
> —Plato's *Gorgias* (457c-457e)

> Socrates: Writing, Phaedrus, has this strange quality, and is very like painting; for the creatures of painting stand like living beings, but if one asks them a question, they preserve a solemn silence. And so it is with written words; you might think they spoke as if they had intelligence, but if you question them, wishing to know about their sayings, they always say only one and the same thing. ...Now tell me; is there not another kind of speech...The word which is written with intelligence in the mind of the learner, which is able to defend itself and knows to whom it should speak, and before whom to be silent.
> Phaedrus: You mean the living and breathing word of him who knows, of which the written word may justly be called the image.
> —Plato's *Phaedrus* (275e-276b)

0. overview

1. two guiding principles for breaking the blocks to dialogue

2. the culture of work, and the work of culture

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5. parallel worlds/overlapping worlds

6. where are we in the life-cycle of socratic social architecture

0. overview

Dialogue is the key both to interpersonal dialogical relationships and critical enquiry. How do we alleviate the obstacles to dialogue as techno-subjects in the Global Techno-Scientific Culture or Technopoly? The answer is: Use cross-cultural/social group dialogues as a model for dialogue as techno-subjects in the Technopoly. Cross-cultural/social group dialogue works through cultural borrowing, and then modifying those borrowed cultural elements. For cross-cultural/social group dialogue to occur, we have to treat cultures and social groups as having permeable borders that allow us to adopt and adapt elements from different cultures and social groups. Indeed, the daily reality of cultural and social life reveals that cultural/social group boundaries are not fixed. Though cultures/social groups seem (and can be made) parallel, their boundaries are fluid and porous. Individuals are able to cross cultures/social groups and simultaneously live and experience multiple cultures/social groups. Indeed, all cultures and social groups involve appropriations of other cultures/social groups and are in perpetual flux through cultural interactions and through individuals introducing cultural borrowings from other cultures. This feature of cultural permeability, living in multiple cultures and cultural borrowings, raises the question: what sort of social architecture or structure best allows for cross-cultural and cross social group dialogue? The answer is: the social architecture required both for cultural/social group development and cross-cultural and cross social group dialogue can be developed from the structure of Socratic dialogue.

The short of it is that by implementing socratic social architecture in all institutions, we create the space for dialogue within the Global Techno-Scientific Culture or Technopoly.

1. two guiding principles for breaking the blocks to dialogue

The long epigraph at the head of this chapter from various Socratic dialogues of Plato contains the core of everything I have to say in this chapter on dialogue and provides the blueprint for my discussion of the socratic social architecture. However, what I have to say as written, similar to a realist painting simulating a scene (or these days, a virtual reality display or a 3-D movie, simulating a changing landscape or live-action scenario), only simulates discussion. I can at best simulate living discussion

through writing, where I propose and work through the articulation and development of questions and responses. Moreover, a reader can only simulate the verbal exchange of real-time interlocutor where the interlocutor asks questions, states criticisms, and proposes in speech, alternate ideas, by thinking through what I am saying in this book in terms of implications, objections, counter-examples, alternate ideas or views, and questions, for the author as if the author were talking with the reader in real-time. In any case, I forge ahead with this textual simulation of a very one sided dialogue, where I get to say my side of the story, and perhaps through the modern technology that I am critiquing, a reader can tell me their side of the story (whether in email, in blogs, or with real-time chat apps).

I have two guiding principles in this approach of how to break the blocks to dialogue. The first guiding principle is: look for discrepancies. When we find discrepancies, we find a space for a question, a space for discussion, a space for argument, a space for research, a space for learning, and of most importance an answer to why we discuss and have dialogue in the first place, a space for dispelling ourselves of biases, prejudices, narrow and closed outlooks, or even for dispelling half-truths that inhibit us from looking at the world in new ways and from improving our understanding, knowledge, and action.

This guiding principle is not new, it is about 2400 years old: Socrates stopped people in the marketplace, asked them a few questions, and pointed out some of the discrepancies in their thinking. For that he was tried and sentenced to death. (Plato,1914 and Goldstein, 2015)

The second guiding principle is also not new, stated by many in various forms, by Maimonides (1904), Spinoza (1901,1951), Karl Marx (1845, 1886), Charles Sanders Pierce (1931), Karl Popper (1959), and various others who tend towards realism and concrete experience: The test of an idea, concept, theory, only comes through our attempt to put it, the idea, concept, theory, into practice. (Stephen Turner, 2014) Large-scale testing of theories in physics is costly in terms of human resources and material resources. However, large-scale testing of theories of society, utopian visions, are costly in terms of human life.(Popper, 1945/1967, Richmond, 2019) I am proposing a small-scale test of the ancient Socratic idea for social systems such as in classrooms, lecture halls, and workplaces: design such social systems so that there is no social cost for those who find and tell us about discrepancies, no more trials and executions for social critics. (Unfortunately, executions without trials or with mock trials for social critics are still current, as I write these words, around the globe excluding

in a handful of liberal-democracies.)

Here we now come to the crunch question: what are the obstacles to running such small-scale social experiments? How do we overcome those obstacles and work step-by-step to improve our social architecture such that wide-spread dialogue or in more simple terms, discussion of discrepancies occurs? I propose that there are three obstacles to having dialogue among different people and groups of people. The three obstacles are the ways in which we approach both the differences or discrepancies among people and also how we structure or design our societies to deal with discrepancies or differences within societies: 1) inside-out/outside-in, 2) top-down or bottom-up, and 3) parallel worlds or overlapping worlds abstracting away from the reality that cultures or societies actually overlap and are not homogeneous totalities that are sometimes thought to be the pure form or authentic form of the social group under question. I will not discuss these obstacles theoretically, as an abstract product of mental models or even as a behavioural product of societies as bio-social evolutionary ecological niches. Rather, I will discuss how those three obstacles have been actually removed or bypassed by various former co-workers in my work experience in the actual reality of the world of my work when I was an IT professional.

2. the culture of work, and the work of culture

I present an intellectual scaffolding as a structure for coherently, concisely, and pointedly talking about how my co-workers overcame the institutional blocks to open-ended, critical discussion, as I experienced it, in a large corporate institution, I nickname, “the Corporation”. The argument or system of thought I construct with the intellectual scaffolding is made from the materials of my experience. What I do here is talk from the perspective or frame of reference of my firsthand experience. I talk from the viewpoint of a hands-on worker. In hindsight, I intuitively and tacitly used the technique of the participant-observer used by many cultural anthropologists, ethnomethodologists, sociologists in my working-life as an IT (Information Technologist) worker. (I. C. Jarvie, 1967, Stephen Turner, 2018; also Wittgenstein's discussion of forms of life, 1953 and Joseph Agassi’s discussion of Wittgenstein’s use of forms of life, 2018)

The intellectual scaffolding is constructed from three situations found in modern, liberal-democratic, high technology dominated societies, in the Global Techno-Scientific Culture, where people have time outside their

labour to do things that are not directly related to earning a living. For instance, outside one's main occupation, people have time for family-life, entertainment, pursuing hobbies and vocations; engaging in social and political endeavours; engaging in informal face-to-face communal activities. Here are these three situations available in modern societies: First, Inside-Out/Outside-In: We are all inside various organizations, institutions, and social groups; and we are outside others. However, there is fluid flow in our Inside-Out/Outside-In situations. For instance, in my experience, I officially worked inside a department, and then I took a temporary assignment with another department. I was both inside and outside the two departments, and was expected to go back to my home department after the assignment was completed, and then become totally outside the other department. Second, Top-down, Bottom-up: In my assignment, I was expected to develop a systems analysis of how various data collection, distribution, and processes worked in the local environment of the department, and produce a basic blueprint or architecture for a new integrated system that could be developed for the department to resolve whatever basic problems that are in the current environment. This is apparently a top-down type of work. However, to figure out how the department with respect to its data or information use functioned and malfunctioned, I needed to interview people somewhat like a participant-observer anthropologist in an unfamiliar culture. Indeed, my manager had told me, which is a common bit of instruction and advice to new employees, or in my case, a visiting employee, to learn the culture. Learning the culture is a bottom-up approach, how do people interact, communicate, use tools, use language, behave with each other, and how do they organize themselves. The participant-observer, whether anthropologist or new employee, or visitor, looks around, asks questions, tries things out, participates in social events. But not all visitors and strangers are immediately welcomed with open arms or given the honest truth from the inhabitants, those invested in the stability and permanence of the home culture: the visitors may be told lies, stories, and tricked, and at worst, exploited and abused psychologically. There may be initiation rites to go through, and there is wariness and distrust to overcome: the stranger can be seen as an unwitting and naive, if not malicious, disruptive force much like disruptive technologies that cause job change and job loss, even though the technologies are dumb and have no wit or intentionality. The third situation involves Parallel Worlds or cultures vs Overlapping Worlds or cultures. Different job-functions often form different cultures that exist in parallel in the workplace, and those different cultures pursue their own agenda and functions: administration, client-service (or communicating

with the public), or depending on the nature of the department and its mission-statement and vision-statement, scientific, engineering, planning, professional, and other parallel worlds follow their own path, and manage their own garden, or more literally, perform their own prescribed functions and keep to their own roles. However, the worlds do interact and overlap, but in the worst-case scenario, the worlds conflict and impede each other's performance of their individual world's functions, roles, and each other's achievement of their individual world's goals.

So far I have talked about the intellectual framework for my discussion. I have provided an intellectual scaffolding for setting up a discussion about the plight of those who act as humane people and interact with others through civil discussions, within the confines of large corporate organizations, including large governmental organizations, usually called government bureaucracy. In the following I will focus on the three situations of inside-out/outside-in, top-down/bottom-up, and parallel worlds/overlapping worlds. How do those situations in any way characterize the overall situation of work and life in corporate organizations?

Let’s see.

3. Inside-Out/Outside-In

Toronto North, is the location of the place where I accidentally fell into full-time work for the Corporation. Sometime early on I was given the task of determining whether our department would benefit from a Computer-Automated-Drafting system, in the very early days of desktop computers. I am going to talk about a specific person in the drafting department and the name I will use for the person is “Gorilla”, collegially nicknamed by a co-worker who nicknamed himself “Pest”. Gorilla was so nicknamed by “Pest” because Gorilla had a huge chest and muscular arms as a weight-lifter and wrestler. Gorilla often wore tuxedos or torn jeans to work depending on whether his 1950s style rock and roll group had a job in the evening and the nature of the job, at a club, fancy private event, or party. I will focus on the situation of Gorilla. Gorilla inhabited many parallel worlds, but here I am talking about Inside-Out/Outside-In.

Gorilla saw himself as an outsider who fell into the workforce by circumstance and accident. However, in the corporation he was the consummate insider using every rule in the contract to his advantage. He filed grievance after grievance. He turned complaints about him around,

by arguing and demonstrating that the same complaint of some minor rule infraction applied to almost everyone else in the office, including management. My point is that I learned from Gorilla that one can take an Inside-Out/Outside-In view of the situation simultaneously, or at the least, one can alternate between inside-out and outside-in viewpoints, depending on the context, much like the wave-particle duality in quantum physics. In the context of Gorilla doing his work as a drafting person, he knew the techniques and requirements inside-out. As an employee, he knew the collective agreement or labour union contract inside-out. However, he could when preparing his mind for a performance as a musician, see himself at the moment in his work in the corporate office from the outside-in, as performer in tuxedo or torn jeans mechanically doing his job until he would be released from his virtual time-prison to his external reality of the world of music.

Meanwhile, during this period of time in the 1980s, there was a plan afoot to outsource certain occupations and functions. Of course, the Corporation at the top level, where the plan was hatched and fed to the leading managers for development and implementation, had to come up with a catch phrase something along the line, "the Corporation 2000", (Teller, 1992) and after 2000 came and went, the catch became something along the line, "Renewal of the Corporation", but has gone through several iterations until the latest, (Heintzman, 2014), to make the process of axing employees sound, humane, futuristic and progressive. While the top level management came up with the plan of outsourcing various operations as a means for carrying out staff cuts, low-level managers nearest to the front-line workers began on their own to acquire stand-alone computers. The proliferation of stand-alone PCs evolved into the process of decentralized computing within the Corporation. It did not take too long for the informally bottom-up process of decentralized and distributed computers to become hijacked by the top-level Information Technology management at the centre, to transform this process into a top-down implementation of computer services throughout the Corporation. It became de rigueur at first, and then later, official policy, to implement local area networks and soon after that, wide area networks of distributed computer servers and personal computers as the official IT (Information Technology) infrastructure. It has only been since about 2010 or so, that the trend to ever increasing decentralized and distributed computing has reversed due to the development of cloud technology, where servers are centralized and outsourced. The steam-roller of outsourcing was put into high speed with the centralization to the omnipresent cloud (of centralized server technology) hanging over the universe of processor and chip using systems. Moreover, this new form

of technology infrastructure became the theme of a major shift in management philosophy or more precisely, ideology. Some called this a paradigm-shift that involved flattening the hierarchy and turning the organizational pyramid upside-down.

How did people maintain a sense of balance and work humanely with each other within this shifting situation in the Corporation where there was a tension among different organizational and technological policies? How did people work humanely and carry on civil discussion when the organizational and technological policies driving the Corporation were pushing and pulling from different directions? How did people keep their balance and humanity while conflicting policies were being implemented such as: outsourcing, privatization (for public institutions), centralization pulling from the top; versus implementing distributed and decentralized computer infrastructure pushing from the bottom; versus the centralization of computer technology infrastructure with the development of cloud technology pulling from the top? Gorilla for instance and many others, were able to look outside-in to their work, and were able to skirt the push-pull shifts going on in the Corporation. By taking an outside perspective, the Gorilla and others were able to distance themselves from the shifting tides of organizational policy and maintain their humanity in civil discussion within work, and by following humane pursuits outside work. Gorilla saw the whole Corporation as a safety net; as a haven that allows those who have a non-earning vocation, support themselves outside of their vocation, and in Gorilla's case, leading his rock group. Thus, Gorilla was able to put up as many obstacles as possible to inhibit management from controlling and manipulating him to perform his job mechanically or machine-like, according to the narrow confines of policy. His resistance to management having him function in a machine-like manner according to job-description and policy, allowed him to maintain his humanity where he could carry on civil discussion during work and about work, even when that open discussion was out of the bounds of his job-description, job-classification, and changing policies. (Adams, 2015) This brings me to the next situation for discussion.

4. top-down/bottom-up

The terminology of top-down/bottom-up can be taken to refer to either a theoretical, or even axiomatic system of thought, or empirically based system of thought where a ladder of theoretical generalizations is developed that goes from low-level narrowly focused generalizations to

high-level broadly focused generalizations. The top-down/bottom-up terminology can also be taken to refer to deductive versus inductive logic; or as well, to refer to methodologies for testing, starting with theories and deducing their low level consequences, to find out whether those consequences conflict or confirm specific facts, or observations, or even low-level generalizations.

How I want the terminology of top-down/bottom-up to be taken in this discussion is as a way of social practice, a way of developing institutions and organizations. In other words, I look at how in practice organizations work in assigning responsibilities, making decisions, and how people interact with each other. Moreover, I don't discuss subjective, introspective reflections; rather, I use an observational perspective from the bottom-up for approach and for discussing this situation: that is, I talk not about myself, but about how I saw people at the bottom react to the situation and how supervisors and managers reacted to these people. Where my first-hand experience occurred in the case of this top-down/bottom-up situation concerning power shifts, power conflicts, power uncertainty, was in a small regional office of a small central department that acted as a human resources group, hiring and firing; training, and also, as a conflict resolution group for the Corporation. This was during the 1990s and just around the time of the First Gulf war that I moved to that department.

Hegel is famous for saying that history is dialectical, and that every thesis produces its anti-thesis. (Hegel, 1807, 2005) One of the people I knew personally in my daily work, and who attempted to inform me about the oddities of corporate institutions (or the Corporation) in the early 1980s, told me this: the Corporation worked in cycles of centralization and decentralization, usually over a thirty year period. I think this person's historical sense was as acute if not more acute than Hegel's because my informant was at the end of his thirty plus year career during a period of decentralization, and I was joining at the beginning of a period of centralization, or so it seemed. But the introduction of distributed computing seemed to throw gravel into the wheel of history, and slow down if not halt the period of decentralization regarding computer systems and informatics in the Corporation, by about thirty years, until the time I completed my tenure with the Corporation. Moreover, other informants told me about a principle of corporate behaviour that can be looked upon as an unwitting variation on Hegel's theory of historical social pecking orders, that Hegel called master-slave. According to Hegel, the master-slave relationship in historical evolution induced the mutual dependency of master-slave as a necessary stage in the workings of history towards the

development of humanity to the historical stage where freedom and reason are no longer alienated from reality, but become actualized in the end of history. My informant, or another informant, from my first days in the department where I worked in the 1980s told me that if you take too much initiative, and don't stay within the prescribed roles assigned to you by your boss, your boss will tie you to your desk and to your assigned job. However, managers suddenly seemed to mitigate, even, eliminate the Hegelian slave-master, and social pecking order system, during the development and introduction of new informatics systems where managers needed skilled people to take the initiative with developing and implementing computer-systems about which management had no inkling nor understanding. Furthermore, the delayed by 30 year move to centralization refutes the Hegelian theory of historical laws, whether linear or cyclic. (Popper, 1957 and Gombrich, 1969). In hindsight, rather than historical laws driving the apparent cycles of corporate enterprise (the Corporation) centralization versus decentralization, it seems the Corporation see-saws between two competing strategies. Lower and middle-management climb the bureaucratic or corporate ladder by using the strategy of creating their own empires through up sizing. Upper management then needs to control and reduce their operational budget under fire from directors (or politicians in the case of public institutions) who promise decreased expenditures (or taxation in the case of public institutions) by cutting spending. Upper management, then, has to swing the see-saw the other way by cutting lower-levels of management by adopting the strategy of centralization and amalgamation of departments. (Parkinson, 1958, Peter, 1969, and Adams, 1997)

Now back to the future of the 1990s when upper management needed to employ the strategy of centralization because of the demands of directors to cut Corporate expenditure. Instead of talking about one individual, I will tell a short history of how desktop computers migrated into the Corporation that I think illustrates how top-down/bottom up social interaction and social control became transformed during the 1990s as computers appeared as if from thin air into the workplace.

All staff started to use distributed software and hardware or what is called “client-server” applications with desk-top PCs linked to local servers that provided the use of email, electronic transfer of electronic documents and forms, and provided the opportunity for developing personal databases and personal spreadsheets, and eventually provided access to the wider world of the Web. With the informatics system in place where universal access to everyone in the Corporation and almost everyone in the wider world

became possible, what happened instead of going up the line and through managers, people in my office sent email and documents directly to each other and to people at various levels of management everywhere, regardless of the person's level in the hierarchy and location in the department, in the next cubicle, on another floor, in another city and even in some cases, in other corporate departments. One element in this short history that is appropriate here is how people reacted to the new applications introduced willy-nilly with the new distributed informatics systems: how did the people at the bottom of the top-down implementation of this system who actually used the new applications, sent emails to their local management, top-level management, and of course, to their peers all over the country and world, for that matter, react? They voiced their complaints and suggestions for improvement, sent in emails, over the heads of local management, directly to the top-level directorate. The lower-level managers developed a way to unburden top-level managers from the onerous task of reviewing and passing on complaints from the actual users of the technology to the appropriate lower level-management. This was the way to get IT implementers to introduce software for reporting complaints. The software was euphemistically described as reporting software. The reporting software supposedly enabled IT developers to provide “remedies for the software troubles”. In effect, the reporting software shielded the top-directorate from the complaints of those who actually used the technology, the lower level staff. The lower level staff were deceived into thinking that the failures of the systems that they found would be captured in the reporting software, and then remedied by IT developers. The reporting software cut the channel between the lower-level computer users and the top-level directorate. The top-level directorate were enabled to surmise that all was well concerning the development, implementation, and use of the new systems. The top-level directorate, were enabled to falsely claim success for their decision to have financed the development and implementation of expensive technology. Furthermore, the top-level directorate could broadcast and promote the supposed success of their decision as a laudatory rationale for receiving bonuses and awards; for advancing their career to even higher levels; or to build new larger corporate empires with campuses of towers, but “towers with feet of clay”. (Walter Stewart, 1979 and 1982) Though one beneficial unintended side-effect of the attempt to side-track complaints about the shortcomings of the new technology was that the reporting software with the list of complaints was used by the hands-on IT software developers to modify the new software so that the computer technology would actually satisfy many if not all the requirements of those at the working-level.

Somewhere during this process of trial-and-error through feedback surfacing from the bottom-up, from those who had hands-on experience with the actual use of the abstractly top-down designed computer technology, people at the top-level realized that the information-flow, and knowledge-flow of the Corporation had shifted underfoot.

I repeat and emphasize that what I am reporting is from my point of view as a former hands-on corporate worker, as a participant-observer in a particular form of life known as the Corporation. I am using a specific viewpoint within a specific form of life as a participant-observer during the implementation of decentralized technology in various Corporation departments.

5. parallel worlds/overlapping worlds

In the holistic approach to cultures, misunderstanding of the other occurs when one fails to imaginatively place one's self in that culture, or when one does not completely immerse oneself in the other's culture through a process of conversion. I think there is a more direct and in some ways common sense and intuitive way of understanding misunderstanding: misunderstanding is due to the lack of learning not only the culture one may inhabit, but also due to the lack of learning parallel cultures. After all, cultures and cultural boundaries are not fixed. Though cultures are parallel, they are not physically parallel multi-verses where no signals can escape. Cultural parallel universes have no fixed boundaries; the boundaries are mutable and blurry; and moreover, people can and do inhabit several parallel cultural worlds, both sequentially, and simultaneously. (Appiah, 2006)

I spent the winter of 2008-2009 in the Canadian Arctic as a visitor on assignment from my home department in Toronto. I focus upon the director who invited me to take this job with his department located in Nunavut, and how I adapted his main instruction to me upon my arrival at my new workplace. I call him “Sir”, not the actual nickname he gave himself.

Sir happened to be away on holiday when I arrived. He called me and gave me one instruction, “learn the culture”, and left a few manuals and reports on my desk for me to peruse during the two weeks or so that he was out of office. How does one learn a culture, especially if one is from a foreign culture, and how does one learn the multicultural and parallel cultural

worlds inhabited by the people in the workplace, and those same people when out of the workplace, and as well the people who have different workplaces, in the same building, and as well the people who are inhabitants of the city where the workplace is?

Philosophers influenced by Ludwig Wittgenstein (1953) and Thomas S. Kuhn (1962), hold the view that different forms of life are incomparable, and holistic, similar to Leibnizian monads (Leibniz, 1965). On the other side, philosophers influenced by Karl Popper (1994) or Donald Davidson (Baghramian, 2013) hold that isolated frameworks and isolated conceptual systems are a myth. For Popper, cultures are theories, and all theories can be rationally criticized. For Davidson, cultures are belief-systems, and all belief-systems can be rationally understood and inter-translated, even radically different belief-systems, by using the principle he calls “charity”. According to Davidson, all people ultimately are rational, and can be understood from within their own point of view, and when understood from their own point of view, their belief-systems can be radically translated into one's own belief-system. However, this whole issue is sidestepped by Michael Polanyi (1958) who puts tradition and social practice front and centre: tradition and practice involve a form of knowledge that is learned through a process of mentorship as well as living within the tradition. Moreover, I think the theoretical problem of how we cross over cultures can be sidestepped by just looking at how people actually inhabit a variety of cultures.

If cultures are hermetically sealed, how is it that cultures often borrow from each other, even unintentionally and unaware? This is a puzzle for many who accept the premise that cultures are holistic and closed. Menachem Fisch, accepts the premise but argues that we need trusted leadership who have learned from other cultures, to introduce ideas from other cultures into one's own culture. (Fisch, 2011, Richmond, 2015, and Turner 2014) However, what we do in practice often undercuts the theoretical problem, and indeed displaces the theoretical problem. In other words, though we may have a problem with understanding in abstract-theory how we do what we do, the puzzle and mystery in theory disappears in actual practice; and actual practice often transcends the limits of theoretical frameworks. Indeed, the instance of a practice crossing what is expected as a limit by a theory, can lead to the development of a new theoretical framework. (Fisch, 2017, and Richmond, 2018c)

Let me return to “Sir” and his practical advice to learn the culture of my new place of work. Sir, who is from Asia, is part of an informal social network with other expatriates from Asia. Before joining the Corporation, Sir worked in a local organization in Nunavut. Sir crossed and crosses many cultures, both in and out of the workplace. Learning cultures was integral to his life. But when he instructed me to learn the culture, he meant for me to learn the culture of our workplace. It was a very specific culture, where due to the limited pool of labour, many of those hired into the regional office of the Corporation as well as all other workplaces, for that matter, had a family, or in anthropological terminology, “kin” relationships. Also, after hours social life often involved fellow workers. The town where I worked in the Arctic is small with all the foibles of a small town. But in spite of its smallness, it was in a manner of speaking cosmopolitan, a microcosm, very micro, of global cultures, living and working together in an isolated island where the only way in and out other than skis, dog sleds, and snowmobiles (or motorized sleds) was air travel. (Boats and sealift in use for a few warm months.)

Despite the cosmopolitan nature of the town, there still is a major divide between the Inuit who were native to the area, and the non-Inuit who arrived to profit from the various private and public workplaces. The term “cosmopolitan” can be misleading in this context because a cosmopolitan person is often thought to be a “rootless” person without a culture, and one who is able to dwell in other cultures and just pretend to be part of those other cultures, act as a Roman acts in Rome, but not actually be a Roman. However, I am talking about cosmopolitan in a different sense where a person may have roots in a home culture, but is able to cross-over cultures and live in those other cultures without pretence, but as a permanent resident, who keeps a sense of the home culture. (Agassi, 1977, 1990 and Appiah, 2006) I suggest that this is a reality because practice is foremost to cultural identification, and thought within culture is the symbolic representation of practice. I want to go even further, people in the global multicultural world and multicultural cities, are transcultural in their very identity. In the early stages of transcultural life, one had to leave one's culture of origin, hidden in the home, or in the private sphere, and live according to the so-called majority culture, in the public sphere. When centrally run organizations and nations attempt to force the divide between home or private cultures and public cultures, they force the adoption of false identities upon people, creating artificial bi-polar syndromes. There is nothing wrong with a sense of privacy, as a free-choice option for individuals, but when the so-called “private life” is imposed from top-down, a separation of cultures is created where transcultural and cross-

cultural living is made taboo. Minds are split when practices are split.

Let me provide another perspective on this situation of parallel cultures where individuals are transcultural and form identities that are transcultural even though they are rooted in a home culture. Where do you find a culture and cross-cultural living, and where do you find traditions? There is a tendency to treat cultures and traditions as abstractions that can be represented completely in symbolic systems. For instance, we look at the myths, legends, and literature of a culture and tradition, and then think we have come to understand the culture. However, this abstract way of understanding stems from Hegelian Idealism, where history is reduced to a dynamic of thought without thinkers. The individual person disappears from history. Rather, if we look at the practice of individuals, we see culture and tradition as systems of practice and thought, as ways for coordinating and interconnecting systems of practice and thought. Cultures within the workplace feed over to cultures outside the workplace and interlock with those cultures as overall systems of practice within a specific local environment. (Polanyi, 1958, 1966, Turner, 2014)

6. where are we in the life-cycle of socratic social architecture

I review my two working principles about dialogue: First, dialogue occurs when we recognize discrepancies. This was discovered about 2,400 years by Socrates and he was executed for bringing this discovery into actual daily life. (Rebecca Goldstein, 2014 and Plato, 1914) Second, ideas, concepts, and theories are only tested in practical life. Obstacles occur in reality to implementing Socratic dialogue as a social architecture, where everyone is open to pointing out and recognizing discrepancies as the stimulus for improvement of social systems. The obstacles include treating people with various degrees of preference and respect, specifically, taking their reactions to discrepancies more or less seriously depending upon whether or not they are outsiders, lower in the social hierarchy, and from another culture.

The point is: we are still not beyond the first stage of the life-cycle of socratic social architecture. We are caught in the initial implementation stage, and not at the maintenance stage where we have learned how to improve the social architecture. If we can get to the point of learning to act as an insider, while remaining an outsider; if we can get to the point of learning how to hear bottom up criticisms from people who feel the pinch

of our social institutions and culture; and if we can learn how to blur the lines among different cultures and appropriately do cultural borrowing; I think we will get one step closer to taking Socrates out of the clouds, and implementing the Socratic method of learning to use discrepancies as levers, spring-boards, or launching pads for intellectual and social improvement in our workaday lives, and even in our educational institutions. Unfortunately, many academic philosophers in our Global Techno-Scientific Culture, unlike Socrates in his day, are and want to remain in the clouds. Moreover, what many philosophers say in their very sophisticated and elaborate discussions about mind and computation, often feeds into the ideology of the Global Techno-Scientific Culture. The question is: why do many academic philosophers in our day, unlike Socrates in his day, mostly unintentionally, act as promoters rather than critics of the ideology of the monolithic techno-scientific culture? This question is addressed in the next chapter, Chapter Five, Philosophers. Even when most academic philosophers criticise, their criticism dwells on fine points argued by their colleagues in their various isolated, and parochial schools of thought. But again, if we look carefully, we will find a small and resistant number of academic philosophers who attempt to focus on the pressing and serious real-life problems of the day. How is it then, that so many very critical thinkers focus on technical, philosophical questions that have bearing only to their fellow parochial and modern ivory tower schools of thought? I pick up on this question in the final chapter of the book, Chapter Six, Criticism.

CHAPTER FIVE

PHILOSOPHERS

> Social life is essentially practical. All the mysteries which turn theory towards mysticism find their rational solution in human practice and in the understanding of this practice.
> Karl Marx (1845,1886)

0. overview

1. where are the philosophers, critical enquirers?

2. philosophers who are ideologues for techno-submissiveness

3. interfacing with change

4. implementing an interface

5. the role of philosophers, criticism

0. overview

Philosophers can choose to leave everything as is or can choose to improve the world through critical enquiry and discussion. Where we have no choice is that the world will change regardless of how we choose. I propose that philosophers, and for that matter, all of us, participate in the current radical transformation of society by acting as critical enquirers. Philosophers, and all of us, can participate in the changing world by implementing virtual dialogical interfaces in our various corporate organizations such as in government, business, universities, in research institutes, in journals, and in conferences. Two structures I suggest are democratic relationships and interpersonal dialogical relationships. Democratic relationships occur when individuals share planning, decision-making, and intelligence. Interpersonal dialogical relationships occur when individuals speak with and listen to each other regardless of position in social hierarchies. Basically, these structures amount to the implementation of a socratic social architecture, for all of our institutions.

1. where are the philosophers, critical enquirers?

Where have all the philosophers gone? You don't see them, as we did for the most part from the beginning of philosophy (not only in Ancient Greece and the Greek colonies, but also in China and India) in the everyday world of work, military, religious institutions, and government. Philosophers in early times, apart from mingling with the everyday ordinary people when they too lived mainly in the world of everyday life, also became involved in the establishment of educational institutions that set teachers and students apart from the world of everyday living. (Marrou, 1956, and Segre, 2017) Since the late eighteenth century until now, most philosophers have gone into Academia and secular or religious educational institutions. Though philosophers may have always spun abstruse thoughts, they shared the practical concerns of the ordinary person, in trying to make a living in the professions, in skilled labour, in government, and for many in educating the wealthy, royalty, and nobility. Even Karl Marx had to earn a living as a journalist in the capitalist industrial society that he so much critiqued. (Bertrand Russell, 1945,1972)

Have philosophers (those in Academia, and those in other professions) surpassed Marx’s famous and apt critique that philosophers at best only understand the world but do not attempt to change or improve the world? (1847) If not, so what? Is there anything wrong with philosophers

pursuing pure research that has no practical or social bearing? Though arguably, even philosophers who do philosophy for philosophy's sake (similar to artists who do art for art's sake) do have a social bearing. In effect philosophers doing philosophy for its own sake remain silent about the political, social, technological, and environmental evils that are now happening on the doorsteps of Academia and other research institutions, public and private. (John McCumber, 2017) Do we ask mathematicians studying set theory, topology, or complexity theory to become involved with the everyday world beset with tremendous global problems? What people do in their private time who happen to pursue mathematics or philosophy as a profession, regarding the global problems in which we are all enmeshed, may have nothing to do with their professional pursuits: just as not every lawyer is asked to pursue cases regarding human rights, or environmental law, or war crimes, whether for pay or pro bono. Is there something different about the situation of philosophers as philosophers, that requires them to involve themselves as philosophers with the social, political, environmental, and perhaps technological impacts on humanity and the globe? I think so. There is something different about philosophers as philosophers that requires them to become involved with practical life and the various practical global problems: to perform as social and cultural critics in words and deeds. (John Stuart Mill, 2009)

Today we live in a time of transition, at a time of a fundamental global shift concerning how we live our daily lives, in the very matrix of what we do, and how we think. We live in a global culture or civilization that most observers say is undergoing a paradigm shift. For instance, Don Tapscott, 1993, borrows Thomas Kuhn's theory of scientific revolution, 1962, but Tapscott shifts the application of the concept of paradigm shift, from the history of science to organizational, technological, social, and economic change. The shift is supposedly, from an industrial society, with pyramid control structures, and centralized power to a society with horizontal layers of control, and distributed nodes of power. Are philosophers playing any role in this change, even as critical observers? For that matter, historically have philosophers played any role at all in the major historical changes in the technological and cultural development of humanity? It will be hard to find where philosophers, or even broadly speaking cave artists, oracles, poets, priests, and other sages who use pictures or words to guide us through their wisdom, or at least, who made mysterious pronouncements, were directly involved with the change from hunting-gathering, to plough, to machines, to computer. (Ernest Gellner, 1998, Yuval Noah Harari 2015, 2017, 2018) Usually, philosophers appear on the scene after the massive civilizational change and then make pronouncements on what had been,

but is no longer. (Hegel, 1807, 2005)

By and large, philosophers have done little about the vast social changes around us. (Raphael Sassower, 1995) But is more to be expected of philosophers? Were Marx and Mill in their own day expecting the wrong form of action from philosophers? Just what do academic philosophers do?

Academic philosophers focus on theory (theoria) at the expense of practice (praxis): on fundamental questions and the ongoing discussion of those questions at the expense of action. However, some recent historians of philosophy argue that the stream of academic philosophy that stems from Aristotle, unlike Plato, is oriented towards practice, and the practical world. The practice oriented tradition of philosophy includes Jewish philosophy. (Pierre Hadot, 2002, Hilary Putnam, 2008, Michael Mack, 2013, and Iddit Dobbs-Weinstein, 2015)

Marx tacitly assumed the tradition of Aristotelian philosophy in the attempt to adapt theory to the practical world of work. Though the job of philosophers according to Marx is not to understand the world but to change it, we cannot change it if we don't understand it. Hence, Marx developed a theoretical system of philosophy, history, politics, and economics designed to explain, and not to merely understand, the world of his time so that we could participate in changing it. Today, there is no Marx. So what? Is that so much for the better?

Karl Popper has revealed the theoretical weakness of historicist philosophy, including the philosophy of Marx. History is made up of singular events, as opposed to trends and laws. Likewise, economics is only law-like when we assume certain factually false models to explain singular events, and to predict market behaviour. Hence, the attempt to understand cultural change in terms of laws is futile. At best, we can develop stories, purely fictional dramatizations of our past that give us perspective on our history. (Karl Popper, 1957, E.H. Gombrich, 1969)

Followers of Popper developed his views under the framework of critical rationalism. (Karl Popper, 1945, William Bartley, 1962, Ian Jarvie, 2001, and Joseph Agassi, 2014) I have attempted to apply this method to interpret the works of E.H. Gombrich, an historian of art. (Sheldon Richmond, 1994) Hence, I suppose that my brief criticism of critical rationalism in the following is made from within the perspective of critical rationalism. Critical rationalism adapts Socratic dialogue to the modern

dilemma of how we can progress without absolutes. The solution developed by Popper and his followers is this: find the flaws in one's views, and propose improvements; and repeat the process both on the improvements one proposes; and on how one carries out the process of finding flaws and proposing improvements. Critical rationalism is a recursive or self-reflexive process, where the process of applying the methods of critical rationalism is turned upon itself to improve the process.

This is a very powerful idea: one develops methods of learning from trial and error; and one uses those methods of learning from trial and error to improve the methods of learning from trial and error. Independently of Popper, Roger Schank (1977), a cognitive scientist, has applied this idea to the problem of developing intelligent computer systems. Also, organizational theorists, (Chris Argyris, 1957) systems analysis theorists (Gerald Weinberg, 1971, 1982 and C. Churchman, 1971), engineering theorists, (Henry Petroski, 1985), ethologists, (Konrad Lorenz, 1965, 1967) neuroscientists, (Ross Ashby, 1956a,b, and Gerald Edelman, 1978), general biological theorists (Richard Dawkins, 1976, 2006), and philosophers in many areas including the philosophy of knowledge, mind, culture, ethics, religion, and science (Daniel Dennett 1996a,b, and David Deutsch, 1998), have adopted and adapted the Darwinian biological version of trial and error. The hypothesis is that humans develop tools that become ecosystems for various eco-niches whose evolution occurs through a continual process of selection by trial and error. Individual human organisms are not as clever as their virtually autonomously evolving ecosystems: i.e. computer technologies, telecommunication systems, and institutions. (Daniel Dennett, 1996a and 1996b. has a biological orientation; Ernest Gellner, 1988, has a sociological-anthropological orientation.)

What is wrong with that extremely amazing hypothesis of critical rationalism, a hypothesis shared by many leading thinkers in all branches of the sciences and humanities? Simply this: it describes the logic or dynamics of change, but not how we can use that dynamics. To borrow computer terminology: it describes the procedure, but not the interface (along the lines of J.C.R. Licklider, 1960, 1968, Douglas Engelbart, 1962, and Ted Nelson, 1965, 2004). Returning to Marx: he would say, it helps us to understand, but tells us nothing about what we can do with this understanding.

If we agree with the notion stemming from Aristotle that philosophers have some responsibility to participate in the improvement of the world,

philosophers are required to provide some guidelines for developing an interface with the dynamics of change. Our culture is so rapidly changing that we are soon likely to become passive victims of the change rather than active participants in the change. How can philosophers participate in the change so that it develops in a humane way rather than turning people into peripheral devices of computers? Academic and professional philosophers by and large, avoid the question of how to engage with the vast social and technological changes underfoot. As well, academic and professional philosophers turn away from the question of how to direct those changes to increase humanism. Specifically, philosophers in the field of computational philosophy have sidetracked philosophers from critically discussing the socio-technical changes whirling us around and about, by developing an ideology or a metaphysics that performs as apologetics for techno-submissiveness. For instance, Luciano Floridi (2013, 2014,2019) is a prime example of a leading philosopher, a Hegel for today, who has developed and has a grand plan for further developing a metaphysical system where people are morally secondary to information or data, and where people are required to function as servants to computer or informatics technology.

2. philosophers who are ideologues for techno-submissiveness

Thomas Nagel bluntly and concisely states about computational philosophy: "Eventually, I believe, current attempts to understand the mind by analogy with man-made computers that can perform superbly some of the same external tasks as conscious beings will be recognized as a gigantic waste of time." (1986, p.16) I think computational philosophy is worse than "a gigantic waste of time". It is an ideology advocating a submissive attitude toward digital technology, a performative set of utterances or speech-acts (J.L Austin, 1965, and John Searle, 1969) that rhetorically persuade people to adopt the attitude of techno-submissiveness. Computational philosophy is an ideology that amounts to passively accepting the domination of ourselves by the techno-elite and digital technology. I think it is important to see how computational philosophers avoid facing the vast technological and global cultural/civilizational change going on now. Computational philosophers avoid directing this change towards a more democratic and humanistic technology that is technologically pluralistic. Computational philosophers lull techno-subjects into the passive acceptance of the control by the techno-elite with digital technology, dulling our capacity to think

independently, to think critically, to raise questions, and to open up discussion of our plight to critical examination. Here goes my attempt to draw a verbal schematic of the analytical engine of computational philosophy, and show where the analytical engine of computational philosophy falters. Why? I hope that through showing how computational philosophy fails, we can figure out how to work together to find a way through the winding and twisting paths of computational philosophy. However computational philosophy has developed strategies to use the criticisms of its critics to increase its twisted paths as entrenched reinforcements for its unaware, unself-critical, compulsive if not compelling rationalizations of the Global Techno-Scientific Culture.

What has become known as GOFAI, "good old fashioned artificial intelligence" as John Haugeland calls it (1985), assumes that with enough brute force we can replicate minds. Basically, minds are nothing more than Turing machines, but our real world computer systems are practically more limited physically than brains or minds, and so fail to duplicate minds because of their physical limitations. Better design, more processing power, i.e. faster CPUs, more storage facilities or better chips and hard drives, etc. will allow us to break the gravitational pull of the earth-bound computer systems. The latest vision in quantum computers is that they will break even the binary limitations of Turing or von Neumann computer architecture. (Peter Wittek, 2014)

Some thinkers, such as AI researchers Joseph Weizenbaum (1976) and Terry Winograd (1987) have launched a sustained and exhaustive critique of the GOFAI project in terms of the impossibility of replicating human consciousness in computers. Certain features of human consciousness such as judgment, multi-tasking (i.e. whistling while working, chewing gum while walking), and pattern recognition cannot be duplicated by serial processor systems, no matter how many CPUs and how big the storage systems are you throw into those systems. However, the ongoing and rapid development of AI systems that perform pattern recognition, including face recognition, for instance as developed by Geoffrey Hinton (2014) has been now implemented widely, perhaps too widely regarding privacy concerns for face recognition. This is because GOFAI has shifted its ground and transformed into new approaches, partly due to AI researchers recognizing the limits of serial processor computers, their own models of the human mind, and partly in reaction to the external philosophical critics such as Hubert Dreyfus (1979) and internal 'traitors' such as Weizenbaum and Winograd.

One transformation of GOFAI involves the project of simulating human problem solving along the lines of Simon and Newell (1972) using heuristics, or strategies and deductive logic. Hence, when we attempt to replicate human consciousness we need only build congeries or networks of expert machines, i.e. chess playing machines, number theory proving machines, and so forth.

Marvin Minsky (1986) has taken a similar track to Simon and Newell, in looking at the mind as a system of interacting modules. He calls this "the society of mind". There is no unified, central director called the "self" which coordinates activities. Rather, the mind is a set of interacting processes or agents, with no central control other than that which arises indirectly through the mutual adjustment of the agents to each other. Rather than building a big machine that replicates the mind in a top-down fashion, we build networks of machines that signal each other, divide the tasks, or take on specialized tasks. This is an anarchic society of minds where order is achieved by mutual consent among the specialized computer systems.

Roger Schank (1977) took a more unified approach to mind by arguing that the mind is a memory machine that learns when it attempts to confront novel situations by applying remembered themes or representations. Though the mind is not a collection of strategies, or not only a collection of strategies, it is a collection of memories or stories. It is when the story does not apply to a novel situation, and the mind comes up with a new story, that we learn. Schank and his various teams have attempted to develop different expert systems for different story genres, for instance, race-track betting, poetry generation, the stock market and various other real-world applications.

All the while various philosophers have been attempting to find a view of the mind more congenial to the common sense view of the mind as a special sort of entity; but also congenial to computational philosophers of mind where the mind is something no more special than a computer. Jerry Fodor (1975) produced the functionalist theory of the mind where the mind is a family of modules with specialized functions. The nature of the substratum required to produce those operations is not important, whether the material is made up of brain matter, or computer systems, or even urban centres. The important aspect for understanding mind is, what functions are mental functions? How does the mind remember, learn, represent? Or, in brief: what is the grammar of the mind? Whether this grammar uses circuits or organic chemicals is irrelevant to understanding

mind. Supposedly, on the opposite side of Jerry Fodor are Paul Churchland (1984) and Patricia Churchland (1986), and their lengthy books in the field, which they invented and called "neurophilosophy". (Karl Popper, 1977 was a pre-critic and Markus Gabriel, 2017 is a recent critic, a post-critic, of neurophilosophy.) The mind is the brain, and the brain is composed of neurons that interact associatively, by associating various responses or neuronal signals learned through repetition and probabilities of joint occurrence. In order to mimic the mind in computer systems, we need to mimic the material substratum of the mind which is the brain. More precisely: the mind is no more and no less than the brain. We need to build computer systems which function as brains: parallel processing and distributed systems, where events trigger other events according to the nature of external stimuli. The triggering systems adapt as the external stimuli change. (Ross Ashby, 1956a, 1999)

The AI people have their opponents and have engaged in much discussion with some of the proponents of the very impossibility of AI, for various reasons based on the nature of the brain, mind, or nature of human understanding. Here is a very schematic and incomplete outline of the argumentation by philosophers who assert AI is not feasible (either because it is artificial or because it attempts to emulate human intelligence).

John Searle (1980) refashioned the theory of mind to avoid such novel approaches in AI. The mind, according to Searle is a biological entity (1998), but not reducible to the brain. It is a set of properties produced by brain activity. Searle also produced a puzzle that is intended to show that no manner of computer power can duplicate the special mental property of the biological system of the mind, i.e. understanding and intentionality. This puzzle is called the Chinese Room where people with no understanding of Chinese just compare symbols using various rules and produce the correct translation, which is what a computer translation system would do. Can we say that such a translation system or "information processing system" has any "understanding" of Chinese? Searle, of course, expects us to answer No, or to come up with a theory of understanding that reduces understanding to symbol manipulation. (Searle, 1980)

Noam Chomsky (1979) through studies of linguistics, as opposed to philosophical theories of mind, intentionality, and speech acts, developed a view that is actually very similar to Searle. Though Chomsky does not launch any direct attack on AI, I think his theory of language, knowledge, and the mind does have an implicit critique of more recent approaches in

the computational theory of mind. According to Chomsky, the mind is not identical to the brain, but is a biological system with an evolutionary history. When the human brain evolved to a certain stage, it produced a brain with special attributes, such as the attribute of having a universal and deep grammar that allows all humans to learn all languages. (Chomsky, 1979)

Chomsky like Searle, argues that human language has special features that cannot be replicated by mechanical or non-organic systems. Ironically, at least from the perspective of the computational philosophy of mind, Jerry Fodor (2000) has of late switched camps and has developed a critique of computational philosophy similar to the critiques by Chomsky and Searle. Fodor argues that the mind uses forms of reasoning that are context dependent and cannot be formalized. These non-mechanical processes are functions of the mind as a biological product of evolution (Fodor 2000). On the computational side of the argument among philosophers of mind about computation, brain, and mind, David Chalmers (2010) is a fan of singularity: we are on the verge of creating an AI machine that will not merely surpass human intelligence, but will also pose a potential threat to the existence of humanity. (Daniel Dennett, 2012, critically discusses Chalmers's arguments for the feasibility and inevitability of super-intelligence; Nick Bostrom argues for the existential threat of super-intelligence, 2014; Avery Slater, discusses the problem of a “kill-switch” for super-intelligence, 2018.)

Is there a terminal point for this debate between the computational philosophers of mind and their critics? Can it end in a decision concerning whether the viewpoint of computational philosophy, as the critics argue, is mistaken or not?

The debate is turning into a 3-D chess game, with the number of pieces, the size of the board, and the number and moves of the players increasing without a stop in sight: somewhat similar to the decision-problems of Alonzo Church (1936), Alan Turing (1937) and Stephen Cook (1971), no sight in end to a (de)termination. It could be that the various studies of the brain, mind, and computer are at too early a stage for a determination to occur: though the science of the brain is rapidly growing, and though computer science and the development of machine-learning systems (Geoffrey Hinton, 2014) are flying high, there is still much to learn and very difficult problems to solve: such as the old-hat problem of mind-brain connection, and the relatively new complexity problems in computer science. Meanwhile: virtually untouched and unnoticed are the practical

issues concerning the massive technological shift that is going on under the feet of those who debate the philosophical and conceptual issues concerning the very possibility of AI (let alone those who debate with Chalmers about the very possibility of getting even a glimmer of understanding of the mystery of consciousness, the so-called "hard problem", 1995,1996). To repeat Nagel's honest and trenchant assessment: the debate about the computational philosophy of mind is "a gigantic waste of time" (1986, p. 16)

Where then is the "waste of time" in the discussions and explorations of the computational philosophy of mind?

Dennett does not locate the "waste of time" with the computational philosophy nor with the philosophy of mind, in general. Dennett actually is one of the leaders in the contemporary naturalist, specifically evolutionary biological, approach to the philosophy of mind. Dennett does think that discussions of super-intelligence are a "waste of time" in terms of how our reliance on digital technology could harm humanity. Dennett poses the question, what if something of a catastrophic nature happened to the internet?

> ...thinking about the Singularity is a singularly imprudent pastime, in spite of its air of cautious foresight, since it deflects our attention away from a much, much more serious threat, which is already upon us, and shows no sign of being an idle fantasy: we are becoming, or have become, enslaved by something much less wonderful than the Singularity: the internet. It is not yet AI, let alone AI+ or AI++, but given our abject dependence on it, it might as well be. How many people, governments, companies, organizations, institutions, … have a plan in place for how to conduct their most important activities should the internet crash? How would governments coordinate their multifarious activities? How would oil companies get fuel to their local distributors? How would political parties stay in touch with their members? How would banks conduct their transactions? How would hospitals update their records? How would news media acquire and transmit their news? How would the local movie house let its customers know what is playing that evening? The unsettling fact is that the internet, for all its decentralization and robust engineering (for which accolades are entirely justified), is fragile. It has become the planet's nervous system, and without it, we are all toast. (2012, p. 87)

I think both Nagel and Dennett would rather have philosophers spend time on other abstract and abstruse issues of the philosophy of mind than super-intelligence. In Nagel's case, he would rather have philosophers spend no time on super-intelligence as well as no time on the computational

philosophy of mind. Nagel thinks it is worthwhile to use philosophical resources for discussions of abstruse theoretical issues of philosophy. For instance, I have just done an online search in philpapers for “what is it like to be a bat” and 997 papers were listed (as of this writing). Nagel is the first entry on the list in a paper published in 1974. Dennett's very first publication in philosophy was a critique of computer simulations of cognition. (1968). Here the question pops up: why rule out discussions of super-intelligence as a “waste of time”, but not other theoretical and abstruse issues in the philosophy of mind? Indeed, this raises the even more general and important issue: how do we know working on a problem, even if abstruse and abstract, won't lead to results that are fruitful not only for other abstruse problems, but as well, for practical problems? Even, more generally, how do we allocate resources to research in specific problems before the research is done? The outcome could be surprising and rich, on many levels, practically, socially, and intellectually. I don't know the answer, but I have a suggestion for what philosophers and all of us might do now. We might want to spend some time researching and discussing the question, How is what is going on with digital processor technology affecting and transforming humanity, civilization, and our humaneness? For instance, the rapidly growing literature on post-humanity, posthumanism, or humanity 2.0 does address the question of humanity's transformation by technology in a very literal way, which I think is worth examining and criticising. (Alcibiades Malapi-Nelson, 2017, and Steve Fuller, 2013) However, my perspective in this book is conservationist: how can we prevent the human species as we are now from becoming extinct, whether due to global disasters caused by our own environmentally neglectful activity or whether due to digital technology? (I focus on how digital technology impacts us as we are now.) In this book, I take as axiomatic, as a categorical ethical principle, the position that humanity 1.0 is worth preserving. (Spinoza 1889, Kant, 1949) As a consequence of that ethical axiom, I see the discussion of posthumanism, transhumanism, and in general, thinking about the replacement of humanity by super-intelligent machines, as a distraction and also as a sell-out to the passivity of the ideology that tacitly endorses techno-subservience. (Markus Gabriel, 2017) I could be wrong, and I look forward to the critiques of those who think I am selling short post-humanist and transhumanist philosophers.

Indeed, in my view, what philosophers and computer scientists are missing is the everyday here and now issues surrounding the information technology revolution. There already have been computer application disasters and catastrophes: both financial disasters (due to stock market

systems and due to government wide payroll systems for the public service in several countries) and airplane crashes. Though attention grabbing, that is the least of it.

Philosophers and computer scientists are overlooking the small area which is often overlooked but which is the most serious practical, nerve racking, time wasting, obstacle making situation in most people's daily lives at work and home. This is the situation where when attempting to do something with a computer, we cannot do it either because we do not know how, or because the computer fails. The failures and frustrations with digital technology not only entrench the techno-elite but also entrap, and dummify, and mechanize techno-subjects.

Because people, both ordinary users of computers and computer experts in their own use of computers, do not find the use of computers to be transparent; because computers are error prone; the techno-elite has job security and is able to control society and techno-subjects. Here are sample scenarios where everyday problems with computers entrench the techno-elite in their controlling position.

Bill is using a program for word processing which I shall call "Word Wizard". However, when he attempts to retrieve a specific attachment in email using "Word Wizard", the program "crashes". The program freezes and Bill needs to shut down the program. However, when Bill uses "Word Wizard" to retrieve other attachments, the program does not crash or freeze. It only freezes with that attachment. Bill is puzzled. So is the expert. The only solution the expert can think of is to save the file to disk, use a standard text editor for retrieving the text, but without the formatting features. All the bolds, underlines, fancy fonts, and so forth are lost. However, Bill gets the text. Bill is puzzled. The technical expert guesses that some code in the text, the code for creating the formatting, conflicts with other codes, causing the program which depends on that code for text formatting to halt. To Bill's mind, he is following a simple procedure which he has used many times before. The computer for some reason does not allow him to use that procedure. He is doing nothing out of the ordinary, nothing different from his usual routine, and the document he is working on, or attempting to retrieve, is in itself apparently innocuous. Everything should be transparent and work as always.

Consider another example:

Beatrice has written notes for saving a document to a drive on a computer. Though she has done this many times before, she likes to work with written notes which she made when she was instructed on how to save documents. However, after saving the document, and retrieving it, according to instructions, she noticed it was blank. All her work disappeared. She is puzzled and so is the expert.

To figure out what happened, the technical expert asks some basic questions: How did you save the file? Did you get any messages on the screen? Beatrice tells the expert that she always does the same: Choose the option, “File Save As”, and Choose “Yes” when prompted “overwrite the file”. It has always worked so far. However, after further interrogation, the expert finds that Beatrice had intended to delete some text, add new text, and then save the document before rushing off to a meeting. But she did not have time to add new text, so she just saved the document with the deleted portion of text. The expert explains to Beatrice that she mistakenly deleted everything and that she had then saved the blank file overwriting her existing file.

To Beatrice’s mind, the computer should have known that the file was empty, and should not have overwritten a full file with a blank file. The computer should be more adaptable. The expert suggested that Beatrice choose the “preference” to save the original file as a backup when saving any modification to that file. Beatrice still was not too happy because Beatrice expected the computer to be smarter than that! It should “know” not to write a blank file over a file with data or text.

I will provide one example of computer frustration from the experience of a technical expert, a systems administrator. Some years ago, before going on vacation the expert decided to do some computer network operating system house-keeping. The expert ran the program for doing the house-keeping. The unexpected result was that every user account was obliterated. This undocumented result was explained on the web site for the network operating system as a bug. The explanation was found in the Frequently Asked Questions (FAQ) area of the website for the network operating system. Systems administrators, as do ordinary computer users, usually look up FAQs after a problem occurs. The solution to the bug was to restore the user accounts from the backup system that included old passwords, causing many users to become unable to use their network accounts, until they informed a systems administrator to provide them with a temporary password for them to access their account and set a new password. (“A glitch in the system; had to restore from the backup” was

the response of the embarrassed systems administrator.)

Even technical experts, as well as the average ordinary computer users, expect a certain level of obviousness or transparency. The technical expert expects at least some warning from the system in use, but no warning is given. The only warning was listed on the vendor site, which is usually consulted only after a problem is noticed. Rather than correct the bug and put it in the place for downloading critical updates, the vendor decided to provide an advisory in the place where one looks after running into a problem. Moreover, the sophisticated user of technical computer procedures, often forgets to keep in mind the trivial lesson that all reasonable expectations regarding what we can rely on from computers concerning obviousness and basic etiquette should be suspended and replaced with the rule: computers are never to be trusted. But, why? Why can't we demand transparency? Why can't we even expect some minimum level of obviousness in the use of computers? Why are computers so obscure and user-hostile?

I could provide many more examples with different sorts of tasks, applications, and different levels of sophistication. I have two points: 1. Computers are not transparent, i.e. they do not replicate the human mind, and they require special sorts of operations to use them. 2. Those who design the special sorts of operations do not understand the mind or culture of ordinary people, including themselves when acting as ordinary people.

First, digital computers can never be transparent to humans who are analogue-cybernetic (feedback) creatures. I have more to say on this point in the final chapter, Chapter Six, Criticism.

Second, computer developers, and the techno-elite in general, live in a different elite subculture from computer users or techno-subjects, and even they themselves change subcultures to the subculture of techno-subjects without being aware of that when they use computers. (Discussed in Chapter Three, Cultures.) How do the techno-elite think about minds, especially the minds of techno-subjects, if not their own?

The techno-elite has implicitly adopted the ideology and apologetics developed by philosophers who propagate the computational theory of mind. However, the computational theory of mind is disguised by the technical terminology and acronyms used by computational philosophers. The verbal disguise functions in practice, even if unintended, to guard

their ideology and apologetics from the criticism of those who are outside the intellectual holiday resort of Academia: a holiday, as Wittgenstein (1953) claimed for all philosophy, from the reality principle of everyday practical life. Furthermore, the technical terminology and acronyms of computational philosophers not only reinforce the Mystique of computer technology (Chapter One); but also, creates a culture parallel and closed to the culture of people who in their everyday lives and work are immersed in and subject to the tyranny of computer technology. I briefly critique a plain language version of computational philosophy that I hope is an accurate representation of the jargon-laden language used by computational philosophers. The jargon-laden version used by computational philosophers, functions, tacitly and perhaps unwittingly to the developers and users of that jargon-laden philosophy, as the ideology and apologetics of the Global Techno-Scientific Culture.

Computer developers, computer scientists, and philosophers of the computational theory of mind, think of minds as poor computers. If we were more logical, faster in our processing, and more persistent, we would have no trouble with computers. It is that we cannot adequately do what computers do very well. We cannot break tasks down into sufficiently small steps in the required sequence, we cannot do those steps rapidly, and we cannot last very long doing those minute and repetitive steps. Basically, what Weizenbaum (1976) warned us about many years ago is coming to pass: if we can't make computers do what we do as intelligent beings, we call what computers do as intelligent and reduce our activities to replicating, as best we can, computers. But this does not work. People tend not to understand how computers work because they expect computers to work in the same way that people work or interact. But computers have their own rules, basically abstract and impersonal rules for acting. Computers need detailed instructions where nothing is taken for granted and where nothing is assumed. Furthermore, computers are literal, and every action or result required by the computer must be explicitly spelled out by, in the first instance, the computer programmer, and in the final instance, by the activities of the computer user, and only those activities that were built-in the computer by the computer programmers and hardware engineers.

The problem is that we explicitly know those things about computers, we know that computers are abstract, explicit, literal, but we expect that though computers are not like humans they are human-sensitive: sensitive to humans who have minds of their own, and can understand our own minds and other minds, and what we expect. But this is not the case.

Computers need special instructions, and special hardware in order for them to behave according to our expectations and in order to adapt to individual persons with their own individual knowledge and expectations.

We are slowly learning this lesson and are developing better ergonomics, at least, the so-called GUI, graphical user interface, with the use of pointing devices and touch screens that are thought to be more user-friendly. However, this is not an easy task. We tend to stop short of the mark and expect users to adapt to what we think is user-friendly. Children pick up the skills required for using computers and so-called smart devices quickly, but that only shows that children are better at adapting themselves to new technologies, and not that the new technologies are better adapted to humans.

The practical lesson of working with computer based technologies is that because computers are digitally based tools, they are not transparent to human users. At best, technical experts can attempt to figure out how to design computers so they do what techno-subjects expect them to do with as few repercussions or misadventures as possible. This means, at best, techno-subjects need computers with inbuilt systems that will prevent people from totally befuddling and frustrating themselves. A subsidiary lesson very important to the techno-elite is that they do not run out of work to do. There may be less work as computer designers improve their understanding of the analogue nature of human minds, but the limit is that computers still require explicit instructions which are not transparent to people who work with analogue-cybernetic (feedback) minds. If and when machine-learning becomes widely available, computers may learn how to adapt their binary-functions to the analogue thinking of humans. However, until machine-learning simulates human-learning, and becomes human-sensitive, computers remain alien from the perspective of humans.

We think that the computer will do what the online manual says, if there is one, but the online manual was written by humans, at least for now, and so some important steps are taken for granted. It is just those steps that others need to have articulated in order to avoid becoming frustrated by their computers. But, even so, the frustration is never ending because humans are not digital machines. (Donald Norman, 1988, 1993, and 1998)

In other words, Nagel's insight into the “gigantic waste of time” of computational philosophy is due to the unbridgeable mismatch between how humans are and how digital machines are. Humans are analogue-cybernetic (feedback) creatures as involving continuous comparisons and

continuous development of new relationships. Digital machines are tools that use discrete quantifications within fixed operations. How then can philosophers and all of us maximize whatever minimal time we have for discussing and thinking about the massive technological shift going on world-wide? How can philosophers and all of us take a degree of control over technological change? To discuss those questions, we first need to discuss three questions concerning the mechanics and dynamics involving change-making and change-control. The questions are:

First. How can we interface with the rapid dynamics of change? (Discussed below in section 3.)

Second. How can we implement this interface? (Discussed below in section 4.)

Third. Where can philosophers play a role in the implementation of the interface? (Discussed below in section 5.)

3. interfacing with change

Here I discuss the question: How can we interface with the rapid dynamics of change?

I suggest that we look at the architecture or design of human systems: how do humans interface with dynamic systems? (Don Tapscott, 1993) Ironically, I propose we borrow the notion of Client-Server architecture from computer systems to explicate this architecture. (Paul Baran, 1964, prepared the classic paper on distributed networked computers, the basis of Client-Server architecture.) According to the notion of Client-Server architecture in computer systems, processing is done at the Client Personal Computer (PC); the Server stores and distributes files and programs to the Client for the Client to use and process at the request of the Client.

Most people are familiar with email and with the Internet (or World-Wide-Web). Email is sent or received at a Client PC to a Server which stores and forwards the email message to Servers, which also store and forward the message until the message reaches its destination. For the most part, it is the Client PC that initiates email, and not the Server. The Server acts only at the request of the Client. Similarly, it is the Client PC that connects to the Web or Internet, initiates searches, file transfers, emails, transactions, chats, games, and the other functions now found on the Internet or Web Servers. In short, Client-Server architecture forms the interface among

networked computers. Prior to this Client-Server architecture, was the architecture of mainframe or centralized processing with dumb terminals. Dumb terminals were so-called because they were merely input-output devices; they did no local processing. The Client-Server architecture only became possible when distributed processing was implemented. Decision making became distributed to the Client; and the mainframe was replaced with a Server that connected the various Clients. The key here is the distribution of decision-making among the Clients. The Server functions as an intermediary for the Clients. (By the way, Peer-to-Peer or P2P computer networks are a subset of the Client-Server architecture: every PC can act both as a Server or a Client. The end result is the same, when a PC acts as a Server, it distributes files or messages to other PCs that act as Clients for processing, or decision-making.) How can, if at all, this computer architecture for computers be applied to human social systems?

Applying the Client-Server model of distributed computer architecture to human systems (as did Norbert Wiener for his cybernetic version of distributed communications with feedback, 1948, 1950) involves entering the ongoing debate over nature versus nurture, which is still a tangled maze. The debates over whether computers are conscious, and whether intelligence can be artificially simulated in computer systems, are part of this maze. Part of the maze involves the open-ended and multi-layered nature of learning: in order to learn, humans need to learn how to learn. We have developed excellent methods of learning, but new methods for learning could be found which exceed current methods of learning. How do we go about finding these new methods? My answer is: implement socratic social architecture where critical discussion of how we learn and how we carry on critical discussion is encouraged. (Chapter Six, Criticism)

Client-Server architecture in human social systems is impossible when decision making is centralized and the interface is one of Command and Control. (Peter Kropotkin, 1902, argued, using biological models of cooperation, for the decentralized, distributed feedback systems of “mutual aid”, also known in political systems as “anarchism”. Anarchism is opposed to the imposed order of Command and Control; rather, anarchism endorses self-organizing and self-controlling systems through a process of trial, feedback, adjustment. Do a computer search on the P2P Foundation, and one will run into the current intellectual descendants of Kropotkin.) Those making the decisions at the centre ensure that their decisions are carried out through commanding those who act; and ensure that their decisions are carried out effectively through control systems. Scott Adams, business cartoonist, graphic novelist, and social satirist (1997) lampoons

centralized decision making systems in his cartoons and books. Control programs are introduced by the dozens from Management-by-Objectives to Quality Teams. In hierarchical systems, the hierarchy is externally marked by the size and location of office space: from large offices with windows, private bathrooms, kitchens, and meeting rooms, to tiny cubicles separated by flimsy partitions. Other famous measures of control are rigid job descriptions, and employee appraisals.

How would Client-Server architecture look or work when transferred to human systems as a model for social architecture? Managers and administrators would be replaced not by coaches or leaders, but by co-ordinators. (Thomas Peters, 1982 applies the distributed, decentralized, feedback control to the sphere of business management.) Decision-making would occur at the Client level of the one that makes the product or provides the service: office worker, factory worker, teacher, doctor. The position of Manager or Administrator would be replaced by a Co-ordinator who would function as a Server: provide information and resources to the Client at the request of the Client or primary actor, the person doing the hands-on work, also known as the front-line worker. In the Client-Server social architecture it is the primary actor, the front-line worker, the person providing the service or making the product, who interfaces with the changing human systems. The front-line worker or primary actor decides on the direction of change: how and when to apply resources provided by the co-ordinator or manager, to the changing process. (The classics of the literature on leadership as coordination are written by Chris Argyris, 1957, Warren Bennis, 1989, Stephen R. Covey, 1989, Michael Hammer, 2001.)

The dynamic of change is one that occurs according to a Darwinian process of evolution: the recursive application of the method of trial and error. Systems are proposed and implemented. Flaws are found. Improvements are made. The process of proposing improvements, implementing improvements, and finding flaws is also subject to refinement through finding flaws in the process and proposing improvements for the process. Strangely, the decentralized feedback approach to social decision-making, has been proposed as an alternative to centralized planning by so-called “conservative” thinkers such as Friedrich Hayek, 1967, Michael Polanyi,1996, as well as the “leftist” thinker, Karl Polanyi, 2014, and the socialist anarchist, Martin Buber, 1949. Recently, from a sociological point of view, looking at societies, in general, as composed of distributed social objects, social centres of control, and social groups, seems to be a more fruitful method than looking for a fixed centre of control. Specifically, Stephen Turner recommends: “We can think of actual

societies as made up of multiple focal points which are the subject of joint attention by different overlapping groups, as the distributed rather than centralized source of multiple modes of coordination." (2018, p. 209)

The Command-Control architecture (unlike the decentralized feedback system) centralizes the decision making for making changes, and treats the actors at the working level whether teachers, professors, professionals, or workers as dumb terminals or input-output devices. (Elliott Jaques, 1996, has a thorough, intensive and extensive advocacy of traditional hierarchical management, or Command-Control that forms the core of most global corporations as well as the current trend within the civil service of all governments including liberal democracies. The level of management is determined by the length of the timeline of their planning abilities.) The Client-Server architecture as a social architecture, decentralizes the decision making for changes, and treats professors, professionals, and others at the working level as the ultimate controllers of the implementation of policies and programs that are developed through the coordination of the front-line workers.

From the perspective of enhancing the very dynamic of change through trial and error, the Client-Server social architecture is superior to the Command-Control architecture. In the Command-Control architecture when errors are recognized they are often hidden because responsibility for the making of decisions occurs at the centre, but the implementation of those decisions occurs at the periphery. Hence, the centre tends to blame the actors for misunderstanding, misapplying, for cheating, for being lazy, stupid, dishonest. The centre does this in order to avoid taking responsibility for the errors. The simplest tactic is to ignore errors and to deny that they have occurred at all. In the Client-Server social architecture, decisions are made by the actors, hence when errors are made, the actors are the ones who are responsible for correcting the mistakes, preventing repetition of the mistakes and learning from the mistakes. The central Servers or Co-ordinators merely share information and lessons that are gained by the primary actors. There is no gain or interest for the central Servers to hide errors or to blame the primary actor-Clients. Hence, the primary actor-Clients are not faulted by anyone else other than themselves when errors are made. They are the ones who decide on the implementation of policy through their own decision-making. They cannot cheat or lie or misunderstand someone else's policy or decisions because they are the ones who are responsible for the policies and decisions. (Charles Handy, 1984, and William Bridges, 1994)

Is the Client-Server architecture as applied to human systems merely idealistic? No: this is currently how human systems are evolving toward the implementation of the architecture of the Client-Server interface. Through implementing such notions as horizontality, delayering, empowerment, developing learning systems, employing knowledge managers, and even in downsizing and business process re-engineering, and so forth, human systems are evolving towards the Client-Server architecture. Those who have directly developed the management philosophy for implementing Client-Server architectures are the so-called management gurus. (Warren Bennis, 1989, William Bridges, 1980 and 1994, Stephen Covey, 1989, Edward De Bono, 1995. Michael Hammer, 2001, Charles Handy, 1994, and others among the rising tide of business and management thinkers ironically advocating for self-management or distributed management.)

Most management writers agree on distributing decision-making to the so-called front-line. What is not fully recognized is that when decision-making is distributed, management no longer is needed, not even in a leadership role. What is needed are coordinators that serve their Clients. When managers are replaced in function if not in title by coordinators, the interface between the dynamics of change and the people in the systems undergoing change will become completely transformed from the Command-Control to the Client-Server interface. Elaborating that process will lead to the development of an answer to the next question for discussion: How can we implement the Client-Server social architecture as our interface with the dynamics of change?

4. implementing an interface

Here I discuss the question: How can we implement the Client-Server social architecture as social interface?

How can we get a grip on our changing technological world? How can we actively participate in this change? I propose that we create Client-Server social interfaces within our organizations, institutions, schools, businesses, and political systems. These social interfaces will allow us to actively interact with the dynamics of social change by distributing and decentralizing decision-making and intelligence. How can we create Client-Server social interfaces?

The concept of the social interface here is an application of the concept of the virtual device, as used in such areas as virtual memory, virtual drive, and virtual private network. The virtual device mimics the actual or physical device, and extends the scope of the physical device by simulating the physical device or mimicking the operation of the physical device. For instance, virtual memory extends the actual random-access-memory (RAM) of a computer by having a portion of the hard drive function as RAM. Similarly, Virtual Private Networks use shared networks, such as the Internet, to provide the function of the private line or network. Are virtual devices abstract entities or world three objects according to Popper's metaphysics? (Popper, 1977) No. Virtual devices use one physical entity to function as another physical entity. For instance, a virtual hard drive allocates a portion of random access memory to act as a physical hard drive. For Popper, world three or abstract entities are a special kind of entity such as numbers, theories, values, and designs that can be represented by physical entities but which themselves do not functionally replace other physical entities. Thus, virtual devices are not abstract entities because they are physical entities that functionally replace other physical entities.

The Client-Server interface is a virtual social interface that functionally replaces face-to-face, concrete relationships among specific individuals within bureaucracies and corporations. For instance, in a restaurant, a waiter brings you the food you request usually from a fixed menu. This is the actual physical-social relationship of Client-Server. The waiter is literally the server of the food, which the customer-Client requests and processes. In a bureaucratic or corporate organization, management adopts the role of Server, and staff adopts the role of Client who processes the resources delivered by the Server. Thus, certain structures are used to function as a Client-Server interface. Specifically, the structure of management interacting with staff functions as a Client-Server virtual interface when management provides resources and information to staff. Managers and employees interact face-to-face, but management and staff virtually interact according to a Client-Server virtual interface when the concrete face-to-face interactions are guided by the notion that the job of management is to provide resources and information, and the job of staff is to decide how to proceed with the resources and information.

We cannot use all structures to implement the Client-Server interface. For instance, in a traditional Command-Control hierarchical organization, the Client-Server interface apparently cannot be implemented because decision making and all intelligence is centralized, and production and service is

placed at the periphery. However, by introducing teams (Weinberg, 1971) or groups at the periphery, and within the various levels of the hierarchy, the Client-Server interface is introduced in a segmented fashion. Each segment or level in the hierarchy uses a Client-Server interface internally, with a Command-Control interface externally between levels. Even at the individual level, when individuals act with each other in terms of Martin Buber's I-Thou dialogical relationship (1970) by actually speaking with and listening to each other, rather than using each other as instruments, we use the existing organizational structure to form a Client-Server interface.

In order to implement the Client-Server interface where decision-making and intelligence is distributed in traditional hierarchical organizational structures, we need to superimpose team organizations and I-Thou dialogical relationships. However, the new technology of computer systems, the distributed and networked computer technology systems, are now the main socio-technical infrastructure for human activity: economic, intellectual, political, familial, institutional. Distributed networked computer systems are pervasive, ubiquitous, and embedded in all human environments and activities. Distributed networked computer systems, ironically, can be used as the models for the replacement of the traditional hierarchical organizational structures with non-hierarchical, flat and open organizational structures. Even in the public realm, government departments no longer have to be hierarchical bureaucracies.

It is odd that management thinkers and futurists are pointing out new ways of working, to increase rather than diminish humanism in humanity. The new ways of working are based on the affordances for increasing humanism provided by distributed networked computers, the Client-Server. But philosophers have remained silent. For instance, the work life thinker, William Bridges advocates autonomous work (Job Shift, 1994). The employee working in a defined job for their entire career will become obsolete and replaced by the consultant who has multiple job-tracks, or works part-time for several companies, and has multiple careers.

Other forms of autonomous work life have sprung up on the initiative of workers such as the virtual office. In the virtual office, workers telecommute or telework through the internet and private virtual networks over the internet. Also, teleworkers who need to use a desk and meeting rooms in a central office space may use shared facilities. These new ways of organizing work allows for the implementation of the Client-Server virtual interface since it is difficult to use the Command-Control structure over a dispersed workforce.

With autonomous work there is no centralized planning, decision-making, intelligence, and controls. Then, how can we coordinate our activities? This is the world where the Client-Server social architecture and virtual interface functions best: coordinating distributed nodes of intelligence. By using teams for sharing decision making, and having individuals relate in an I-Thou dialogical manner, we create a virtual structure for co-ordinating decisions. There need not be an actual coordinator because virtual coordination is achieved through the different teams and nodes sharing decisions and intelligence. (Buber, 1949)

To return to the question of how to get a grasp on the dynamics of change: The answer is that through implementing Client-Server virtual social interfaces, organizations actively interface with changing situations. The distribution of intelligence and decision-making allows staff to initiate policies and programs where errors are immediately exposed and where corrections are immediately applied.

Where do philosophers play a role in this world of distributed intelligence and distributed decision making?

5. the role of philosophers, criticism

Here I discuss the question: Where can philosophers play a role in the implementation of the Client-Server interface in the new world of distributed intelligence and decision making?

Discussing the above question returns us to my opening question for the entire Chapter Five, Philosophers: should philosophers follow Marx's advice that philosophers attempt to change the world rather than merely to understand or to explain it? I propose that philosophers must now attempt to change the world. Philosophers can test philosophical concepts and theories through controlled and highly monitored small scale social implementations of those theories and concepts in various institutions. The Client-Server social interface is a form of social architecture that allows philosophers to socially implement their theories in the practice of small groups in institutional settings. The idea is to create a test-bed for alternative philosophical theories: Client-Server social architecture provides the means for creating test-beds for philosophical theories within actual, functioning institutions.

The current situation renders theory-oriented or understanding-oriented philosophy incomplete. The current situation of technological change is radically transforming industrial civilization. If we wait to fully understand the transformation, the situation will change underfoot rendering our theories about technological change inapplicable or only applicable to what is now no longer relevant. If we don't act on our partial understanding, we will not be able to participate in the change.

Everyone is in some sense a philosopher: we all have questions about how to live ethically, and how to live a worthwhile life. A few who are academic or professional philosophers also entertain more abstruse questions such as, what it would be like to be a bat. However, Ludwig Wittgenstein, once said: “If a lion could talk, we could not understand him”. (1953 p. 225) Bats and lions do not share the “form of life” that humans have: they have a different reality both from each other and from humans; they have a different set of expectations and constraints. We cannot even imagine what it would be like to be a bat or a lion.

But are those over 900 publications, since the time Thomas Nagel published his paper on bats, an immense waste of time? Do we know? The question about bat consciousness may in some future world prove fruitful beyond what we can imagine today. Similarly, it could be that the discussions of computational philosophy, and super-intelligence, turn out to have an unexpected importance in the future conditions of humanity.

Wittgenstein figuratively steps in here to remind us: “Philosophy is a battle against the bewitchment of our intelligence by means of language.” (p. 47) Wittgenstein gives us a warning about abstruse philosophical questions whose relevance to our actual forms of life is not clear. Worse, the language philosophers use to address their abstruse questions and to develop their arguments misleads them into thinking ridiculous thoughts, according to Wittgenstein, about how we live or can live, and how to think and understand things. But the defenders of philosophy publications on the bat-issue might say that Wittgenstein has got it wrong: philosophers need a special language to talk about their questions because the questions philosophers ask are not part of ordinary discourse, in everyday living, in ordinary forms of life. Also, these particular philosophers could remind us about another thing that Wittgenstein said about philosophy. “Philosophy may in no way interfere with the actual use of language; it can in the end only describe it. For it cannot give it any foundation either. It leaves everything as it is.” (p. 49) Philosophers who just describe actual language-usage don't stray beyond what we are ordinarily saying in that

usage of language: they leave everything as is. But, philosophers who seek to go behind the ordinary usage of language, and ask abstruse questions, may become bewitched by the artificial language-usage they have created, and the artificial puzzles that are derived from and with their artificial language-usage during their bewitchment, also end up leaving everything as is. Can philosophers in all intellectual honesty and even in morality as humane persons, just leave everything as is? Can philosophers stand aside in all moral honesty and watch the world from a place nowhere in the world? Can philosophers continue as is, when all of humanity is caught in a whirlwind of social and technological change that could turn humanity into the servants of the technology of our own creation; into peripheral devices of a technology that rules humanity?

I propose that when philosophers leave everything as is, they become complicit with whatever current ideology is being foisted on the public by those who want to gain and keep control and power in society. (Fuller, 2018, and Richmond, 2019) Where philosophers have no choice is that the world will change regardless of how philosophers choose. Our choice, not only for philosophers, but for all of us is: Do we want to be dragged along with the changes while remaining silent? Or, do we want to participate in the current radical transformation of human civilization and gain control over the direction of the transformation so that our humanity and humaneness is kept front and centre?

I propose that philosophers, and all of us, participate in the current radical transformation of society by acting as critical enquirers who work to develop social milieus that encourage and promote critical enquiry in all social milieus and institutions; and use critical enquiry to improve all social milieus, that is everywhere, where we are carrying out critical enquiry; and also, critical enquiry itself. Philosophers, and all of us, can participate in the changing world by implementing Client-Server social interfaces (social architectures) in our various corporate organizations such as in universities, in research institutes, in journals, and in conferences. Client-Server interfaces or social architectures as intermediaries for implementing philosophical theories, such as the theory of critical inquiry, involve two social structures as follows: one, democratic relationships; and, two, interpersonal dialogical relationships.

One: democratic relationships occur when individuals share planning, decision-making, and intelligence.

Two: Interpersonal dialogical relationships occur when individuals speak with and listen to each other regardless of position in social hierarchies.

Basically, those two structures (democratic relationships and dialogical relationships) amount to the implementation of the the Client-Server social architecture. The terminology of the Client-Server model that I have used in this chapter (Five), is the terminology used by computer systems analysts. From now on I revert to what I take as ordinary, non-technical language. In plain language, instead of using the terminology "Client-Server" social architecture, I refer instead to "socratic" social architecture. To implement socratic social architecture we require implementing democratic and dialogical relationships. Socratic social architecture embeds open critical enquiry and open critical discussion within all institutions. By embedding open critical enquiry and open critical discussion within our institutions, we can put to test our theories in actual practice; moreover, we stand a good chance of regaining Knowledge and our humanism (our humanity as creatures that seek to know, and seek to act morally) in the Global Techno-Scientific Culture.

This is the perfect segue to Chapter Six, Criticism.

CHAPTER SIX

CRITICISM

> The essential characteristic of philosophy...is criticism. It examines critically the principles employed in science and in daily life; it searches out any inconsistencies there may be in these principles, and it only accepts them when, as the result of a critical inquiry, no reason for rejecting them has appeared.
> Bertrand Russell (1912, p. 12)

0. overview

1. where do we find the critics?

2. theories of critical thinking or socratic enquiry

3. how has the global techno-scientific culture refashioned society such that critical enquiry cannot gain a foothold?

4. the fault-lines in the global techno-scientific culture and how to renew critical enquiry in the digital technology dominated world of today

5. a hope for the development of a more humane computer technology

0. overview

The Global Techno-Scientific Culture makes life difficult or next to impossible for the archetypal Socrates, or the culture critic, or critical thinker, or critical enquirer, or independent thinker. Where can a modern day Socrates or current critical thinkers open their mouths?

In other words, that is the crucial question, the focal question of this chapter: can critics get a hearing in the Global Techno-Scientific Culture? But the question of whether critics have any place in modern day society, requires considering two other prior questions. First, how do Socratic teachers, thinkers, and critics function even in theory? Second, how has the Global Techno-Scientific Culture fashioned society? After discussing those two questions, I turn to the main question of this chapter: How can critical enquiry or Socratic criticism be heard in the Technopoly, the oligarchic Global Techno-Scientific Culture? The short answer is: concentrate on the serious four fault-lines of the Technopoly. To be explained.

1. where do we find the critics?

The culture of Information Technology makes life difficult or next to impossible for the archetypal Socrates, the culture critic, critical thinker, critical enquirer, independent thinker.

Where can critical thinkers open their mouths? Not in corporations where people are rushing like mad to complete their tasks within their lifetime and managers don't want their plans and projects shot down before they get the funds for implementing those projects and then are able to move on to the next higher level before their projects bomb out during the stage of implementation; not in the marketplace, where people are rushing like mad to get to the bargain stores before everything is sold out; not in the educational institutions where students want to get the requirements done, get good grades, get out and get a job, and also have some fun and leisure and where ideas of graduate students and non-tenured professors need to gain approval from the authorities in whatever field in order to ensure grants, if not tenure; not in the political arena where criticism equals attack ads. Where can critical thinkers get a hearing?

Before going forward with attempting a solution to the problem of getting critical thinkers a hearing in the Global Techno-Scientific Culture, we

need to discuss two major questions. But so as not to keep you in suspense, I think there is a solution and the solution is that the Global Techno-Scientific Culture has four major anomalies or fault lines that the critical thinker or critical enquirer can exploit. I will say more later about those fault lines after completing the discussion of the two major questions.

First, we need to answer the question: How do Socratic teachers, critical thinkers, function even in theory? I am going to focus on a recent book by Joseph Agassi. Second, we need to answer: How has the Global Techno-Scientific Culture fashioned society? I am going to focus on the work of Luciano Floridi to help us figure out what is going on with the exponentially growing rate of the world wide diffusion of information technologies and systems. After discussing those two questions, I can turn to the main question of this chapter: How critical enquiry or Socratic criticism can be heard in the Technopoly, the Global Techno-Scientific Culture?

2. theories of critical thinking or socratic enquiry

The common view regards criticism even when kind and constructive as judgmental and negative. Logically negative criticism according to the common view, is judgmentally negative; moreover, logically negative criticism is the worst judgment a theory and the proponents of a theory can face. When criticism is taken as judgmental, criticism-avoidance is the only way to ensure a positive judgment of both the proponents of a viewpoint and the viewpoint. Hence, when criticism cannot be avoided, and when the only option under the judgmental attitude toward criticism appears to be defensive, the defender risks suffering the judgment as either defensive or dogmatic. Also, under the judgmental attitude toward criticism, when one accepts criticism, one then is thought to have admitted defeat. There seems to be a dilemma: If one responds to criticism, one is considered defensive or defeatist. If one doesn't respond to criticism, one is considered arrogant.

Under the judgmental attitude toward criticism, one who responds to criticism and one who does not respond to criticism, are both personally lacking and defective. Better to give than to receive criticism, for only the critic can win no matter whether the criticism is appropriate or not. But then, how can criticism at all be useful intellectually and practically? Could it be that criticism under the judgmental attitude is itself defective?

How can criticism become non-judgmental?

Menachem Fisch and Yitzhak Benbaji (2011) developed a theory of criticism as self-criticism that underscores the common view of criticism as judgmental and as legitimate only to the degree of the authoritativeness of those making the criticism. Moreover, the Fisch/Benbaji theory underscores the current bias among philosophers who argue that criticism is only self-criticism or internal to one's culture or community.

Fisch and Benbaji say that impersonal criticism cannot transform anything:

> With regard to normative commitment, the truly transformative moment of rationality...is not one of bold conjecture or keen refutation but one of disturbing, destabilizing ambivalence; a moment characterized by indecisive dithering, a state of mind not usually considered the most inspiring and motivating and therefore, not usually associated with rationality. But if there is any truth in our analysis, then the creative individuals initially responsible for rationally transforming a field are to be sought among those who were lucky to be exposed to the ambivalating challenge of trusted external critics, real or imagined.... (Fisch/Benbaji, 2011, p. 292)

The “trusted external critics” are those authoritative mentors from outside our home community that are encountered by our own authoritative mentors (“creative individuals”) if and when they journey to outside communities or outside disciplines. The “trusted external critics” translate their frameworks and norms to our authoritative mentors (“creative individuals”), who become intermediaries for us of the frameworks and norms of the outside communities and disciplines. When our authoritative mentors (“creative individuals”) return to lead and teach us, we follow, though hesitantly, and though sometimes rebelliously.

The Fisch/Benbaji theory misses the point of criticism according to Karl Popper's theory of critical rationality as interpreted by Joseph Agassi: The point of criticism is not to judge, not to change minds (“the truly transformative moment of rationality”). Rather the point of Popper's theory of criticism is on a different plane: it is to expose error, or in computer terminology to “debug”. There is no transformative purpose involved with criticism, neither the transformation of individuals nor even of disciplines.

Against the common view of criticism (that the Fisch/Benbaji theory explicates) as judgmental, Popper's view is that criticism is simply a technique for pointing out important errors. The correction of important errors takes us further along the path of the improvement of knowledge,

society, and civilization. Even finding out through the criticism of viewpoints that we have taken the wrong path and need to discover a new path is not mere nihilism, but the presentation of a new challenge or problem-situation. In Agassi's words:

> Popper's critical rationalism comes to replace Bacon's inductivism.... Popper took the encouragement of criticism as the hallmark of liberalism– in (scientific) research and in (democratic) politics alike...Within the philosophy of science...Refutations...are not always valuable for survival but they are always valuable as intellectual assets: their upsetting important ideas renders them important. (This is the positive power of negative thinking.) (Agassi 2014b, p. 130) ...What is peculiar to Popper is not taking criticism as a lofty activity: this is rather traditional; what is peculiar to Popper is the view of science as critical, as dialectical. Maimonides had said, human language is not fit to describe the attributes of the divine, yet it behooves humans to try to do so and to acknowledge the limitations of the results of their efforts. Combining the dialectic of the Maimonidean negative theology with the Spinozoist replacement of natural theology with natural philosophy amounts to the negative science that Einstein and Popper envisaged. (2014b, p. 47)

Why does Popper's theory of criticism (and Socratic critical enquiry) according to the interpretation of Joseph Agassi, as (logically) negative (not judgmentally "negative" or "bad"), matter today in the Global Techno-Scientific Culture? Popper inherited and carried forward the powerful tradition of criticism or negative thinking. Ironically, in computer terms, criticism is a form of debugging and there is no more or less legitimacy, value, or authoritativeness to the criticism whether or not the debugging or criticism comes from authorities inside or outside the community. Nor is criticism less valuable as a form of debugging when it comes from fringe members of an outside community than when the criticism comes from authorities or experts within the community. The value of criticism when viewing criticism as a technique for finding errors can only be determined after the error is uncovered. The value of the criticism depends upon how important the error is relative to the current state of critical enquiry.

However, there is a lot to be said for the idea of constructive criticism. The point of constructive criticism is that nasty criticism is not really legitimate criticism, or real criticism. Nasty criticism amounts to a series of complaints, personal insults, or just insulting both the proponent of a viewpoint and the viewpoint itself. In a book on literary criticism by Cassandra Falke (2017), though she does not directly address nasty criticism, Falke does provide a theory for constructive criticism, or

sympathetic criticism where the critic (in terms of literary criticism) approaches the book with an attitude of love, even erotic love. One puts aside one's ego, or biases, or viewpoints and looks for the best in the book.

Basically, the above viewpoints on criticism are modern elaborations of Socratic criticism: Socrates attempted to help the person with whom he was speaking to develop their own view. Socrates, at least in theory, did not approach the person with whom he was engaged in discussion, with the intent of winning over that person to Socrates's own viewpoint. Rather, Socrates wanted mainly to find the best in that person's viewpoint, which often was preceded by showing how earlier versions of that person's viewpoint were mistaken according to that person's own understanding. Similar to Popper and Agassi, Socrates used the negative technique of showing contradictions in a viewpoint. Similar to Fisch and Benbaji, Socrates had the goal of transforming the whole person through intellectual discussion of viewpoints, that is Socrates helped the person change viewpoints fundamental to their lifestyle by helping them to articulate a complete viewpoint hidden within their current incoherent and incomplete viewpoint. (Plato, 1914) Similar to Cassandra Falke, Socrates approached the other person with empathy, approaching the other person as a friend and attempting to see the world from the viewpoint of that person, and attempting to help the other person in friendship to articulate the best in their viewpoint while rejecting what is confused, incoherent, and inconsistent in their viewpoint.

The Socratic critics or Socratic enquirer implicitly expects a world where there are differences, alternatives, and especially a hierarchy of values. Does the Technopoly or the Global Techno-Scientific Culture allow for differences, alternatives, a hierarchy of values? If not, how can a Socratic critic gain a toehold in the current world?

3. how has the global techno-scientific culture refashioned society such that critical enquiry cannot gain a foothold?

Luciano Floridi (2013) unwittingly shows how values in the the Global Techno-Scientific Culture are flat. “Information Ethics” (or “IE”), Floridi says, “is an environmental ethics based on the phenomena and corresponding concepts of information/infosphere/entropy rather than life/ecosystem/pain.” (p. 98).

Floridi's IE (Information Ethics) in the Global Techno-Scientific Culture, or in what Floridi calls the world of "Information-Communication-Technologies" ("ICT") makes explicit the flattening of values in the Technopoly.

> Without IE's contribution, our understanding of moral facts in general, not just of ICT related problems in particular, would be less complete. Our struggle to escape from our anthropocentric and solipsistic condition, be that Plato's cave …, will be more successful if we can take a patient-oriented, informational perspective to the universe and its value. (2013, p. 333)

There is a Socratic irony and dialectical self-refuting nature to Floridi's flattening out of the values in the Technopoly, where everything is treated as information systems; and where all information systems are of equal value, except for those information systems such as malware and viruses that destroy other information systems (i.e. create "metaphysical entropy") in cyberspace (or in Floridi's terminology, "the infosphere"): human life and human flourishing and even human suffering have no more value than getting people out of the rain because humans are simply systems of information. Floridi says:

> ...maintaining one's dignity in a Nazi prison-camp is simply no better or worse, morally speaking, than giving a lift to an unknown person on a rainy day, not just because the two experiences are worlds apart, but because both agents have done their best to improve the "infosphere" , and this is all that matters in order to consider their actions morally approvable. (2013, p. 79)

In another book, Floridi (2014) goes further and argues that the function of humans is to serve information and communication or computer technology (ICT). Firstly, humans have a minor role due to "information friction", or bottlenecks to the access of information which indirectly protects privacy in sharing information online. Secondly, humans are needed to interpret data and data-patterns. Thirdly, according to Floridi, humans apparently gain more direct democratic power when the nation state withers away due to the shift to multi-national and multi-agent decentralized processing power. However, when "the political multi-agent systems" take over "political and social space", human political and social involvement will become next to minimal. Fourthly, humans might have some role to play in solving our environmental problems and in "configuring our ethical infrastructure" or in creating an ethical social environment that guides individuals to act in socially acceptable ways. The

irony is that we will need more and better ICTs to essentially solve environmental and ethical problems for us because "...We have moved inside the infosphere...". (p. 218) Hence, humans become "inforgs"(or information processing organisms) who serve ICTs, and at best, become technical experts, part of the entrenched and dominant techno-elite, who develop and improve ICTs to solve whatever messes humans as pretty poor "inforgs" have created, for example, environmental issues.

If everything is flat, all values merge, all norms merge, and humans are "inforgs" (information processing organisms) who only serve ICTs (information and communication technologies) and live in the infosphere (cyberspace), how can a Socratic critic, a critical enquirer get any questions about the the Global Techno-Scientific Culture out of the infosphere to humans who are bound to ICTs?

The answer lies in the fact that everything is not really flat as solely data; people are not inforgs. There are fault-lines in the Global Techno-Scientific Culture that form portals of entry ways onto a level where critical enquiry can be launched.

4. the fault-lines in the global techno-scientific culture and how to renew critical enquiry in the digital technology dominated world of today

Here I survey the fault-lines and indicate areas for developing or launching critical enquiry in the Global Techno-Scientific Culture.

1. The Global Techno-Scientific Culture contains a contradiction between two opposing computer system architectures: John von Neumann and Alan Turing's centrally controlled serial digital systems and Norbert Wiener's parallel or connectionist analogue-cybernetic (feedback) systems.

2. Humans are analogue-cybernetic (feedback) creatures and even the best interface with the Internet and so-called Cloud, or distributed servers whose identity and location are unknown to the ordinary person, the techno-subject (including smartphones and tablets) are digital. Thus, the digital technologies developed by humans to serve human purposes undercut and defeat the purposes that humans want the digital technologies to serve. There is a misfit between the technologies humans developed for human ends and

humanity, and those humanistic ends and the humanism of humans.

3. There is a social tension and discrepancy between information systems as open and horizontal versus organizations and institutions as closed and hierarchical. The structure of our social organizations does not match up with the structure of our information systems or data.

4. Intellectual property equals theft (claiming private ownership over what is public: air, water, language, thought). Intellectual property represents a discrepancy between the proprietary approach to ideas, and inventions versus the collaborative and shared intellectual resources and informational work (as in open source software, and in science).

The first fault-line of analogue architectures vs digital architectures allows the Socratic critic to push for developing cybernetic type architectures that require computers to extend and augment human intellect as opposed to dominating humans. In other words, the architecture for cybernetic machines provides a new frame for developing critiques of current information systems. Ironically, the design of learning-machines uses cybernetic design methodologies, though they barely acknowledge Cybernetics. (Geoffrey Hinton, 2014, Terrence J. Sejnowski, 2018) However, their intent is to replace humans in the following major systems: transportation where self-driving and self-flying vehicles are in partial use and under rapid development; health with automated diagnostic systems; pharmaceutical research where automated systems are under rapid development. (There is a list of publications at the Vector Institute, where Geoffrey Hinton is the Chief Scientific Advisor, https://vectorinstitute.ai/publications/ accessed 2019-07-23.)

The second fault-line of the discrepancy between humans as analogue-cybernetic versus the digital interface for digital technologies, provides the basis for a new philosophical anthropology that restores anthropocentric values. For instance, people are not analogues to social animals, nor to machines, nor to information systems. Rather, people learn from feedback (Cybernetics); see the world in relational and comparative terms or in the form of stories or narratives, analogue, as opposed to seeing the world in terms of discrete binary systems, digital. (Norbert Wiener, 1948, 1950/1954) The alternative philosophical anthropology allows for a leverage point for evaluating our institutions in the Global Techno-Scientific Culture. (Joseph Agassi, 1977)

The third fault-line, the misfit between traditional organizational structures and open systems, allows for the creation of informal sub-systems and informal lines of communication within traditional hierarchical structures. For instance, the misfit between knowledge creation and the institutions and social structures of knowledge/education organizations creates a vantage point for criticizing social, educational and political institutional structures and organizations.

The fourth fault-line of proprietary systems vs. systems for open access, allows for the Socratic questioner to find alternative subcultures and outlooks within the Culture of Information Technology that can be used to develop criticisms against the reinforcing techno-submissive ideologies of the Global Techno-Scientific Culture, such as the techno-submissive neo-Hegelian metaphysical system of Luciano Floridi (discussed above in this chapter) and the reductive view of humanity as information processing machines/organisms in computational philosophy (as discussed in Chapter Five, Philosophers).

These fault-lines depend on the tension between the digital and analogue-cybernetic (feedback). Cybernetic systems are long gone except for the new wave of learning-machines. (Alcibiades Malapi-Nelson, 2017, and Sheldon Richmond, 2018a) The defender of digital technology can readily argue: except for the development of learning-machines and quantum computing, on the cutting edge of computer research, the digital von Neumann and Turing machines are in the mainstream even in Artificial Intelligence and expert systems, and in the mainstream of life in the Global Techno-Scientific Culture. Moreover, if the cybernetic does soon get launched into the mainstream, as in self-driving vehicles, the cybernetic systems will function as the engine for those systems, but the interface will still be controlled by digital systems. Also, as far as information goes, the digital seems to be irreplaceable. Indeed, the worlds of communication and information are the main wheels, the main dynamic and the main life-force of the Global Techno-Scientific Culture. The entire human species is enmeshed in a digital ecology. The digital, social, and technological architecture of the Global Techno-Scientific Culture composes the entire economic, social, and intellectual infrastructure.

Is there any hope, given the digital infrastructure for all of humanity, for a more humane technology?

5. a hope for the development of a more humane computer technology

In the discussion here of a hope for the development of a more humane computer technology, I refer to a book by Alcibiades Malapi-Nelson (2017). This book has a dense historical, social, and philosophical or intellectual study of the short life cycle of what Malapi-Nelson calls the "metaphysical research programme" of Cybernetics. I will start off with a brief overview of Malapi-Nelson's sociological and intellectual history of the life, death, and the apparent recent after-life of Cybernetics as both the science of control and the theory of self-governing, feedback mechanisms. From the time of the early WWII years both in the US and in the UK, sometimes independently and sometimes conjointly, until the early post war years, from 1942 to 1952/1953, Cybernetics was born, developed, and ultimately faded away due to mainly an internal instability. Cybernetics research ultimately imploded over its main principle of developing material models of theories, including its own, when cybernetic theorists failed to build machines that modelled complex aspects of cybernetic theories. However, near the end of its life, just as it began to fade away, the advocates of Cybernetics began to loosen the materiality requirement and began to replace that requirement with the virtuality requirement: can all machines be simulated? For instance, can all machines be simulated within a computer simulator? Or even more abstractly put: can every theoretical model of machines be virtually simulated within a theoretical model of computation such as the Universal Turing Machine? Such questions allow Cybernetics to find a partial after-life in the current technological developments in artificial general intelligence, nanotechnology, and learning-machines. (Geoffrey Hinton, 2014, Terrence J. Sejnowski, 2018)

Moreover, Cybernetic notions infuse the new developments in technology, biology, and even mathematics as a branch of computer science and computer modeling. Also in theoretical quantum physics, Cybernetic notions infuse the information-theoretic model for Quantum Mechanics and Quantum Computing, and infused from the start Hugh Everett's Multiverse view of Quantum Mechanics where both the observed and observer are interacting Cybernetic mechanisms. (Sheldon Richmond, 2018c) Specifically, Cybernetics influenced some of the pioneers of the personal computer, such as J.C.R. Licklider in the 1960s, among others who worked in Xerox in Palo Alto, on the development of user-friendly ergonomics or interfaces. (Chapter 2, Knowledge) The pioneers developed

personal computer technologies such as the mouse, haptic (such as touch-screen) interfaces and technologies, and graphic iconic representations of computer functions, as part of the deployment of the family of Cybernetic concepts related to the augmentation and assistance of human intelligence, sensory and physical functions.

Rather than go over the details as discussed in Alcibiades Malapi-Nelson's book (2017), I will jump to the lesson one can learn from Malapi-Nelson's book.

There is hope in the model technology of the very recently and still developing learning-machines. The hope is that their design affords their use in a way that serves humanity. There is hope for a return to a humane technology in the near future with the development of analogue-cybernetic (feedback) systems. Moreover, all of us as critical enquirers, will still need to work on implementing a socratic social architecture for our institutions of education, research, and work, and politics, to continue democratic participation in the development and application of computer technology as well as the development of dialogical interpersonal relationships.

If we don't take the opportunity where the hope for a humane technology is on our doorsteps, both the hope and the humane technology will disappear. We will lose the future to anti-humane technology. But what might stop us from taking the opportunity to leap to a more humane technology are two widely held dogmas that techno-subjects themselves have developed in the Global Techno-Scientific Culture about computer technology.

It is always worthwhile to overcome obstacles to hope, especially those based on dogmas. Techno-subjects have developed two dogmas of computer technology use. These dogmas create subliminal psychological blocks to taking action for participating in changing the design or physical architecture of computer technology, and in changing the design or social architecture surrounding the Global Techno-Scientific Culture.

The two dogmas of technology use are:

First: It is mistaken to make mistakes.

Second: Experts are experts because they are in the know.

Those two dogmas were revealed as mistaken by the work of two philosophers of science during their prime years in the 1950s, Karl Popper

(1958) and Michael Polanyi (1959). Karl Popper attacked the first dogma as it appeared in the context of the theory of science. According to the common theory of the day, which was developed by Francis Bacon back in the sixteenth and seventeenth century, science can avoid mistakes by making specific observations, and building upon those observations. (Francis Bacon, 1906)

David Hume in the eighteenth century discovered this dilemma: if science is based on the collection of observations (induction), all scientific generalizations are logically invalid because generalizations have more information than the sum of all collected observations. However, science must use the inductive method because science always uses empirical premises for its proofs. (David Hume, 1911) Popper solved this dilemma by arguing that science does not use induction, but uses hypotheses and deduces its consequences or predictions from its hypotheses. When a prediction turns out as false, then the hypothesis is mistaken, and new hypotheses have to be developed. Hence, science proceeds by attempting to uncover mistakes. In everyday terms, science proceeds by trial and error. (Karl Popper, 1959)

The second dogma was refuted by Michael Polanyi. (1958) He observed that the experts of science know more than they can tell. To learn science one needs to find a network both of colleagues and mentors, because there is more to scientific knowledge than what is included in the standard textbooks. Science involves the search for knowledge through relying on personal experience that one has gained over many years through the use of experimental instruments and through working with a wide variety of experts and novices. The experts, so-called, do not in actuality know more but have more in-depth personal experience both through many years of trial and error and through interaction with other explorers in the field.

Here is the relevance of those two break-through ideas developed by Popper and Polanyi for techno-subjects as technology users. We should allow ourselves to experiment with computers and other technological devices. We need to give ourselves the confidence to try out different applications without worrying about mistakes because we can only learn from making mistakes and trying out new things. This seems dangerous, allowing ourselves to make mistakes. We do not have the luxury to allow ourselves a reduction in productivity through fumbling with our mistakes. However, as we learn from our mistakes, we will actually improve our productivity. Also, we need to talk over what we are trying out on the computers with others because the only way to gain and increase expertise

is through hands-on experimentation and modeling how our mentors perform functions with technology.

In short, we learn from Popper and Polanyi that learning how to use technology comes through trial and error and through personal experience rather than through standing back and letting experts tell us what to do and/or do everything for us. But can we learn both from mistakes and mentors? On the one side, if we learn from mistakes, mentors are not needed. On the other side, if we learn from mentors, making mistakes impedes our learning. This is a puzzle, the puzzle seems actually to strengthen the two supposed dogmas. Moreover, the consensus judgment in the philosophy of science is the pronouncement that Popper's philosophy of science is outdated.

According to the consensus judgment, Popper's theory of his own contribution to the philosophy of science is mistaken. Popper supposed that he solved the two main problems of the philosophy of science. (1959) Popper claimed to have solved, firstly, the problem of the demarcation of science from pseudo-science, and, secondly. the problem of induction, through his idea that science uses only deductive logic in testing theories against empirical evidence (if p implies q, and q is empirically false, then p is false), and that scientific theories can be falsified because they have specific empirical consequences, especially exclusionary empirical consequences, as opposed to pseudo-scientific theories which are consistent with all empirical states of affairs. However, most critics of Popper, such T.S. Kuhn and Imre Lakatos, argue that firstly, since all observations are theory-laden, no empirical evidence can neutrally refute or falsify a scientific hypothesis. Secondly, or so they argue, all theories are born refuted, hence science is only possible because scientists ignore refuting evidence. Scientists supposedly explain away so-called refuting evidence as based on observational error, or as based on a limiting hypothesis which can be derived from the new scientific theory. (Joseph Agassi, 2014)

If Popper is now refuted, where does the idea stand that science is a special case of learning by trial and error?

The common defense of Popper is that the historical development of science is irrelevant to Popper's philosophy of science because his philosophy of science is intended as normative or legislative rather than as descriptive or explanatory of history. In other words, Popper's theory of science applies to an abstraction of science, an idealization of science. This common defense of Popper is correct in so far as we can keep an

absolute separation of the world of actual scientific practice from the world of an idealized science. However, the cost of this defense is great. The cost is that Popper's philosophy of science does not apply to the real world of scientific practice. Agassi's (2014) defense of Popper is more acute: Popper actually recognized the various so-called criticisms even before they were made in the theory of science he put forward in his original work. Popper had actually incorporated those aspects of science into his theory of science. Popper proposed that whether to accept or reject a tentative, theory-laden observation as a refutation is basically a matter of social choice, an agreement or convention. Some theory-laden observations, as non-neutral were agreed through consensus to be a refutation, or merely an anomaly to be explained away, or a puzzle to be later solved. Popper never claimed that the history of science is neat. His point was that underlying the history of science is a logic, or an idealization, that can be used as a null-hypothesis for examining the various idiosyncratic twists and turns in the actual history of science. This is no different in science where linear inertia is a null-hypothesis and in mathematics where points and lines are idealizations. Is Popper's theory of science, as he actually meant it and stated it, mistaken?

In my view, Popper's theory of science is indeed mistaken, not because it has been refuted by a closer examination of the actual history of science, or by how science actually proceeds in its historical development. Popper's theory of science is refuted because it is incomplete. It ignores the element of practical knowledge gained by scientists through the use of technology or experimental equipment.

However, the various popular alternatives to Popper: Kuhn, Lakatos, and Feyerabend are also fundamentally mistaken. The myth of the framework as Popper characterizes their philosophies (1994) holds that scientists do not critically discuss fundamentals, but only discuss applications of the fundamental premises uncritically accepted by scientists through paradigm-shifts. The myth of the framework is revealed as a myth because it is contradicted by the historical development of Quantum Mechanics. In brief, the so-called Copenhagen Interpretation of Quantum Mechanics has been discussed since its very birth by Niels Bohr, the developer of the Copenhagen Interpretation, and Albert Einstein, its first main critic. Later, David Bohm, Hugh Everett III, and many others followed along the path of criticism that Einstein, Bohm and Everett cut against the mainstream Copenhagen Interpretation. (Sheldon Richmond, 2019) The interpretations proliferate, and yet all working physicists are able to use Quantum Mechanics for their experimentation. Why? If there is a fundamental

disagreement over the basic premises of science, how can scientists actually conduct their work? Why are they not in a crisis stage as Kuhn would have it?

A partial answer can be found in the works of Michael Polanyi. (1958 and 1966) In brief, science is composed of tacit premises which cannot ever be articulated and critically discussed. This answer has its limits, which I will explain in the following.

Polanyi holds that scientists do not use abstract methodologies, neither inductive nor the logic of trial and error, or to use Karl Popper's technical term, the logic of falsification. (1959) Rather, science progresses through a mentorship process. Scientists use tacit knowledge in developing their explicit theories and mathematical formulae. Furthermore, scientists develop an implicit practical knowledge or knowledge in practice through the use of their equipment in conducting their experiments. Science is not just composed of an abstract world of impersonal or Objective Knowledge, but also consists of a world of living, personal knowledge through the ‘hands-on’ use of equipment. Apart from the works of Michael Polanyi, but I think, inspired by the works of Polanyi, there is a more recent interest in the material conditions governing scientific research, such as in the technology and the equipment used for scientific discovery and testing. (Peter Galison, 1997 and Mario Bunge, 2017)

The novice scientist acquires the personal dimension of scientific knowledge not merely through reading books and articles, but through apprenticeship to a mentor. By modeling the actions of the mentor, and allowing the mentor to help adjust the trials of the novice, the novice achieves expertise. The critics of Polanyi accuse his philosophy of science for being subjectivist and for advocating irrationalism, and anti-egalitarianism. However, such criticism is made from the traditional point of view of science as an abstract process where people are seen as irrelevant. Since people do play a role in science, how do they play a role in science where the traditional values of rationality, equality, objectivity, and truth are respected?

The problem for followers of Polanyi is to explain the following: On the one hand, how is science personal and imbued with practical knowledge or rather, how is knowledge gained through the practice of science in a social system of mentors and apprentices? On the other hand, how do scientists achieve objectivity, equality, rationality, and truth?

I propose an answer that requires the integration of the philosophies of Popper and Polanyi. Experts in technology first learn by trial and error, developing mental models or hypotheses about the nature of the computer, for instance, or developing hypotheses about how an application or programming language works or functions, and then by attempting to debug, or find the errors in those mental models. That is the Popperian part of how experts learn the use of technology. However, that is not sufficient. The very process of debugging or finding flaws in one's mental models or hypotheses requires hands-on use of technology and modeling one's use of technology by watching and working with mentors.

Using technology, whether riding a bicycle, flying a plane, or using a computer, and especially, the learning of how to use technology, not only requires developing a mental picture or hypothesis of the technology, but also requires physical immersion in the technology. One becomes a participant-observer where one develops both a critical attitude towards one's hypotheses and observations, but also one participates by using the technology in order to determine where one's hypotheses and observations are mistaken. At crucial moments, when one is totally befuddled by the use of the equipment, an expert or mentor is called upon to help one with the next move: the expert often cannot explain, but can only demonstrate or even guide one's hands and/or body. (Henry Petroski, 1985)

The deeper theory underlying both Popper's and Polanyi's philosophy of science as limiting cases is this: Scientists are participant-observers in socio-technical systems. Learning the use of technology is required by scientific knowledge and experimentation. Learning the use of technology involves both developing mental models or hypotheses, and practical knowledge gained through using the equipment to find bugs or errors in one's mental models. Consequently, there is an interaction between the abstract knowledge of scientific theory or technology theory and the practical knowledge gained through the use of technology, where both elements are required. First, abstract knowledge is required to help one approach the use of technology, or to help one apply theory to physical reality by using technology. Second, practical knowledge is gained tacitly in the use of technology, which in turn is used to refine and incrementally improve abstract knowledge, and where mentors are called upon to help us when we get stuck, when we do not know what to do next.

To learn the use of technology we apply abstract models or hypotheses to concrete situations, which in turn, help us to debug those abstract models when we find how those abstract models promote mistakes in the use of

technology. By refining our use of technology, we incrementally improve our abstract models. Consequently, science is not exclusively an abstract process nor is science exclusively a personal judgmental process. Science at its heart involves the use of technology and so involves learning the use of technology. Furthermore, learning the use of technology requires using abstract models and debugging those models by becoming a participant-observer of socio-technical systems. (Peter Galison, 1997, and Mario Bunge 2017)

An improved form of the philosophies of science of Karl Popper and Michael Polanyi amounts to the refutation of the two dogmas of techno-subjects: one, it's bad to make mistakes; two, experts are required. Though we do need mentors, we also need to make our own mistakes. That is how science works. So, too, does philosophy and critical thinking work by making our own mistakes, and by learning with mentors.

There is hope for a humane world by all of us sharing in the development and implementation of improved computer architectures and improved social architectures. Moreover, there is hope for restoring knowledge (Chapter Two); enhancing alternative cultures by borrowing from each other (Chapter Three); having dialogue interpersonally and inter-culturally in order to learn from each other (Chapter Four); acting as philosophers that are engaged with the issues of the current dominating techno-scientific monopoly in the form of the Global Techno-Scientific Culture (Chapter Five); and, by engaging in friendly and honest and open critical discussion with each other, of each other's views, and especially of the social architecture of the Global Techno-Scientific Culture, by looking for the fault-lines in the Technopoly (discussed here in Chapter Six).

Since there is hope, it is worth our while to take the risk of engaging in critical discussion and thereby taking an informed part in the social decision-making for directing the massive technological and social change going on now under our feet. We need to and can eschew the submissive role as techno-subjects, controlled by the techno-elite. because of the mystique they have created about computer technology (Chapter One). There is a way through: Criticism. (Chapter Six).

EPILOGUE

> Isn't it time we began? The danger is, we have been brought up to think as though we had all the time in the world. We have very little time.
> C. P. Snow (1959, p. 54)

0. overview

1. reminders

2. the new socio-technical system of computer technology threatens the extinction of the humane

3. how can we regain the cognitive functions that inform our practical and moral judgmental capacities?

0. overview

Throughout this book I have discussed how and why we have allowed ourselves to lose our sense of humanism in the Global Techno-Scientific Culture. Why and how? Throughout this book I have argued, in different ways, as follows: We live in a socio-technical system, the Global Techno-Scientific Culture, dominated by computer technology and other so-called "smart" devices; as well as by the techno-elite who control the design, development, and implementation of those devices. We have allowed ourselves to become techno-subjects. In our modern socio-technical system we have various mistaken ideas about computers: computers are smart machines, and in many cases, smarter than humans. Hence, we do something very strange with tools of our own making: we transfer human qualities (such as creative and critical thinking, judgment, decision-making, including moral decisions) to technology and take them from ourselves by transferring machine-like behaviour and as well transferring machine functions and attributes to ourselves. When we make such a transference between ourselves and our technology, we allow ourselves to lose our mastery and control over our computer technology. We transfer our mastery of computer technology and our intelligence to the technology. Hence, we remove humanism from humanity when we become techno-subjects. To regain humanism, we need to transfer back our mastery, and intelligence, from the computer to ourselves. How can we regain our mastery and intelligence, our humanism? We need to open up computers to everyone so that we allow everyone to learn computer technology through trial and error and through consultation with our mentors, colleagues, and friends. Moreover, everyone needs to be given the opportunity to participate in the development and implementation of a new architecture for computer systems that conforms to humanity as analogue-cybernetic creatures. Everyone needs to be given the opportunity to participate in the implementation of a new social architecture that permits universal interpersonal dialogue, universal critical discussion, and universal full participation in social decision-making.

1. reminders

When I tell people that I had a book proposal accepted on why, how, and what to do about the frustrations that computer technology cause all people, they tell me, firstly of their own frustrations, secondly, there is no way to avoid those frustrations, and thirdly, they want to read my book.

Some of the stories of frustrations have to do with the software systems used in their workplace, other stories have to do with people who are peripheral attachments to their smart devices. I realized that I will have to continue putting up with the frustrations of the writing software applications that I use now, in order to improve the various drafts of this book.

I have a suggestion for critical discussion, a proposal for a new socio-technical system: We have a choice. We don't have to put up with the frustrations of computer technology; more importantly, we can work together to develop and implement a new socio-technical system, a new techno-scientific culture that will be less frustrating to us. How?

Prior to discussing how to develop and implement a new socio-technical system, a new techno-scientific culture, here is a disclaimer: I say nothing much new; and as various philosophers have said, including Socrates and Ludwig Wittgenstein: philosophy consists of reminders. ("127. The work of the philosopher consists in assembling reminders for a particular purpose.". (Wittgenstein, 1953)

Here now, to my mind, is how to develop and implement a new socio-technical system, a new techno-scientific culture: use Cybernetics, that is, use decentralized, distributed, interconnected analogue/comparative systems with feedback based on checks for discrepancies governed by the goal of improving the world and humanity, for our social and technical systems. If we choose to do so, in short, we can make both society and technology, the products of humanity, fit humanity, and increase humanism and humaneness for humanity. We don't have to passively accept the frustrations of the Global Techno-Scientific Culture. We don't have to passively accept the transformation of people into cyborgs, inforgs, and the latest fad of transhumanity. It is our choice and I think it is not a mission impossible, to conserve and improve humanism for humanity.

Please let me know whether and how I am mistaken, if I am, about the main suggestion of this book: Conserve humanism through radically transforming our social and technological architectures into systems that increasingly improve humanism.

Here is an advisory: the rest of the Epilogue is a concise reminder of the entire discussion in this book. I hope the reminder helps readers engage in virtual dialogues with the book; and, I hope the virtual dialogues, in social media and email, help how we can understand and how we can change our

socio-technical systems to the benefit of humanity.

The rest of the Epilogue, then, is the reminder of the discussion in this book.

2. the new socio-technical system of computer technology threatens the extinction of the humane

Computers are just machines. Even Artificial Intelligence and Learning-Machines, are just machines.

As John Searle says, computers manipulate meaningless symbols, where the purpose or intention is decided by those who build the computer and develop the software. The machine in and of itself has no purpose:

> Because the formal symbol manipulations by themselves don't have any intentionality; they are quite meaningless; they aren't even symbol manipulations, since the symbols don't symbolize anything. In the linguistic jargon, they have only a syntax but no semantics. Such intentionality as computers appear to have is solely in the minds of those who program them and those who use them, those who send in the input and those who interpret the output. (John Searle 1980, p. 428)

What has happened over the last forty years since Searle wrote those words? Has any philosopher or computer scientist come up with a knock-down argument that refuted Searle's declaration that aimed to deflate the pretensions and over-reaching claims of those who proclaim the possibility, if not yet, of the achievement of Artificial Intelligence? No, not to my knowledge.

But on the other side of the coin, a virtual coin that exists metaphorically: Searle's hypothetical, imaginary situation has not persuaded the increasing numbers of people engaged in the rapidly advancing field of Artificial Intelligence, Machine-Learning, and their subsidiary and off-shoot fields of research and development, of the salience of Searle’s hypothetical reasoning to their practical endeavours. Researchers and developers in AI deny that what they are doing is just producing dumb machines that merely follow instructions. AI researchers and developers still deny that their machines cannot be creative, and cannot outsmart and out perform the cognitive and perceptual functions of human as, on their view, organic based computational minds. According to the proponents of AI, humans are computational machines or devices. Moreover, on the view of many

philosophers and computer scientists, steeped in the philosophy and the science of computation, humans are organic computational devices, but, as organic or biological, human computational devices are mortal, unreliable, and require much more attention and care than the metallic, plastic, and silicon components of machine-based computational systems.

As Turing admitted, all his arguments for computers having intelligence are theoretical and conjectural. However, Turing asserted that his arguments as conjectural, as are all theories in science, can be the basis for fruitful research programs. Indeed, Turing's conjectures are still driving research in computer science and computer development. Where do we come into this? We, humans. If computers are what AI advocates suppose they are and can be, where do we humans fit into this scheme of automated smart systems full of information flow, and governed by information flow?

My proposal is that we discuss the following questions: what do we want from Artificial Intelligence, or what do we want Artificial Intelligence to do for us? And what do we want, even the super-smart computer devices, connected by the internet of things, to do for us? So far in the history of technology development, we have not had much of a good record in taking charge of our technology. As Yuval Noah Harari says, we invented flint-stone, and behold we have atomic weapons; and now, we have invented computers, and behold, we don't know whether these computers will end up deciding that humanity is obsolete. But we have a choice and we can act now, to regain our dignity and freedom. The task is great, and no one individual, and no one generation, may be able to complete the task, but we must begin. (2018, p. 323)

3. how can we regain the cognitive functions that inform our practical and moral judgmental capacities?

People have transferred their own mastery of technology and their own intelligence to computer technology. Our humanity, how we function as humans, is informed by our cognitive capacities, and when we transfer our cognitive capacities to machines, we transfer not only those functions, we transfer our capacity to make both practical and moral decisions. How do we regain our humanity, our cognitive functions that inform our practical and moral judgmental capacities? More importantly, it is our humanity as creatures that seek to know, and seek to act morally, that make up our humanism: the practice of improving humanity, of reducing suffering.

How do we conserve, and enhance, and improve, our humanism?

We have to transfer the mastery of technology and transfer the supposed intelligence in technology to everyone. In other words, we have to transfer the social control of our technology from the techno-elite, to everyone. When we return both our intellect and the social decision-making and social control over our technology to everyone, we return not only our intellect, but everything that our intellect informs and everything that goes into forming our humanity and humanism, including and especially our creativity and judgment, practical and moral. Both the effort and risk is high: the effort involves everyone learning more about technology; the risk involves making mistakes, having setbacks, and then attempting to learn from the mistakes, and moving forward.

I propose that humanity adopt the goal of implementing a new analogue/feedback architecture for technology and society, involving our complete and equal participation, but the way there is unknown. We have had the technical architecture both for analogue computer chips (Carver Mead, 1989) and distributed multi-processing computers (David Rumelhart, 1987) for a long time. We have had the social architecture for feedback in society for a very long time, since Socrates. We have the design for mutualism, complete and equal participation, in society since the evolution of biological mutualist symbiosis for an even longer time. (Peter Kropotkin, 1902)

As the parable goes (paraphrased from S. Y. Agnon, 1948 and attributed by him to Rabbi Hayyim of Zans):

> ...Walking for hours, lost in the forest, a person was on the verge of total collapse. Then as if by a miracle, he spied another person some distance away. Running until the lost caught up with the other person, the lost one fell at the other person's feet and said desperately, “Can you help me? Do you know the way out of this place?”
>
> “The second person nodded. “Yes, I think I can help! I, too, have been wandering in this forest for some time. And while I don’t yet know the way out, I do know the paths that are definitely not the route we seek. Together we can eliminate the wrong paths and find a road that leads us to freedom.

Suppose I am mistaken; and we can take a back-seat to the drivers of the current socio-technical system; and let them develop very intelligent, if not super-intelligent learning machines that run all technology, without further loss of our humanism. Then those machines, even the super-intelligent

learning-machines will choose to partner with humans, and not treat humans as servants to the technology. Will those machines do that, choose to partner with us? No one knows. (Pavel Kraikivski, 2019) Hence, if we wait to see what happens, it might be too late for us to do anything about regaining our humanism because we will have been turned into peripheral devices to what used to be our own technology.

Let me rephrase my proposal for discussion, so that the stakes of the discussion are clear:

I think ordinary computer technology now, let alone the development and ongoing implementation of learning-machines, is becoming the master of our humanity. If we do nothing, we risk completely losing our very humanity to computer technology; mere machines; and machines that do not deliver the promises of the techno-elite who guard the computer technology. The techno-elite surround the technology with a mystique (Chapter One); the techno-elite deprive techno-subjects from gaining objective Knowledge (Chapter Two); the techno-elite create a closed culture, the Global Techno-Scientific Culture, where humanistic oriented people and cultures are kept at the periphery (Chapters Three and Four); the techno-elite and their ideologues (many philosophers and many computer scientists), both avoid critical discussion and rationalize the anti-humanism of computer technology, mere machines, and cloak their ideology in language that shields their ideology from critical discussion (Chapters Five and Six).

The sum of it all is that people who want to enhance and improve humanity, humaneness, humanism, must act now, not later.

Though, "..we are analog beings trapped in a digital world, and the worst part is, that we did it to ourselves" (Donald Norman, 1998, p. 135), we can make a different world for ourselves that better suits our analogue-cybernetic selves.

We must act now to implement what we have known since the time of Socrates: We must critically rethink how we design and use the technological and social tools we have made for ourselves to think and communicate; to gain knowledge; to educate; to live together in societies and cultures that enhance civility and humanism. We know what to do: critically rethink, critically redesign; and learn from the errors of our trials. When we fail, work together to find another path.

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