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Invention of Email in Newark, NJ (1978):
The First Email System

Abstract: The invention of email in Newark, New Jersey reveals fundamental truths about the nature of innovation and exposes the "histories" and propaganda of the "golden triangle" of *the military-industrial-academic complex* whose multi-trillion dollar *brand* advertises itself as the source of all revolutionary innovations. Such propaganda are constructed and packaged by those consecrated as "historians" who hone this branding to brainwash humanity that war brings good things to life. This cabal anoints and exalts its "innovators," predominantly whites, and a few persons of color, who pledge to its hegemony of innovation. The indisputable facts of the invention of email in 1978 by V.A. Shiva Ayyadurai, a 14-year-old, dark-skinned, lower-caste, Indian immigrant prodigy, working as a research scholar at the University of Medicine and Dentistry of New Jersey (UMDNJ) in Newark, defy such "histories." The boy's invention, the first electronic *system* replicating the complex and myriad functions of the interoffice, inter-organizational paper-based mail system (inbox, outbox, memo, address book, etc.), which he named "email," was motivated by his desire to create and to do the "impossible." Email was invented to digitize this entire system of *civilian office communications* and *not* just to exchange text messages reliably for *military battlefield communications*. Email was the first end user software application that made the digital revolution accessible to ordinary people who had never experienced the computer keyboard or terminal. Ayyadurai's evolution as an inventor and scientist continued, far beyond email, to his completing four degrees at MIT, receiving worldwide acclaim, and being exalted as an *innovator* during his thirty-three years at MIT, while within the triangle. He served their needs as a penultimate ambassador and "model minority" to enhance their brand's image of "inclusivity," "diversity," and "equality." However, when the Smithsonian requested and obtained artifacts documenting email's origin in 1978, in Newark, on February 16, 2012, and when Ayyadurai accepted this great American honor, he unwittingly pitted himself against their brand. The cabal unleashed disinformation claiming email was created before 1978. When these claims were debunked and Ayyadurai continued sharing facts, the attacks escalated to a public "lynching" revealing an insidious side of racism, which exalts persons of color when needed, and expels and annihilates them when they challenge false histories and propaganda. Email did emerge from "collaboration," but not from their triangle, but organically in a local, and indigenous ecosystem of a small medical college, where a brilliant young boy, committed teachers, a loving family, and a dedicated mentor, solved a civilian problem, exemplifying countless other innovations across millennia, inspired to advance life not retrofitted from technologies intended to maim and kill. Such histories are deliberately not documented to perpetuate lies that war is good and to mask its rapacious profits. Documenting the invention of email in Newark, New Jersey, therefore, is a historical imperative towards breaking this diabolical trance to reveal a fundamental truth: innovation can occur, anytime, anyplace by anybody, and war and profit are not its necessary and required impetus.

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Chapter 1

Introduction

The invention of email in Newark, New Jersey, in 1978, reveals fundamental truths about the nature of innovation and exposes the "histories" and propaganda of the *"golden triangle"* (Leslie, 1993) of the *military-industrial-academic complex* (Fulbright, 1970), whose multi-trillion dollar brand is advertised as the source of all revolutionary innovations. Such propaganda are constructed and packaged by those consecrated as "historians" and "scholars" who hone this branding to brainwash humanity to believe that funding war and the militarization of academia and scientific research are necessary (Turse, 2009) to create a pipeline of developments for industry to deliver tangible civilian innovations. Such propaganda have created a self-fulfilling prophecy where both industry and academia have become interlinked and addicted to military funding for their survival and growth; and, for educational institutions, the maintenance of their stature as a "leading university" is dependent on this nexus (Leslie, 1993; Turse, 2004).

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The benefits of this golden triangle to address societal needs for health and well-being by retrofitting innovations, originally intended to maim and kill, are questionable at best and, more likely, negative and of incalculable damage to humankind (Fulbright, 1970; Leslie, 1993). The indisputable facts of the invention of email in 1978 by V.A. Shiva Ayyadurai, a 14-year-old, dark-skinned, Indian immigrant prodigy, working in Newark, New Jersey, as a research scholar at the University of Medicine and Dentistry of New Jersey (UMDNJ), then a small medical college, on a project neither funded nor reliant on the military, provides a much-needed reminder on the truth that innovation can occur, anytime, anyplace by anybody, and war and profit are not a necessary and required impetus.

Email was invented to digitize the entire system of *civilian office communications,* not to exchange text messages reliably for *military battlefield communications* as marketed in revisionist "histories" of email. Email emerged from a "collaboration," but not from within the golden triangle, but organically in a local and indigenous ecosystem where a brilliant young boy, committed teachers, a loving family, and a dedicated mentor, collaborated to solve a civilian problem to advance the lives of ordinary office workers. The history of email's invention in Newark, New Jersey, and the subsequent struggle to share the facts also reveal how such accurate histories and examples that defy the manufactured "histories" of the military-industrial-academic complex are deliberately not documented and excised from the history books through an organized collusion of a cabal involving academic "historians" and industry insiders, who serve as public relations agents to defend, guard and promote the triangle's propaganda.

Documenting email's origin from Newark, therefore, is a historical imperative to inspire the adoption of models of innovation non-reliant on war and militarization. This imperative is critical for the future of humankind to reconnect with its true source of creativity and innovation: local, indigenous and not driven by war and profit. This manuscript provides such documentation and is organized into three critical elements. The first is this *Introduction*, which provides a detailed overview of the facts about email's origin within the dynamics of the larger socio-historical context. The second element is sections two through seven, which provide the detailed facts of email's invention in Newark, New Jersey in 1978. The third element is the Appendix, *Misuses of the Term "Email"*, which debunks the propaganda of "historians," who aim to confuse journalists and the public, by misusing the term "email" to misappropriate email's origin to before 1978 and to give undeserved credit to those within the golden triangle, who never had any intention to invent email and, at best, thought it was "impossible".

1.1 What is Email?

Email is actually a *system* --- a system of interlocking parts (§2.0) intended to emulate the *interoffice, inter-organizational mail system* consisting of the Inbox, Outbox, Folders, Memo, Attachment, Address Book, etc., the now-familiar components of every email system (Pearl, 1993; Ramey, 1993; Markus, 1994; Tsuei, 2003), made accessible and easy-to-use for *end users* (ordinary people with little to no computer experience) to manage the complex and myriad functions necessary for office communications mediated through the model of the interoffice memorandum (Yates and Orlikowski, 1992; Foster, 1994; Holmes, 1995; Morrisett, 1996).

Prior to 1978, experts in the ARPAnet community had concluded it "impossible" (§3.0) to invent a full-scale emulation of the interoffice, inter-organizational mail system (Crocker, 1977; Nightingale, 2014). In the RAND Report, published on December 1977, its author, Mr. David Crocker, a leading member of the ARPAnet community, conveyed the impossibility of creating such a system. The RAND Report's introductory sections defined the limits and scope of the ARPAnet's then-current work in electronic messaging:

> *"At this time, **no attempt is being made to emulate a full-scale, inter-organizational mail system [p.4] .... The fact that the system is intended for use in various organizational contexts** and by **users of differing expertise makes it almost impossible to build a system which responds to all users' needs [p.7]."*** (Crocker, 1977)

1.2 The Invention of Email in Newark, NJ

In 1978, Dr. V.A. Shiva Ayyadurai, then a 14-year-old prodigy, who was accepted into a special program in computer science at the Courant Institute of Mathematical Sciences in New York University (NYU) (Mullish, 1978), was hired by Dr. Leslie P. Michelson to be a research scholar, and later a Research Fellow, (Michelson, 2012) at the UMDNJ (§4.0). Michelson challenged Ayyadurai to create an electronic version of the interoffice mail system (Aamoth, 2012; Nanos, 2013; Gopalakrishnan, 2014).

Ayyadurai took on this challenge ("Livingston Student", 1980; Michelson, Bodow, Brezenhoff and Field, 2013), and did "attempt" to create such a system, and did do the "impossible," when he became the first to conceive, design and implement a pioneering software application that replicated the functions of the entire interoffice, inter-organizational mail system (McLeod and Bender, 1982) for "use in various organizational contexts" and by "users of differing expertise" ranging *from* secretaries, office workers, students, doctors, e.g. *end users*, who had never

experienced a computer keyboard or terminal *to* technical personnel such as systems analysts, programmers, scientists and engineers, who were highly experienced computer users (Cheney and Lyons, 1980).

Fig. 1. The naming of email as "EMAIL" (c. 1978)

Email is not simply a *method* for the rudimentary exchange of text messages (Ngwenyama and Lee, 1997), as some have erroneously documented (Marold and Larsen, 1997), and one which continues to appear on popular websites such as Wikipedia, which define "email" as "a method of exchanging digital messages" ("Email", n.d., para 1). In the 1970s and early 1980s, developing such methods for the simple exchange of text messages was the focus of the military-industrial-academic complex that included the golden triangle of: (1) military: Defense Advanced Research Projects Agency (DARPA) and its ARPAnet researchers, (2) industrial: Raytheon/Bolt Beranek and Newman (BBN), and (3) academic: MIT, in order to support military battlefield communications (Kuo, 1979; Lyons, 1980; Postel, Sunshine and Cohen, 1981). The aim of their efforts was to develop such methods for the reliable communication of simple text messages from one location to another (Cerf, 1979; Malgieri, 1981).

The invention of email by Ayyadurai at UMDNJ in Newark, New Jersey, however, was not motivated to create such simple point-to-point exchange of text messages but rather to manage the complex functions of day-to-day *civilian office communications* where the interoffice memo (Yates, 1989) was the primary medium of formal business communications in the office environment (Gains, 1999; Orlikowski and Yates, 1994). The military had little interest in creating a system for managing the interoffice memorandum on the battlefield. This was far beyond their scope of work. They were not being funded to make the lives of ordinary office workers easier. The ARPAnet was neither designed nor built for this use (Patel, 2003). Clear evidence for this is reflected in the ARPAnet's own well-documented *ARPANET Information Brochure* (Dennett, Feinler and Perillo,

1985), as late as 1985 (seven years after the invention of email by Ayyadurai in Newark), which makes _no mention whatsoever_ either about "email" or "electronic mail." In fact, there are no entries, starting with "e," to be found anywhere in the _Index_ of this brochure!

The historical revisionism to define email as the simple exchange of text messages (§5.0) took place _after_ Ayyadurai's invention so as to misappropriate credit specifically to Raytheon/BBN, a multi-billion dollar defense contractor which profits from the branding that it is the "inventor of email" in the lucrative cyber-security market ('Raytheon Website', 2012) and, _more broadly_ to the ARPAnet community that thrives on a false narrative that email and other great innovations can only emerge from the "triple helix" of the military-industrial-academic complex (Leydesdorff and Etzkowitz, 1996; Etzkowitz and Leydesdorff, 2000; Carayannis and Campbell, 2011).

In 1978, at UMDNJ, there was no ARPAnet. The challenge to invent email required the young boy to go far beyond just creating a simple means to exchange text messages using a computer network (already present at UMDNJ and independent of the ARPAnet), but demanded him to invent _an entire communications platform consisting of a sophisticated database and workflow systems architecture, while implementing the myriad features for enabling interoffice mail communications_ (Smith, 2011; Gopalakrishnan, 2014) necessary for office workers to move from the world of the typewriter and paper communications to the realm of the keyboard, computer terminal and electronic communications, _delivered through an easy-to-use interface_. Ayyadurai's work was focused on digitizing the entire "system" of interoffice communications rather than just the mere transport of messages reliably from point-to-point (Westinghouse, 1981; Field, 2014).

The components used to build email, furthermore, were not based on any tools or technologies built by DARPA or the ARPAnet community. The tools used by Ayyadurai to build email were: 1) computer hardware, 2) an operating system, 3) terminals and keyboard, 4) a network, 5) a programming language, and 6) a database system (Michelson, 2012; Field, 2014). _None of these components, which specifically existed at UMDNJ in 1978, were developed by the ARPAnet_. Erroneous claims by some "historians," tabloid journals, and blogs have asserted that the components used by Ayyadurai to invent email at UMDNJ had been created previously by the ARPAnet (Biddle, 2012; Aguilar, 2012). This is simply not true and serves only to perpetuate a false and revisionist history, going back to the 1970s when Raytheon/BBN attempted to take credit "…for having invented everything…" (Padlipsky, 2000).

EMAIL --- the first email system, operated independent of the ARPAnet or Internet, on its own private network known as the Laboratory Computer Network (LCN), which Michelson had earlier implemented to connect the four campuses of UMDNJ (Michelson, 2014). Email did not need to "transport messages," but pro-

vided a novel database-driven mechanism to share the interoffice memorandum across relevant users and organizational hierarchies, long before Simple Mail Transfer Protocol (SMTP) was made available in 1982 (Postel, 1982) and which was four years *after* email's invention at UMDNJ in 1978. Therefore, the golden triangle of DARPA (including the ARPAnet community), Raytheon/BBN and MIT cannot take credit for email's invention. Simply put, they were solving a different, and a much easier problem, from Ayyadurai's mission to create email, the first full-scale electronic emulation of the entire interoffice, inter-organizational mail system.

1.3 The Inventor of Email

Dr. V.A. Shiva Ayyadurai's distinction as the *inventor of email* is grounded on both technical and legal foundations (§6.0). In 1978, no legal methods existed to protect software inventions, until 1980 when the Copyright Act of 1976 was amended to become the Computer Software Act of 1980 (Crews, 1987; Lemley, et. al., 2006). Per the compliance requirements of the Computer Software Act of 1980, Ayyadurai, in 1981, applied for a United States Copyright to legally protect his software invention.

Fig. 2. United States Copyright for EMAIL --- The First Email System.

On August 30, 1982, the United States government awarded Ayyadurai the first U.S. Copyright for *"Email," "Computer Program for Electronic Mail System"* (Ayyadurai, 1982a), officially recognizing him as the inventor of email --- the sys-

tem of interlocking parts designed to electronically emulate and expand the functionality of the paper-based interoffice mail system.

In addition, Ayyadurai was also awarded another Copyright for the *"Email User's Manual," "Operating Manual for Electronic Mail System Program"* (Ayyadurai, 1982b). The user's manual provided the office workers at UMDNJ a detailed guide on how to use email. Was Ayyadurai aware of the significance of his invention? In 1981, he submitted an essay on his invention for an awards entry to the Thomas Alva Edison/Max McGraw Foundation (Ayyadurai, 1981) to be considered for a scholarship to support his attending university. The concluding paragraph in Ayyadurai's essay reveals the prescience of the young inventor:

> *"[Email]'s practical applications are unlimited. Not only is mail sent electronically, as many telexes and teletypes are capable of doing, but it **offers a computational service that automates a secretary's or file clerk's work of <u>writing a memorandum, document or letter, editing, filing, and retrieving</u>. If electronic mail systems become a reality, they will surely create different patterns of communication, attitudes, and styles.** Volumes of written work, for example, shall become obsolete."*
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> Excerpt of Statement by Ayyadurai as Teenager in 1981
> *Thomas Alva Edison/Max McGraw Awards Application*

His invention of email did not go unnoticed. For example, in 1981, Ayyadurai was recognized for his invention by distinctions such as the prestigious Westinghouse Science Talent Search Honors Group Award, and being featured on the front-page of MIT's *Tech Talk* (Miller, 1981) as one among 3 of 1,041 students, entering the MIT class of 1985, for having innovated something of deep significance.

1.4 Ayyadurai's Contributions Beyond the Invention of Email

Beyond his invention of email, from 1981 onward, Ayyadurai received worldwide acclaim as a prolific inventor and scientist as well as an entrepreneur who translated his ideas within the disciplines of media and medicine into tangible products and services for humankind. During 1981 to 2007, Ayyadurai went on to receive four degrees from MIT across the fields of electrical engineering, mechanical engineering, visual studies, and a doctorate in biological engineering (Trafton, 2007; Ayyadurai, 2014a). In 2014, Ayyadurai was nominated for the United States National Medal of Technology and Innovation.

MIT's *Technology Review*, one of the world's most eminent technology journals featured Ayyadurai on a front-page cover story on his pioneering innovations in artificial intelligence and automatic pattern recognition (Shapley, 2000) for

document analysis. He was also internationally recognized for his innovations in developing early social media portals and email management technologies for Global 2000 companies (Conover, 1996; Shapley, 2000; Subramanian, 2014a). His research and leadership to advance the use of email and digital media at the United States Postal Service (USPS) was widely shared (Kolodny, 2011; Whitacre, 2011; Beam, 2012). The USPS Office of the Inspector General (OIG) awarded a significant contract ('USPS OIG Award - 6HQOIG-12-A-0005', 2012) to Ayyadurai's research center, the International Center for Integrative Systems, to develop a strategic plan to use email and digital media to generate new revenues for the ailing USPS (Corbin, 2013; 'Going Global', 2013).

Ayyadurai's achievements were also reflected in his many patents, publications (Bulkeley, 2001; Ayyadurai and Dewey, 2007; Ayyadurai, 2011; Subramanian, 2014b), and his entrepreneurial efforts, over 35 years, in starting successful companies such as EchoMail, Millennium Software Productions, General Interactive, Systems Health and CytoSolve (which provided thousands of jobs both in the US and India) as well as his seminal contributions to the fields of integrative medicine and computational systems biology (Desikan, 2013; Mertz, 2013; 'Engineering Theory', 2014). His lifelong work and deep interests in integrative medicine and systems biology, for example, resulted in his being awarded a Fulbright fellowship to India to study the integration of Siddha and Systems Biology, which was featured on the front-page of MIT's Tech Talk, whose research aimed to discover the scientific foundation of eastern systems of medicine (Trafton, 2007). This work resulted in a breakthrough discovery, which demonstrated that the principles of modern control systems theories are the foundations of traditional systems of Indian medicine (Ayyadurai, 2014b).

1.5 Smithsonian Institution Acquires Invention of Email Artifacts

In 2012, Ayyadurai's 1978 work was honored by the Smithsonian's acquisition of his papers, computer code and artifacts documenting his invention of email. The circumstances leading to this acquisition as well as the events following this acquisition were an important turning point not only for Ayyadurai but also for the insights, as shared in this manuscript, on understanding the deeper forces, which now control the forces of innovation.

In 2011, Ayyadurai's mother, Mrs. Meenakshi Ayyadurai, gave her son a suitcase containing the historical artifacts from 1978, documenting Ayyadurai's invention of email, which she had meticulously archived. At the time, Mrs. Ayyadurai was diagnosed with pulmonary fibrosis, a terminal disease. The contents of the suitcase included computer tapes, the Copyright awards, print outs of computer code, and numerous other historical papers (Ganesh, 2012). One of Ayyadu-

rai's colleagues shared the contents with Doug Aamoth, Technology Editor at Time magazine. Mr. Aamoth, after several weeks of careful review of the documentation, wrote an article *The Man Who Invented Email* (Aamoth, 2011).

Ayyadurai had sought neither fame nor fortune for inventing email. He had come to UMDNJ in 1978 to pursue research in biomedical sciences, and was given the project of inventing email by Michelson to test his skills as a programmer. However, the Time article and a deep reverence for his mother inspired him to find a formal resting place for the documents that she had saved. Following his mother's death on January 7, 2012 ('Meenakshi Ayyadurai Death Records', 2012), he contacted Dr. Deborah Douglas, curator of the MIT Museum, with the intention of donating the historical materials to MIT, his alma mater. After consideration, Dr. Douglas wrote to Ayyadurai (Ayyadurai and Douglas, personal communications, February 1, 2012):

"I wanted to follow-up with you but first I'd like to extend my sympathies to you and your family. The loss of one's mother is often a great blow…. Naturally, I and my assistant are always interested in learning about pioneering science and technology projects, so it may be worthwhile for us to meet. Have other stories besides the Time magazine article been written? We'd love to get materials for our bio files."

Once Dr. Douglas realized the extensive nature of the artifacts, and though she was excited for MIT to own and house the artifacts, Dr. Douglas wrote to the Smithsonian and the Computer History Museum (Douglas, Molella and Bedi, personal communication, February 2, 2012), stating:

"Shiva generously offered this collection to the MIT Museum and while part of me wants to acquire this, I honestly think it deserves to be at a place like the Smithsonian or the Computer History Museum. I also mentioned the Lemelson Center (which caused him to perk up as he has won a Lemelson-MIT prize!)."

This led to the both the Smithsonian and Computer History Museum communicating directly with Ayyadurai vying to have the materials housed at their respective museums (Ayyadurai, Kidwell and Weber, personal communications, 2012). Ayyadurai finally chose to allow the Smithsonian's National Museum of American History (NMAH) to acquire the artifacts that his mother had archived. His decision to place it in the NMAH was based on discussions and an understanding with the Smithsonian that the NMAH would create a special exhibit that would inspire and educate other young innovators on the possibilities for innovation (Ayyadurai, Kidwell, Oswald, Molella and Edwards, personal communications, February 2-20, 2012). Based on these discussions and agreements, Ayyadurai did not charge the Smithsonian anything for the acquisition.

1.6 The Unfortunate Reaction Following the Smithsonian Acquisition

On February 16, 2012, nearly 35 years after the invention of email, Ayyadurai was honored at a ceremony held at the Smithsonian's NMAH, where Ayyadurai's papers, artifacts, and computer code, documenting email's invention, were acquired into the national archives of the NMAH (Kirsner, 2012; Kolawale, 2012; Ganesh, 2012). The occasion should have been an event for celebration. However, news of the Smithsonian acquisition and a report in the *Washington Post* (Kolawole, 2012) sparked the beginning of a vicious history of attacks and vitriol (Abraham, 2014a) that was later escalated to defamation and character assassination of Ayyadurai (Abraham, 2014b).

A detailed investigation of the attacks (Abraham, Cestnick, He and Song, 2014) revealed a collusion between a cabal of "computer historians" and industry insiders, loyal to Raytheon/BBN, the ARPAnet community, and the false narrative that only the military-industrial-academic complex could create something as grand as email. The cabal unleashed disinformation claiming email was created before 1978. Their disinformation equated "electronic messaging" (simple methods for exchanging text messages) with "email." Such disinformation was disseminated to rewrite history so as to pre-date the invention of email before 1978 and to misappropriate credit to the ARPAnet community and Raytheon/BBN, thereby denying and suppressing the facts of email's origin at Newark, NJ.

During the nearly 30 years following Ayyadurai's invention of email at UMDNJ, Raytheon/BBN, a multi-billion dollar military defense company, focused on the cyber-security market, had developed its entire corporate brand, brandishing the '@' logo, on the claim that it had invented email ('Raytheon Website', 2012). Having the moniker as "inventor of email" provided Raytheon/BBN an obvious and competitive advantage in the lucrative cyber-security market. "Historians," loyal to Raytheon/BBN and the ARPAnet community, prior to the Smithsonian acquisition of Ayyadurai's papers, had _already_ written a "history" that attributed the credit of email's invention to members of the military-industrial-academic complex (Judy, 1995; Leiner, et. al., 1999; Partridge, 2008). The acquisition of Ayyadurai's artifacts into the Smithsonian and its worldwide disclosure had thrown the proverbial "monkey wrench" (W. Uricchio, personal communications, 2012) into this false and revisionist history.

To discredit the facts and misinform journalists and bloggers, the cabal of "historians" and industry insiders collaborated to present a listing of false claims of email's existence prior to 1978 ('SIGCIS blog', 2012; Song and He, 2014). These false claims included irrational arguments that upper-case "EMAIL" was different than lower-case "email." MIT Professor Noam Chomsky, the eminent linguist, re-

sponded to such absurdity (Garling, 2012; Blagdon, 2012; Jackson, 2012), by stating:

"What continue[s] to be deplorable are the childish tantrums of industry insiders who now believe that by creating confusion on the case of 'email,' they can distract attention from the facts.... Given the term 'email' was not used prior to 1978, and there was no intention to emulate '...a full-scale, inter-organizational mail system," as late as December 1977, there is no controversy here, except the one created by industry insiders, who have a vested interest."

1.7 Exposition of False Claims of Email's Existence Prior to 1978

Dr. Deborah J. Nightingale, a world-renowned systems scientist, enterprise systems architect and former professor at MIT for nearly 17 years, and Dr. Sen Song, a computational systems scientist working in 2012 as post-doctoral associate at MIT, with the assistance of other researchers, conducted a detailed, point-by-point factual analysis, to expose the disinformation. The analysis was originally published on the website as *False Claims About Email* ('Inventor of Email', 2012), which, since then, has been updated and re-published, in the Appendix herein: *Misuses of the Term "Email"*.

These false claims were based on misusing the term "email" to conflate methods for the simple exchange of text messages, as email. Unlike the false claims and disinformation used to misappropriate attribution of email's invention prior to 1978, Ayyadurai's distinction as inventor of email at Newark, NJ, in 1978, is based on three important facts; he was: (1) the first to electronically emulate the full-scale interoffice, inter-organizational mail system that was an end user application for those in the office situation; (2) the first to call the system "email," and, (3) the first to receive formal recognition by the United States government for the invention.

1.8 A Public "Lynching" to Discredit the Inventor of Email

When these claims were debunked by the publication of the *False Claims About Email* ('Inventor of Email', 2012) and Ayyadurai continued sharing facts, the attacks escalated to a public "lynching." These attacks included deplorable references in major media and blogs calling him an "imposter," "fraud," "asshole," "dick," "scoundrel," "curry-stained Indian who should be beaten," etc. (Abraham, 2014b; Chefnick, 2012). Such attacks were then escalated to character

assassination on Ayyadurai's Wikipedia Talk pages ('Talk Page Shiva Ayyadurai', 2012), wherein all of his achievements as a scientist and inventor were vandalized and deleted with the intent of making him "notable" only for only causing a "controversy" on email (He, 2014a; 'Removal of References', 2012). What's even more egregious is that during the period when sensationalist blogs such as Gizmodo were attacking Ayyadurai, they were publishing favourable and articles in support of the military-industrial complex and never once questioned Raytheon/BBN's false claims as the "inventor of email" (He, 2014b).

Why did Ayyadurai overnight become a pariah after February 16, 2012?

Before then, he had served as a penultimate ambassador and "model minority" to allow an institution such MIT to enhance its brand image of "inclusivity," "diversity," and "equality." However, after the Smithsonian acquisition, which challenged the hegemony of innovation of the golden triangle (which included MIT), he was a made non-person and no longer a "model minority," revealing an insidious side of racism, which exalts persons of color when needed, and expels and annihilates them when they challenge false histories and propaganda.

One experienced Wikipedia editor proactively reached out to Ayyadurai's assistant, Manjula Balaji (Balaji, personal communications, September 2, 2014), to share the abusive treatment this editor underwent when simply attempting to update facts on the 'Email' article page of Wikipedia. His statement, provided below, reflects the level of concerted and aggressive efforts to suppress the facts of email's invention at Newark, NJ:

> *"I seem to have stepped into a mess by accident. [A]s an experienced Wikipedia editor, I had a look at the "Email" article, and was surprised that you hadn't received credit for your contributions. Since I have had a great deal of experience writing Wikipedia articles, I got right to work and added several suitable additions to provide credit to your contributions. **Right away, my edits were deleted, without discussion, not edited to improve them, but just flat-out deleted.** This is the kind of behavior an editor encounters **when editing <u>an article on the 2nd Amendment, abortion</u>** or other extremely hot topics. The response to my edits **has included personal attacks, calling me "ignorant", "reckless" and the like.** Although most editors have been less insulting than that, they have generally been **aggressive in rapidly deleting my additions."***
>
> Excerpt from personal communication received by Manjula Balaji
> from a senior and experienced Wikipedia Editor

While attacking such sincere attempts to correct the facts on Ayyadurai's Wikipedia page, a gang vandalized Ayyadurai's Wikipedia page to destroy his achievements and reputation (Cestnick & Abraham, 2014), and inserted statements without any factual basis (He & Subramanian, 2014). Prof. Noam Chomsky, Ayyadurai's former MIT Undergraduate research advisor, also reflected on these attacks (Chomsky, 2012):

"The efforts to belittle the innovation of a 14-year-old child should lead to reflection on the larger story of how power is gained, maintained, and expanded, and the need to encourage, not undermine, the capacities for creative inquiry that are widely shared and could flourish, if recognized and given the support they deserve. The angry reaction to the news of his invention of EMAIL and the steps taken to belittle the achievement are most unfortunate. They suggest an effort to dismiss the fact that innovation can take place by anyone, in any place, at any time. And they highlight the need to ensure that innovation must not be monopolized by those with power — power which, incidentally, is substantially a public gift."

Excerpt from Professor Noam Chomsky's statement issued on March 2012,
Some Reflections on the Invention of EMAIL by a 14-Year-Old in Newark, NJ,
www.inventorofemail.com

1.9 Innovation Anytime, Anyplace by Anybody

The invention of email in Newark, New Jersey, in 1978, was revolutionary for many reasons. At the time, the world of computing was exclusionary; predominantly, if not only, white males, who were highly trained specialists in science and engineering, had access to and used computers. It was inconceivable that a secretary, typically a woman, relegated to her desktop with typewriter, bond and carbon paper, inbox, outbox, folders, etc. would ever have access or use a computer. Email destroyed this elitist barrier and delivered the first end user application that made the computer accessible to her and other ordinary people who had never experienced the computer terminal or keyboard.

Even more compelling was the fact that email was invented by a 14-year-old Indian immigrant prodigy working at a small medical college located in Newark, one of the poorest cities in the United States. The project to create email, moreover, was not funded by the military or any industrial partners. The surrounding environment at UMDNJ was no "silicon valley" or "innovation corridor" teeming with venture capitalists or big industries. There was never any motivation to invent email for either fame or fortune. In fact, no legal methods even existed to protect software inventions in 1978, until 1980, when Copyright Law was amended. Moreover, at the time, the ability to make money through software patents was non-existent and questionable, at best, as the patentability of software itself was unclear and not recognized by the United States Supreme Court (Flewellen, 1980; Moran and James, 1980).

The intention to invent email, therefore, emerged organically in a local and indigenous ecosystem to solve a civilian problem to advance the lives of ordinary office workers. The invention of email exemplifies countless other innovations, across millennia, inspired to advance life, not retrofitted from technologies intended to maim and kill. What is now compelling is the equally revolutionary struggle to ensure that the basic facts of email's invention in Newark, New Jersey are rec-

orded in the history books. The deplorable and insidious collusion of those claim-ing to be "historians" who deliberately supress or argue these facts, deserves a se-rious public inquiry as public funds are granted to such "historians" to tell the truth of human progress. The struggle to share these facts demonstrates how "his-torians" have become sophisticated public relations agents that manufacture and package "histories," no different than clever propaganda, to perpetuate lies of the pre-eminence of the military-industrial-academic complex.

Not so long ago, more soldiers died in war than civilians. However, that is no longer true. Today, more civilians die in wars than soldiers. Society has become militarized at all levels. From the time a human being wakes up and goes to bed, our lives are completely intertwined within the "innovations" of the "golden trian-gle" from the pesticides, GMO products, reductionist healthcare, processed foods, etc. that affect our environment and bodies. Most, if not all, of these "innova-tions" are deleterious to long-term advancement of human health and well-being. The marketing of such "innovations" are deliberate and well-funded by billions of dollars dedicated to public relations, advertising, marketing and "historians," to convince us that war brings good things to life.

The invention of email in Newark, New Jersey defies these manufactured "his-tories" and demonstrates the true source of great innovations is: local, indigenous and motivated by neither war nor profit. Therefore, documenting and broadly sharing the facts of the invention of email in Newark, New Jersey, is a necessary and historical imperative to break from the diabolical trance of militarization and propaganda, and to remind us of a fundamental truth: innovation can occur, any-time, anyplace by anybody, and war and profit are not its necessary and required impetus.

Chapter 2

Email is a System of Interlocking Parts

What we know today as "email" is really a *system* - a system of interlocking parts, each of which is essential for *ordinary* people to communicate effectively with one or many others, in an environment where different kinds of information must be shared (memos, documents, files, etc.) i.e. the modern office environment (Markus and Yates, 1982)

Many people over the age of 40 will remember the *interoffice paper mail system*, which was the basis of how offices and organizations around the world operated, from the level of secretaries to CEOs to prime ministers and presidents. The interoffice mail system had the following interlocked parts (as detailed in §2.1 below), which are the now-familiar components of email: Inbox, Outbox, Drafts, Folders, the Memo ("To:," "From:," "Date:," "Subject:," "Body:," "Cc:," "Bcc:"), Attachments, Carbon Copies (including Blind Carbon Copies), Return Receipt, Address Book, Groups, Forward, Compose, Edit, Reply, Delete, Archive, Sort, Bulk Distribution, etc. (Bell and Hoffman, 1965; Olson, 1982).

The "interoffice" mail system was not only used across offices but also inter-departmentally and inter-organizationally, some referring to it as the inter-departmental or inter-organizational mail system. Such communications systems were central in creating, maintaining and defining organizations (Weick, 1979; Zmud, Lind & Young, 1990).

2.1 The Interoffice, Inter-Organizational Paper Mail System

The classic definition of a system by the eminent systems scientist Eberhardt Rechtin (Rechtin and Maier, 2000) is:

> *"A set of different elements so connected or related as to perform a unique function not performable by the elements alone."*

The elements (or parts) of email, the system of interlocking parts functioned together to perform the complexity of interoffice, inter-departmental, inter-organizational communications (Kettinger and Grover, 1997; Yates, 1989). If you took away any one element of this system, such as the ability to attach other materials (Attachments) or the use of Folders or the ability to Forward or Prioritize, your ability to function and communicate with co-workers would be greatly im-

paired in the office environment. This is why it was a "system," because you needed all elements to function cohesively together for office, department and organizational communications to take place.

This core understanding of *email as a system* provides a factual foundation to expose the false claims and myths (Nightingale and Song, 2012; Nightingale, 2014) about email's history – myths, which are incidentally promulgated and rabidly defended on popular sites such as Wikipedia to promote disinformation that misappropriate email's origin to the work of the ARPAnet community and the military-industrial complex.

A detailed description of the parts and features of the interoffice paper mail system, in use at UMDNJ in 1978, as observed by Ayyadurai and documented in his computer code, now resident in the archives of the Smithsonian Institution's NMAH is provided in the sub-sections below ([NMAH], 2012). The interoffice mail system at UMDNJ was not unique to UMDNJ, but typical of other interoffice mail systems operating throughout industry, government and academic organizations (Sakata, 1985; Rice, 1987; Pearson, 1991). In all cases, these key features all operated together, interconnected and interlocked, as a "system."

2.1.1 Inbox

This was the physical Inbox where a secretary received incoming documents. It was usually made of wood, metal or plastic. The courier or "office boy" or "mailroom clerk" would deliver postal mail or interoffice memos into this Inbox. Deliveries into the Inbox were done at least twice per day. Sometimes, urgent messages were delivered on an ad hoc basis into the Inbox.

2.1.2 Outbox

This was a physical box made of metal, wood, or plastic, where outgoing postal mail or interoffice memos, which were composed, edited, an placed in an envelope, and addressed to the recipient, were made available for pick up and delivery to its recipients. A courier or "office boy" or "mailroom clerk" would come and pick up the items from the Outbox regularly, at least twice per day.

2.1.3 Drafts

This was a physical box made of metal, wood, or plastic to hold drafts of memos or letters, which were in the midst of being reviewed and edited. Typically, a secretary would write the memo and put in the Drafts box for review. A superior would then pickup, review and provide feedback, by making corrections with a red-pen, "red-lining," on the memo or letter, and place it back into Drafts box. The secretary would retrieve the edited document, make the changes, and place the edited document back in the Drafts box. After the superior gave instructions, the memo or document would be deemed as completed. The secretary would then place the memo in an envelope, and place it in the Outbox for pick up.

2.1.4 Folders

Memos, documents and files were archived and organized in metal cabinets containing metal drawers. Within each drawer, one could organize, categorize and file these items in manila folders within each drawer.

2.1.5 Typewriter

A Typewriter was an instrument that allowed a person to create a Memo. It consisted of mechanical components corresponding to the alphabet in the English language plus the 10 digits of the number system, as well as a number of other special characters. The Typewriter required paper and ink ribbon to convert strokes on the keyboard into letters on the paper. There were many styles of Typewriters, mechanical and later electrical.

2.1.6 Memo

This was typically a piece of 8 ½ by 11-inch piece of BOND paper. The top of the Memo had the word "++++++ MEMORANDUM ++++++" written on it and centered. Below this word, there were the following areas: "To:", "From:", "Date:", "Subject:", "Body:", "Cc:", "Bcc:" (only for view in the sender's original), and another section with "Encl.:", if Attachment(s) were included. After the "Subject:" there was typically a horizontal black line, after which the "Body:" of the memo appeared. Below the "Body:" were the names of people on "Cc:" list, and then the "Encl.:" list, listing the various Attachments.

2.1.7 Attachments

A memo could have Attachments or enclosures such as another file folder, another document, a drawing or a photograph, or even a parcel. Typically a paper clip was used to "attach" the Attachments to the memo.

2.1.8 Carbon Copies

Carbon copies were copies of a Memo created by the secretary, who would typically place dark blue carbon paper between two Bond pieces of white paper and roll them into the typewriter, to create the copies. The Bond paper on top was the original, the paper below, was the "Carbon Copy" or "Cc:." Sometimes, several Carbons were used; and in the event, the "Cc:" list was too long, the original would be mimeographed on a mimeograph machine. Then, the original "To:" recipient would get the original, the top copy, and each person on the CC list would get copies. This got more complicated if there were multiple recipients in the "To:" field, or a Group in the "To:" field.

2.1.9 Blind Carbon Copies

Blind Carbon Copies enabled a secretary to send a Carbon Copy of a Memo to some people, that others on the "To:" and "Cc:" lists were purposely made to be unaware of, or "blind" to except to the secretary who authored the Memo. The "Bcc:" list, in the header of the Memo, was kept by the sender/secretary, only, and others who got Carbon copies, those on the "Cc:" list, did not see e.g. they were

"blind" to those receiving the Bcc's. So only the sender knew who was on the Bcc list.

2.1.10 Registered Memo

In the office environment, this was a very important feature, because certain Memos had to be acknowledged as received. If a Memo was flagged as a "Registered Memo," this would mean that it was treated differently. The delivery person would put it in a different color envelope and ensure that recipient signed a Return Receipt, before it was put into the Inbox. This would assure the sender that the recipient got the Memo.

2.1.11 Return Receipt

This was a formal receipt that a delivery person would make sure got signed by the recipient who had been sent a Registered Memo. This Return Receipt would then have to get sent back to the original sender.

2.1.12 Envelope

The interoffice envelope was typically a bit larger than an 8 ½ by 11-inch paper, and was normally gray or yellow in color. The envelope had a red string on the outside so it could be secured for ease of opening and reuse. The outside of the envelope provided columns and rows on which the sender and the recipient could be listed. After a recipient received the envelope, they could recycle the envelope by crossing out the previous sender and recipient and using the blank rows to write the new sender and recipient, name and address.

2.1.13 Address Book

Every office had an Address Book, which listed each person's first and last names, location, Group affiliation (e.g. surgery, finance, pharmacology), room number and phone number. The Address Book was the cornerstone of each office's contact list.

2.1.14 Groups

A Group was listed next to someone's name in the Address Book. Individuals could belong to multiple Groups. Groups included Surgery, Pharmacology, ICU, IT, etc. One nuance was that the Group names may be the same, but the Group was distinct based on the campus location. For example, the Pharmacology Group at one location may have different people, than the Pharmacology Group at another location. Each location had different people in different Groups.

2.1.15 Trash Bucket

A Trash Bucket was typically next to a secretary's desk on the floor. The bucket was made of either plastic or metal, and was the location where trash, such as old papers and garbage were deposited.

2.1.16 Composing Memo

Composing a Memo was done by the action of taking a blank piece of white Bond paper and placing it in the Typewriter. Sometimes, if errors were made during typing, a white liquid substance in a small bottle jar, colloquially called "whiteout," was used to erase mistakes, and then the typing was done over the whited out area.

2.1.17 Sending Memo to Individual

Memo to an individual meant that the "To:" field had the name of only one recipient.

2.1.18 Scanning Mail

Scanning mail was the process of quickly reading the Envelope in the Inbox, opening the Envelope and quickly reading the top portion of a Memo, such as the "From:," "Subject:," lines to get a quick idea whether to read the Memo immediately or discard it into the Trash Bucket or read it first or to put it aside for later review, or sometimes to discard altogether e.g. junk mail.

2.1.19 Forwarding (or Redistribution)

A person receiving and reviewing an incoming Memo in the Inbox could Forward or Re-Distribute the Memo to others. Forwarding literally involved adding a list of other recipients who should review the Memo. This Forward list was sometimes just paper-clipped on the received Memo, and as the forwarded recipients read the Memo, they checked off their name on the paper-clipped list, and passed it on to the next recipient, who had not yet read the Memo.

2.1.20 Forwarding With Return Receipt Requested (or Registered Memo)

This was an important feature to ensure receipt of a forwarded Memo by the recipient. Sometimes, an important Memo, say from a Director, would be received by a Manager, and that Manager wanted to ensure that certain employees in his group received the Memo. Forwarding with Return Receipt enabled the Manager to know exactly when and who got the Memo and who did not get the Memo. The delivery person would not place the Envelope containing the Memo in the Inbox, until the recipient signed the Return Receipt. The Return Receipts, from each recipient, were sent back to the Manager, and thereby the Manager would count the number of Return Receipts and know how many actually received the Memo.

2.1.21 Editing

A Memo sometimes would be edited after it was composed. Editing could be iterative based on the feedback received. Editing typically involved the use of whiteout or sometimes starting with a new blank piece of paper and retyping the original Memo with the corrections. Editing relied on the use of the Drafts box, as this box served as the point of interaction between the secretary and the superior.

2.1.22 Replying

Sometimes instead of writing a new Memo, an individual Replied to a Memo received in the Inbox. When they replied to the Memo, they could either simply send the response Memo or attach the response Memo to the original Memo sent from the sender as an Attachment for the originating sender's reference.

2.1.23 Broadcast Memo

Sometimes a Memo would need to be broadcast or sent to multiple recipients, sometimes hundreds, not just one individual. This involved listing multiple names of recipients in the "To:" field. The original Memo was created with the listing of all people's names on the "To:" field. Then that original Memo was copied using carbon paper, if the list was small, or the original Memo was simply mimeographed. Then each copy was stuffed in an Envelope and placed in the Outbox. Broadcasts could also be done to a single Group or multiple Groups.

2.1.24 Sending Memo to Group

In a large organization, within and across facilities, there were different departments such as Pharmacology, Finance, Administration, Surgery, etc., and one may want to send a Memo to a department or Group. A Group involved a listing of many recipients. However, in the "To:" field only the name of the Group would appear. The secretary would then have to look up in the Address Book and print mailing labels for each individual in that Group, and send a copy of the Memo to each recipient; alternatively, sometimes only one copy of the Group Memo was sent to on address, and the recipient, the secretary or administrator of the Group, on the other end, would make copies of the Memo, and distribute it to members of the Group.

2.1.25 Deleting

Sometimes a Memo would be thrown into the Trash Bucket for disposal.

2.1.26 Purging

The contents of the Trash Bucket, by request, would be collected and then be destroyed.

2.1.27 Updating Address Book

Address Books were updated as employees came and left the organization. New people were added, and those who had left were removed. Sometimes a circular was sent out, which was the update to the existing Address Book, and one would have to manually insert the changes in an existing Address Book.

2.1.28 Prioritization

When mail was left in the Inbox, it sometimes was sorted based on some priority, and marked, such as High, Medium or Low, by the secretary. And some secretaries had file folders for sorting these three categories of Memos, which was kept in the Inbox.

2.1.29 Archiving

Not all Memos were discarded after they were read. Some Memos were to be kept for storage, and were often put into an archive file cabinet and organized for long–term record keeping.

2.1.30 Undeliverable Notification

Sometimes a Memo could not be delivered even after many Retries. In this case, the delivery person would take the Memo back to the sender with a note on it saying "Undeliverable".

2.1.31 Retries

All mail had to be delivered, or a real effort was made to keep trying to deliver it before being deemed Undeliverable. This meant a policy of "retries," as many as 3 to 5 times, before the attempts were stopped. The number of Retries was a policy decision of the organization.

2.1.32 Securing Delivery

All mail had to be securely delivered. This meant that only the designated recipient should receive it. Typically this was ensured, as the delivery person knew who was who and knew the secretaries. Moreover, Memos were put in an individual sealed envelope, with a string closure or taped, so they could not be easily opened during transit.

2.1.33 Transporting

All mail needed to be transported. There were many ways of Transporting. The delivery person could physically pick up the mail and deliver from local office to office, on foot. Another form of transporting were using pneumatic tubes, in which the Envelope was placed. The pneumatic tubes were sent on a system of train-track-like rails, from office to office. Mail among different buildings and campuses were transported by cars or trucks.

2.1.34 Sorting

Different locations had mail Sorting facilities, where the mail would come in, be sorted by groups, departments, locations, zip code, office numbers, so the delivery was easier. Within each office, the secretary would also perform sorting operations by a memo's priority, source, etc.

Chapter 3

Email Was Thought "Impossible" Before 1978

The interoffice, inter-organizational mail system was a complex system of interlocking parts that were used by secretaries, office workers, and other ordinary people to process paper mail communications.

In 1978, such ordinary people did not interact with computers. Those who interacted with computers were highly trained technical personnel: computer systems operators, systems analysts, computer programmers, engineers and scientists, who used computers for performing complex scientific and data processing tasks.

The concept of *end users*, ordinary people interacting with computers, using software applications, as we do today, such as email, spreadsheets, presentation graphics, etc. was inconceivable at that time. In 1978, there were no personal computers (PCs), laptops, iPads and smart phones. Few, if any ordinary people like secretaries, office workers, doctors, dentists and students, for example, had ever touched a computer keyboard or interacted with a computer terminal or ever even "logged in" to use an end user software application.

This is precisely why leading researchers in the ARPAnet research community, highly trained computer engineers and scientists, who were focused on developing rudimentary methods for the simple transfer of electronic messages reliably, thought it inconceivable to build an entire electronic system for such an untrained, computer illiterate base of end users, to manage the myriad of functions of an inter-organizational mail system.

In the RAND Report, published in December 1977, for example, its author, Mr. David Crocker, a leading member of the ARPAnet community, conveyed the impossibility of creating such a system for such diverse *end users*, in the Report's Introductory section, which defined the limits and scope of their then-current work in electronic messaging:

> *"At this time, **no attempt** is being made to **emulate a full-scale**, inter-organizational mail system [p.4].... The fact that the system is intended **for use in various organizational contexts** and **by users of differing expertise** makes **it almost impossible** to build a system which responds **to all users' needs** [p.7]."*
>
> (Crocker, 1977)

The historical context in which such statements were expressed is important to understand. They reveal two important insights.

First, ARPAnet researchers were highly trained technical personnel. They were working on technologies to support a homogenous group of "users," technical people who knew how to program and were facile with the computer. They were not developing software applications for "users of differing expertise," the secretary or officer worker. The computer, playing a role in the day-to-day life of such end users, was a primordial concept to these ARPAnet researchers.

Second, the ARPAnet researchers were working on creating rudimentary methods to reliably transfer electronic messages from point to point, across multiple nodes of potential failure. Transferring short messages reliably such as: "Charlie take that hill" or "Bomb location 32 degrees North" for battlefield communications was their inspiration. ARPAnet researchers were not being paid to emulate a system for managing interoffice, inter-organizational communications.

The concept of creating the system of interlocking parts to emulate the interoffice, inter-organizational mail system – email, was simply beyond their scope of work, or, as they had deemed, "impossible." In addition to the RAND Report, the Appendix herein: *Misuses of the Term "Email"*, documents research across hundreds of other primary sources, to demonstrate that the work of ARPAnet researchers and others, prior to 1978, was focused on defining and creating simple methods for the exchange of text messages, which were certainly not email.

Chapter 4

Email As We Know It Was Invented At UMDNJ

In 1978, email as we know it was invented at UMDNJ. At the time, UMDNJ was a relatively small institution, which had implemented a wide area network (WAN) that connected computers, across its four campuses, as well as a local area network (LAN), within each campus location. The network was used for enabling scientific and data processing activities.

In this environment, Dr. V.A. Shiva Ayyadurai, then a 14-year-old boy, was hired by Dr. Leslie P. Michelson, and given a challenge to create an electronic version of the interoffice, inter-organizational mail system. Ayyadurai created such a system and called it "email," a term he created, to name his invention, which defined email as we use it today. The core design principles of email were intended to capture all the features of the interoffice mail system, and were to be delivered in a format accessible to end users, ordinary people such as secretaries, office workers, doctors, dentists, and students, nearly all who had yet to experience the computer keyboard or terminal. UMDNJ provided Ayyadurai the use of their computer network, hardware and software components that included the FORTRAN compiler and a simple network-model database to develop email. In late 1978, the first version of email was implemented which contained a robust set of end user features. Subsequently, email was updated and additional features were added to support ongoing user and infrastructure needs.

4.1 The University of Medicine and Dentistry of New Jersey (UMDNJ)

In 1978, UMDNJ, then known as the College of Medicine and Dentistry of New Jersey (CMDNJ), was a young organization, and prior to its establishment as a university of the Health Sciences in December of 1981, it was a free-standing public institution comprising several medical schools, a dental school, school for the health related professions and a graduate school of the biomedical sciences.

The IT department at the time, although small, included a scientific data processing group. The main local computing device, an IBM remote job entry terminal, was connected to remote batch and time sharing machines operated by an educational consortium known as the New Jersey Educational Computer Network.

Minicomputers made by Digital Equipment Corporation, Data General, Hewlett Packard and others were in fairly widespread use by 1975.

UMDNJ began connecting minicomputers directly to laboratory equipment to automate data collection and effect control systems for real time analysis. UMDNJ had several campuses on which to distribute the minicomputer resources, including Newark, Piscataway, Camden, and New Brunswick.

These efforts led to the development of a network called the Laboratory Computer Network (LCN), where more capable minicomputers were connected to one another and to smaller laboratory machines we called satellite nodes. The satellite nodes, more often than not, lacked a mass storage device -- they were very expensive at the time --- and depended on the larger nodes to boot their operating systems and applications. LCN was a private network accessible within the UMDNJ campus infrastructure.

The computer hardware infrastructure at the time comprised mainframes, minicomputers and microcomputers. The microcomputer, while an exciting and clearly promising architecture, was mainly seen in industrial controllers and as a part of larger computer components. The microcomputer had also become an obsession for many computer hobbyists. The IBM PC and subsequent widespread adoption of desktop computing was still a few years away. Standardized networks as envisioned by the National Science Foundation's NSFnet and its commercial successor, the Internet, were almost a decade away.

The predominant use of computers at the time was administrative business processing, scientific calculation and machine-aided design for engineering problems. At UMDNJ, as in other places throughout the world, those who used computers were a highly trained class of computer scientists, systems analysts, computer operators, scientists and engineers. The role of computation in the broader context of human endeavour, for example, enabling concept of ordinary people such as secretaries, office workers, doctors, dentists, using computers, to interact with computers in their day-to-day activities would lie in the distant future.

However, UMDNJ was interested in exploring such areas. Michelson's Laboratory was open to finding others who wanted to participate in such exploration in order to develop end user applications. The Laboratory had resources, space, a network and computing power.

It was in this ecosystem Michelson met Ayyadurai.

4.2 UMDNJ Hires 14-Year-Old Livingston High School Student

In 1977, Martin Feuerman, an accomplished applied mathematician, a Senior Systems Analyst and Biostatistician at UMDNJ, knew Ayyadurai's mother, Ms. Meenakshi Ayyadurai, a co-worker, who was a statistician and Senior Systems Analyst in the Data Processing Department of UMDNJ. Ms. Ayyadurai and her family had moved to the United States only seven years earlier from India. Ms. Ayyadurai sought advice from Feuerman on how to guide her precocious son, who had completed Calculus, while only attending 9th grade in the Livingston, New Jersey school system. The high school had no other courses to offer Ayyadurai in mathematics. Feuerman shared with Ms. Ayyadurai a news clipping of a special program being offered at New York University's (NYU) Courant Institute of Mathematical Sciences, for a select group of high school students to study computer science.

The NYU program had been created by Professor Henry Mullish, a visionary computer scientist, who recognized that there would be a need for skilled software engineers, at some point in the future. Ayyadurai was selected as one of 40 students, in a competitive process, to learn six programming languages: COBOL, PL/1, ARTSPK, FORTRAN, BASIC, SNOBOL, as well as a course in digital hardware and processing. Ayyadurai was the only student from New Jersey, which required his mother to drive him to Newark Penn Station to catch the train to New York City. Ayyadurai's schedule at NYU was intensive, typically from 8AM to 8PM.

He graduated from the NYU program, with distinction, at the top of his class. After he completed the program, Feuerman and Ms. Ayyadurai introduced him to Michelson.

In 1975, the IT department of UMDNJ had hired Michelson, an experimental high energy physicist from Brookhaven National Laboratories, who had some general scientific computing experience and an interest in using minicomputers to control and acquire data from laboratory experiments. Michelson was impressed by Ayyadurai and hired him, with the official title of Research Scholar to work in his Laboratory at UMDNJ. Michelson made it clear to Ayyadurai that he would be treated as every other employee, and he would expect the utmost professional behaviour of him.

The hiring of such a teenager was a first for Michelson and UMDNJ. The concept of a 14-year-old leaving Livingston High School (LHS), in the middle of the class day, to travel to the heart of Newark, was unconventional for the LHS school system. Michelson and Ayyadurai's LHS independent study teacher, Ms. Stella Oleksiak petitioned Melvin Klein, the Superintendent of Schools, to get approval

for Ayyadurai to travel each day from Livingston to Newark. After some significant lobbying on the part of Ms. Oleksiak, who believed in Ayyadurai's being allowed the freedom to pursue his work at UMDNJ, the LHS school system gave approval.

Initially, Ayyadurai was not paid any salary; however, after a year, Michelson secured funding to pay Ayyadurai $1.25 per hour, with the title of Research Fellow. Michelson's research group included the late Phil Goldstein who was an early innovator in the educational use of time-sharing systems as well as Robert Field, a systems programmer, who was very proficient in FORTRAN and database systems. Dave Ritacco, a wunderkind studying engineering at the Stevens Institute of Technology, began working with the group to develop an end user application for a presentation graphics system, predecessor to modern day tools such as PowerPoint. Marilyn Bodow and Tina Brezenoff, statistical programmers in the group, were also part of this team, looking to provide better interfaces and end user applications for broader use of statistical packages.

4.3 The Challenge to Invent the Electronic Interoffice Mail System

Given the inclination of Michelson's group to develop such applications, Michelson challenged Ayyadurai to create an end user application which would be a "full-scale emulation of the inter-organizational mail system," a system that would be the electronic version of the interoffice mail system, consisting of all the parts and features itemized in §2.1. When Michelson first met Ayyadurai, however, Ayyadurai had wanted to pursue medical research to uncover the scientific foundations of Siddha and Ayurveda, India's system of indigenous medicine, which his grandmother, a poor farmer, practiced in their village in deep South India. Growing up, Ayyadurai had witnessed her diagnose and heal local villagers, though she had neither formal education nor any Western medical training. Michelson was not able, at the time, to find ways to support his interest in such medical research.

Based on Michelson's challenge, Ayyadurai built such a system with the precise goal of addressing the "various organizational contexts," for "users of differing expertise." Ayyadurai's invention responded to "all users' needs" by providing a system of interlocking parts for emulating the interoffice, inter-organizational mail system --- an invention, which ARPAnet researchers had thought "impossible" in December of 1977. Ayyadurai's invention was the first full-scale emulation of the interoffice, inter-organizational mail system. The first release of the system was made available in late 1978.

4.4 The Naming and Definition of "Email"

Ayyadurai created the name "EMAIL" to name his system. This name did not previously exist in the English language.

The name "email," based on extensive document review, was first introduced and brought into use as his system spread throughout the UMDNJ campuses, starting in 1978. This name was assigned to his system for both convenience (the electronic, "e" version of the physical interoffice "mail" system), and out of necessity since the FORTRAN IV programming language, which "email" was written in, required all variables to be in upper case and the Hewlett-Packard operating system (RTE-IVB) had a five-character limit for program names - thus, he concatenated the letters "E," "M," "A," "I," "L" to name his program.

While the term "email" may seem obvious to us today, in 1978, it was not. Ayyadurai's explicit naming of his invention "email," which contained all the features we experience today in email programs such as Gmail, HotMail, Yahoo, etc., defined the email we all know and use today.

4.5 Core Design Principles of Email's Design and Architecture

To build email, Ayyadurai first identified the system components and parts, as described in §2.1, that were common to all interoffice mail systems, independent of the type of organization. He then conceived, developed and implemented an electronic system that replicated this system of interlocking parts. The overarching objective was to create a system for the *end users* and presupposed only the most elemental computer knowledge to be successfully employed.

At the time of this work in 1978, most computational systems for business, science and some "embedded" data acquisition and control applications were designed to be used by technically trained users, computer programmers system operators, not end users. Therefore, in addition to building a myriad of features for managing the technical complexity of the interoffice mail system, Ayyadurai also needed to make it easy-to-use, so the end users would and could migrate with comfort from the typewriter to the terminal. Prior to Ayyadurai's invention neither of these two important capabilities had been implemented.

Thus, "email" was one of the pioneering applications that recognized the paradigm of a transparent user interface capable of supporting daily "human" interaction for end-users with minimal to little computer knowledge.

The following core design principles, which in the context of the day were original, and at the very least forward looking, guided the development of email:

• A simple user interface would require no specific computer knowledge and would provide access to all program features at the user level. Command lines are to be prohibited- our users were life science researchers, clinicians and administrators, not computer scientists.

• The user interface would include a visual compose mode with spelling and formatting capability.

• Interoffice memos would be stored in a structure database and replicated on each node, which would also manage account and routing information.

• Only one instance of memo content would exist on any one node until the last recipient elected to delete it or save it in another location.

• Each instance of the program would operate independently of the status of other nodes or the University's local- and wide-area networks (such as they existed at the time).

• Delivery would be guaranteed.

• Attributes, considered to be part of a letter-based postal delivery system, such as return receipt requested, would be implemented.

• A full management interface with account maintenance, environment status and debugging tools would be developed.

• The electronic metaphor of all the other elements of the interoffice, inter-organizational paper mail system would need to be incorporated: inbox, outbox, folders, memo structure, address book and other important features, that we now have in modern email systems, as detailed in §2.1.

4.6 Features and Functions of Email

Email was a large-scale enterprise class system consisting of all the features and functionality of the interoffice, inter-organizational mail system, itemized in §2.1. Ayyadurai needed to include all of these features; otherwise, the community of end users at UMDNJ was unwilling to make the transition from the paper-based interoffice mail system to the new electronic-based interoffice mail system --- email.

The user interface enabled both "Scroll and Enter" mode as well as Command-Driven mode. The Scroll and Enter mode allowed a non-technical user to simply use the up down keys and select a menu item and hit Enter to invoke the command. This was before the existence of the computer mouse, and point-and-click actions. The Command-Driven mode was for more technically trained users to use as a shortcut and simply type a two-letter menu command. This was one way in which Ayyadurai's invention met the need of "users of differing expertise."

Table 1 provides a list of all the parts that were the features of EMAIL --- the first email system. Beyond reproducing the functional parts of the paper mail system, the first email system also incorporated a set of *Integrated System Components* to ensure the implementation of the entire system in an electronic format (see last set of items in Table 1 below).

Table 1 The Parts of First Email System Developed at UMDNJ (c. 1978), and Documented in Computer Code Archived at the Smithsonian Institution.

Interoffice Mail System Parts in the First Email System
Inbox
All Fields of Interoffice Memo
To:
From:
Subject: (70 chars length)
Date:
Body:
Cc:
Bcc:
Sending Memo to Individual
Saving a Memo as a Draft
Scanning Mail
Forwarding (or Redistribution)
Forwarding with RETURN RECEIPT (or registered memo)
Composing Memo
Drafts
Editing
Outbox
Replying
Broadcast Memo (to individuals and group(s))
Sending Memo to Group
Deleting
Purging
Address Book
Updating Address Book

Searching the Address Book
By Group
By User Name (short name)
By Last Name
By Zipnode (node or location)
Prioritization
Archiving
Carbon Copies
Blind Carbon Copies
Groups
Registered Memo
Return Receipt
Undeliverable Notification
Retries
Secure Delivery – Using username and password
Attachments
Attaching to a memo
Creating Attachments from scratch
Saving attachments
Attachment editor
Transmission of memo
Multi-Level User Access – User, Manager, Postmaster, System Administrator
Sorting
Memo Formatting – Formatting functions to make sure that a memo on the screen when printed looked akin to the typewritten memo.
Printing
Print all mail
Print selected memos
Print only the "envelopes," To, From, Subject, Date
Formatted printing --- memo looked like typewritten one
Exporting of Mail
Export a single memo to a file
Export a set of memos to a file
Group Management --- Postmaster/Administrator Level
Creating Groups
Deleting Groups
Placing User in a Group
Deleting User from a Group
Displaying Groups
Restricting Group Access – Particular users could send to certain groups. E.g. Only Postmaster could send to "ALL" for global broadcast.
Postmaster & Systems Administrator Functions
Reports on mail usage by user

Deleting aged mail
Shutdown of the entire system
Startup of the entire system
Deleting Users
Adding Users
Adding a "Zipnode," new network
Deleting a Zipnode
Disabling a User from logging in to the user interface
Direct starting of mail transmission
Integrated System Components
Easy-To-Use User Interface
Word-processor
Integrated Attachment Editor
Relational Database Engine
Modular Inter-Process Communication Protocol
Print Manager for Formatted Printing
Systems Administrator Console
Post Master Console

4.7 The Implementation of Email

The invention of email would not have been possible without the following critical components:
1) Computer Hardware
2) Computer Operating System
3) Terminals and Keyboard
4) A Network
5) Programming Language
6) A Database System

At the time of email's invention, all of these components existed at UMDNJ. Neither UMDNJ nor Ayyadurai depended on any these items from the ARPAnet.

4.7.1 Computer Hardware
Email was developed for use on minicomputers manufactured by the Hewlett Packard (HP) Corporation. The specific brand of minicomputer was the HP 1000 computer.

4.7.2 Operating System
The operating system was the HP RTE Operating System (OS). In particular, at the time of email's development in 1978, the specific version of the HP RTE

OS was *RTE-IVB*. The RTE-IVB OS ran on M/E/F series versions of the HP 1000 computers.

4.7.3 Terminals and Keyboard

Human interaction was mediated through CRT-based display devices (terminals) with keyboards. At the time of email's development, there was no "mouse" for point-and-click actions. End users were able to interact with the email system using the interface of the terminal and keyboard. Novice users could Scroll and Select options on the menu, and then use the Enter key to invoke actions. More advanced users could type in a two-letter mnemonic or shortcut command to invoke an action.

4.7.4 Network

Michelson had implemented a Wide Area Network (WAN) as well as a Local Area Network (LAN) at UMDNJ. This network was known as the Laboratory Computer Network (LCN) and had nothing whatsoever to do with the ARPAnet.

The WAN connected the four campuses across UMDNJ located in Newark, Piscataway, Camden and New Brunswick. The WAN used point-to-point 9600 baud modem links. The LAN connected the network nodes within any campus location. The nodes on a particular campus were connected by a wired link using 100 Kb to 0.5 Mbit bandwidth lines.

This was not an IP-based network. The LCN was a simple networking environment that permitted static routing among nodes in a predetermined mesh. The network protocol used for communication across nodes was the HP DS/1000. The DS/1000 also included an Application Programming Interface (API).

4.7.5 Programming Language

The programming language used to implement email was FORTRAN IV. The language was relatively primitive with restrictive variable naming conventions and lacked intrinsic file system access. Code developed in the language had to be compiled and then "loaded" into memory before it could be executed. FORTRAN IV was designed for coding formulas for science and engineering (FORmula TRANslation), not for creating business or office automation applications such as email. Therefore, Ayyadurai required a great deal of persistence to find workarounds and novel ways to use the FORTRAN IV language, to code up the various features required for the end users of email.

4.7.6 Database System

The IMAGE/1000 database (DB) system was used as the data store of email. The IMAGE/1000 system also provided an API. This databases system was not a "relational" database system as we have today in tools such as Oracle, DB2, etc. IMAGE/1000 was based on the Network Model. This required Ayyadurai to de-

velop a layer of functions and code to create such a relational functionality of searching, merging and displaying data across multiple tables and records.

The IMAGE/1000 system allowed a developer to define tables (dataset), fields within each data set, primary keys and secondary keys. A primary key e.g. LAST NAME, enabled the creation of a dataset or primary key table, of all LAST NAME's, which could then link non-primary key tables, containing multiple instances of a particular LAST NAME and other associated fields. Ayyadurai created a complex and efficient database structure to implement the functionality needed to emulate the functions of the interoffice mail system.

One critical element that should be highlighted was that the body of any particular email message was *only stored once*. Therefore, there was no "transmission" of an email message body, rather "hyperlinks" implemented via a linked list pointed to the particular email message body. This implementation was done out of necessity given the limitations of memory and resources. However, such an implementation, even based on modern standards, was novel and incredibly efficient.

4.7.7 System Architecture of Email
The systems architecture of email was a novel three-tier architecture composed of a user interface, an application layer of a system of multiple programs dedicated to emulating particular features and functions of the interoffice mail system, and a relational database layer.

Although the RTE-IVB operating system allowed programs to access large data arrays beyond their logical address space using a feature called EMA (extended memory access), certain usage constraints prevented the use of EMA for the purposes of developing email. Thus, the programs that were developed needed to fit into a space somewhat smaller than 64KB. Building a robust system with the level of functionality that email demanded required programs well in excess of the 64KB limit imposed by RTE-IVB.

The solution was to use a form of segmentation in which a "main" code section transferred control to "segments," using SEGLOAD, an RTE-IVB OS function that loaded pieces of code segments from disk store. The "main" and a called "segment" could not occupy more than the approximate 64KB logical space. Each SEGLOAD call, of course, would overlay the current segment. Segments were not re-entrant, which added yet other architectural challenges in implementing a large program such as email. These were significant challenges that Ayyadurai needed to overcome to build a program as complex as email.

The "main" program was permanent, and would then invoke other "segments," containing specific functions requested by the end user's interaction with the user interface. Since "segments" were not re-entrant, Ayyadurai employed computed

GO TO's, at the end of each segment to redirect control back to the EMAIL "main" program, which would use the computed GO TO label to direct program flow back to the main menu "segment." Each "new" "segment," could, if necessary, call another "segment." A COMMON variable block in the "main" EMAIL program contained arrays to support the calculation of the computed GO TO's, which were permanent in memory. Given the constraints of the OS's EMA and the constraints on memory, it was a resourceful solution.

As previously mentioned, one important aspect of email was that there was no "transfer of emails between the message databases on each node." When a user at one node (e.g., in Newark) wanted to "send" an email message to recipients at the same node (Newark), the database would manipulate a linked list of recipients. When a recipient logged in, the system displayed the message and appropriate mail headers to the user. In this instance, the message was copied from the local database to the email interface. In the event the recipient was at a remote node (New Brunswick, for example), the system invoked remote database calls via IMAGE/1000 (the ""R" calls) and communicated message data to destination services via DS/1000. In this case, the message and email headers were displayed to the user email interface on the remote node, but the message itself remained in its original destination zipnode.

This transparent functionality (location independence of message store and user) required email account records to be automatically created at each zipnode in the network, regardless of whether or not a general computer account for that user existed at the zipnode. One of the tasks of the email maintenance system was to insure that as new nodes were added, user email account registration records could be easily synced.

In summary, the networked email environment as described here was supported through remote access extension to the IMAGE/1000 database system and services provided by the HP's Distributed Systems/1000 (DS). As should be evident, while the individual components, listed in §4.7 existed at UMDNJ, it was a herculean task on Ayyadurai's part to integrate these base components, design and add relational database functionality to a network-model database, write the incredible amount of software code in FORTRAN IV (a language not designed for such applications) to support all the features itemized in §2.1, and then to deliver it through an easy-to-use interface for end users.

4.8 The Deployment of Email at UMDNJ

Ayyadurai solely built the entire system, nearly 50,000 lines of code, as attested by Michelson, his mentor, and Robert Field, who was a colleague of Ayyadurai, in 1978. Michelson recalls a presentation, where a large lecture hall was filled with

technical staff and other parties that were fascinated by the work Ayyadurai had done. As Michelson recalls in his personal statement on www.inventorofemail.com (Michelson, 2012):

"Here we were, all of these people: IT professionals, administrators, family and friends to learn what Shiva had done. Multiple screens and white boards filled with charts, "screen shots" and flow diagrams kept everyone's attention. There was a bizarre aspect that pervaded all of this. The presenter was not a distinguished scientist or clinician from CMDNJ or some other vaunted institution, but rather a very young man with a fascinating story of ingenuity and determination."

Excerpt from Dr. Leslie P. Michelson's statement issued on March 2012,
Recollections of a Mentor and Colleague of a 14-Year-Old,
Who Invented Email in Newark, NJ, www.inventorofemail.com

Email, as a system of programs, was delivered as one holistic platform, which integrated an easy-to-use interface and a word processor, all built from scratch by the young inventor, as well design, implementation and integration of a relational database functionality (to support folders, archival, sorting and many other features not possible with flat-file based approaches), along with a modular inter-communications protocol. The system also included many management functions for a "postmaster" to manage the day-to-day maintenance of the system. Hardware memory restrictions also demanded that Ayyadurai implement novel methods for efficient and seamless management of memory to swap in and out particular programs to execute functions invoked from the user interface.

Ayyadurai's office was located on the Newark campus. Workers on these campuses used EMAIL, the first email system, as a public and *commercially* viable utility. Email was developed with a focus on user-friendliness and high-reliability, and made accessible to the hundreds of office workers across the UMDNJ environment. In order to use email, users had to log in to the computer on the network.

Dr. Richard L. Corson, then a medical resident at UMDNJ, had created another pioneer application called "CHRGR." CHRGR was a system of computer programs that tracked and managed the usage and billing of online applications. Dr. Corson's software, for example, could bill a user for minutes of usage, at a particular cost per minute rate, based on the application being used. The primary applications on the UMDNJ network, at the time, were scientific and data processing applications. Email was one of the applications for which CHRGR was used to bill and track.

The first version of EMAIL in late 1978 had a few users, and went into full production in 1979. Ayyadurai also created a User's Manual and conducted training sessions and seminars for users across UMDNJ. Unlike the developments on the ARPAnet, which were focused on the simple exchange of text messages, email

was built to address a systems problem in the ordinary office situation using local area and wide area networks (LANs and WANs), where computers across offices and multiple campuses were connected - *independent* of the ARPAnet.

Email did not need the Internet or the ARPAnet. Neither Ayyadurai nor his colleagues had any contact with the ARPAnet. Email was meant to be a widely shared system of ongoing communication by ordinary workers, not simply the rudimentary exchange of text messages which computer scientists at the ARPAnet were focused on, using cryptic codes and command-line protocols, accessible to technical personnel and computer programmers.

Chapter 5

Email Is Not Simply An Exchange Of Text Messages

So email as a system is not simply exchanging messages among computers, even if a person at one end types a message to a human recipient. Sending text messages alone is what today we call Texting, SMS, Chat or Twitter.

Standard histories of the Internet are full of claims that certain individuals (and teams) in the ARPAnet environment in the 1970s and 1980s 'invented email'. For example, the '@' sign, early programs for sending and receiving messages, and technical specifications known as RFCs, have been claimed to be 'email'. But as some claimants have admitted, none of these innovations were intended as a system of interlocking parts - Inbox, Memo, Outbox, Folders, Address Book, etc. - the email system used today by billions of people worldwide.

These standard histories have misused the term "email" - which today is understood to be a system of interdependent features - to apply to other forms of electronic communications. Those developments aimed to solve various problems, but were not intended to substitute for the interoffice paper mail system.

On February 16, 2012, nearly 35 years after Ayyadurai's invention of email, the Smithsonian Institution's National Museum of American History (NMAH) acquired his papers, artifacts and computer code, documenting his invention in 1978 at UMDNJ. The Smithsonian acquisition led to a vocal minority unleashing disinformation to deny email's origin in spite of the technical and legal documentation of facts.

These attacks were unwarranted and unfortunate and, as subsequent research revealed, the attacks were motivated by industry insiders intent on protecting the vested interests of Raytheon/BBN, a multi-billion dollar company, which, during the period after Ayyadurai's invention of email in 1978, had built its entire brand on the falsehood that it had "invented email."

Ayyadurai neither sought fame nor fortune for his invention of email. However, these vested interests, including a coterie of "historians," instigated harsh vitriol in order to discredit and character assassinate Ayyadurai to distract media and press from the indisputable facts of email's origin, by spreading disinformation and false claims about email's origin.

These claims have been compiled and updated in the Appendix herein: *Misuses of the Term "Email"* by Dr. Deborah J. Nightingale and Dr. Sen Song, originally provided by Drs. Nightingale and Sen on www.inventorofemail.com as the *False Claims About Email*. The research across hundreds of primary sources concerning these claims shows that each of these innovations - while very important in the evolution of the Internet - were single functions and never a system of interlocked components intended to emulate the interoffice, inter-organizational paper mail system.

Chapter 6

Email Has A Single Inventor: V.A. Shiva Ayyadurai

Ayyadurai's distinction as the inventor of email is based on both technical and legal foundations.

6.1 Technical Reasons Why Ayyadurai is the Inventor of Email

The following technical reasons document why Ayyadurai is the inventor of email:

(1) Prior to 1978, there was no intention by electronic messaging developers, dating as far back as the Morse Code telegraph of the 1800s, to attempt to create the electronic version of the interoffice, inter-organizational mail system - email;

(2) In 1978, Ayyadurai created the first system of computer programs, which was the first full-scale emulation of the interoffice, inter-organizational mail system;

(3) Ayyadurai called his system "email," a term that he singularly created to name his system, and a term that did not exist before in the English language, thus defining email; and,

(4) The system email, which he solely created, contained all the features that are strikingly similar, if not the same, as the features and functions in modern email programs such as Gmail, Hotmail, Yahoo, etc.

6.2 Legal Reasons Why Ayyadurai is the Inventor of Email

There are three legal reasons why Ayyadurai is the inventor of email.

The first reason is Ayyadurai became "the inventor of email" at the moment, in 1978, when he invented the system of computer programs, which he called

"email," which was the first full-scale emulation of the interoffice, inter-organizational mail system.

The second reason is Ayyadurai received official recognition as the inventor of email from the U.S. government, as documented in the following verifiable records:

a. In 1978, when Ayyadurai developed email, there were no mechanisms to legally protect software inventions, through either Copyright or Patent;

b. In 1980, the Copyright Act of 1976 was amended to become the Computer Software Act of 1980, which allowed software inventors to receive intellectual property protection for their inventions through Copyright. At that time, the Supreme Court did not recognize software patents;

c. In 1981, Ayyadurai applied for a Copyright to protect his invention of email, which required him to submit copies of portions of his code and User's Manual to the Library of Congress that made his work publicly accessible; and,

d. On August 30, 1982, he received official recognition by the U.S. government as the inventor of email, when the U.S. government issued the first Copyright for "*Email*" to Ayyadurai.

The third reason is that during 1980 to 1982, Ayyadurai received recognition for his invention of email in at least three publicly available documents:

a. The *West Essex Tribune* Article ('Livingston Student', 1980) ;

b. The Honors Award letter and Certificate from *Westinghouse Science Talent Search* Committee (Westinghouse, 1981); and,

c. The front-page of MIT's official newspaper, *Tech Talk* on September 2, 1981, which highlighted Ayyadurai for his achievement in creating email, as one of three (3) students, among the incoming class of 1,041 (Miller, 1981).

Chapter 7

Conclusion

This manuscript has provided historical documentation including eyewitness testimony of the facts of the invention of email in Newark, NJ in 1978 as well as a detailed exposition (in the Appendix herein) of the false claims that email existed prior to 1978. These facts offer a compelling example of how great innovations can emerge outside of the bastions of the "triple helix" of the military-industrial-academic complex by a person of color.

Ayyadurai's work with email, beyond its invention in 1978, has continued over the past thirty-five years. During 1979 to 1984, he continued to enhance and evolve email. In 1993, he went on to invent EchoMail a platform for intelligent email management, growing out of work with the United States White House to automatically filter, sort and route email messages.

During 1993 to 2003, EchoMail became one of the leading email management and email marketing companies for Global 2000 organizations. Today, EchoMail, makes its technology accessible to small and mid-sized businesses, and Ayyadurai serves as a Board member for EchoMail, Inc.

In early 2000, Ayyadurai began the Email Research Institute, which is now known as the Email Lab, a division of the International Center for Integrative Systems, and aims to provide fundamental research about email. Ayyadurai, on behalf of the Email Lab in collaboration with the MIT Communications Forum, led, organized and facilitated ('The Future of the Post Office', 2012), a historic forum to discuss how US Postal Service (USPS) would survive in a digital world. The USPS Office of the Inspector General (OIG) funded Ayyadurai and the Email Lab to conduct research on new ways that email and digital technologies could generate revenue for the ailing USPS. Today, Ayyadurai serves as Director of the Email Lab.

In filing for the Copyright, the United States Copyright Office made Ayyadurai's work products, such as the User's Manual and portions of his computer code, publicly available; anyone in the world could have access to it. Shortly after his invention, from 1982 onwards, other products with the same functions and interlocked components used in Ayyadurai's program "EMAIL" appeared in rapid succession as illustrated in the History of Email Infographic ('History of Email', 2014). As Robert Field, Ayyadurai's colleague at UMDNJ, reflected (Field, 2014):

> *"Shiva's distinction as inventor of email is **not to suggest that someone else, at some point in history, would <u>not</u> have created a full-scale emulation of the interoffice mail system** (and perhaps called it something else), independent of his invention. The advances in computing and networking, and a growing desire to automate paper-based functions, would have eventually led to the creation of such a system. However, **Shiva was the first to create such a system, the first to call it 'email,' and, the first to receive formal recognition by the United States Government for its invention."***

An inspiring message from Ayyadurai's journey is this: invention, even something as grand as email, can occur anytime, anyplace by anybody, even by a 14-year old dark-skinned, Indian immigrant, working in Newark, NJ. This manuscript, we hope, clarifies what "email" is and what it is not, as well as Ayyadurai's role as the inventor of email in 1978, while at UMDNJ, and finally, his commitment throughout his career to evolving email to benefit the general public.

Chapter 8

Acknowledgements

We appreciate the work of the various individuals who helped in the review and valuable feedback including those listed on http://www.inventorofemail.com/site-contributors-bibliography.asp over the past several years.

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Appendix

Misuses Of The Term "Email"

So email as a system is not simply exchanging messages among computers, even if a person at one end types a message to a human recipient. Sending text messages alone is what today we call Texting, SMS, Chat or Twitter. Standard histories of the Internet are full of claims that certain individuals (and teams) in the ARPANET environment in the 1970s and 1980s 'invented email'. For example, the '@' sign, early programs for sending and receiving messages, and technical specifications known as RFCs, have been claimed to be 'email'. But as some claimants have admitted, none of these innovations were intended as a system of interlocking parts - Inbox, Memo, Outbox, Folders, Address Book, etc. - the email system used today by billions of people worldwide.

These standard histories have misused the term "email" - which today is understood to be a system of interdependent features - to apply to other forms of electronic communications. Those developments aimed to solve various problems, but were not intended to substitute for the interoffice paper mail system. On February 16, 2012, nearly 35 years after Ayyadurai's invention of email, the Smithsonian Institution's National Museum of American History (NMAH) acquired his papers, artifacts and computer code, documenting his invention in 1978 at UMDNJ. The Smithsonian acquisition led to a vocal minority unleashing disinformation to deny email's origin in spite of the technical and legal documentation of facts.

These attacks were unwarranted and unfortunate and, as subsequent research revealed, the attacks were motivated by industry insiders intent on protecting the vested interests of Raytheon/BBN, a multi-billion dollar company, which, during the period after Ayyadurai's invention of email in 1978, had built its entire brand on the falsehood that it had "invented email." Some detractors went so far as to confuse the public by stating that upper case "EMAIL," was different than lower case "email," to misappropriate credit away from Ayyadurai.

The eminent linguist Professor Noam Chomsky, during the heated controversy in 2012, responded by stating (Garling, 2012):

> *"What continue[s] to be deplorable are the childish tantrums of industry insiders who now believe that by creating confusion on the case of 'email,' they can distract attention from the facts….Given the term email was not used prior to 1978, and there was no intention to emulate '…a full-scale, inter-organizational mail system," as late as December 1977, there is no controversy here, except the one created by industry insiders, who have a vested interest."*

<div align="right">

Professor Noam Chomsky, MIT
Institute Professor & Professor of Linguistics

</div>

These vested interests included a coterie of "historians," who instigated the harsh vitriol against Ayyadurai in order to deliberately discredit and character assassinate Ayyadurai to distract media and press from the indisputable facts of email's origin, by spreading disinformation and false claims about email's origin. Twelve of these false claims, originally itemized, investigated and exposed as disinformation by Drs. Nightingale and Song (Nightingale and Song, 2012) have now been compiled and updated in the *Supplementary Materials* of this manuscript, to demonstrate how misuses of the term "email" were used to disseminate fiction versus fact on the origin of email. These claims include:

1. "Email" was created on the ARPANET.
2. Ray Tomlinson invented "email" and sent the first "email" message.
3. The use of the "@" symbol equals the invention of "email.
4. RFCs demonstrate "email" existed prior to 1978.
5. Programs for exchanging messages were "email".
6. Mail On CTSS developed in 1960's was "email".
7. In 2012, the term "email" now needs to be defined.
8. "Email" is not an invention, but VisiCalc is an invention.
9. Dec and Wang created "email".
10. Laurel was "email".
11. The term "email" belongs to Compuserve.
12. "Email" has no single inventor.

The addendum elaborates on each instance and explains why they are misuses of the term "email" by providing references to primary sources that definitively expose that what is referred to as "email," in such uses, was not email but rudimentary methods for text messaging. The research across hundreds of primary sources concerning these false claims shows that each of these innovations, while very important in the evolution of the Internet, were single functions and never email --- the system of interlocked components intended to emulate the interoffice, inter-organizational paper-based mail system.

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10.1. Misuse #1: "Email" was Created on the ARPANET

The statement:

> *"Under ARPANET several major innovations occurred: **email** (or electronic mail), the ability to send simple messages to another person across the network,"* (Bellis, 2012)

misuses the term "email," since the invention referenced as "email," and attributed to the ARPANET, in the above statement is command-line protocols for transferring text messages, not email --- a system of interlocking parts designed to be full-scale emulation of the interoffice, inter-organizational paper-based mail system.

Early workers of the ARPANET community, such as Mr. David Crocker, in the field of electronic messaging, admitted, with great and direct clarity, that the ARPANET community, had no intention to create a full-scale electronic version of the interoffice or inter-organizational paper-based mail system. This is expressed in the following two statements of Mr. Crocker, published in December of 1977, months before Ayyadurai began his work in inventing email.

> *"At this time, **no attempt is being made to emulate a full-scale, inter-organizational mail system**. p.4"* (Crocker, 1977)

> *"The level of the MS project effort has also had a major effect upon the system's design. To construct a fully-detailed and monolithic message processing environment requires a much larger effort than has been possible with MS. In addition, the fact **that the system is intended for use in various organizational contexts and by users of differing expertise makes it almost impossible to build a system which responds to all users' needs**. p.7"* (Crocker, 1977)

Moreover, other electronic messaging workers of that same time, such as Tom Van Vleck, affiliated with the ARPANET community, also admitted that their superiors, at the time of their work in electronic messaging, in the early 1970s, made it clear that they were <u>not allowed</u> to work on creating an electronic system to replicate "letters" e.g. the interoffice paper mail system, since it was considered a waste of time, as expressed in this statement:

> *"The idea of sending 'letters' using [the Compatible Time-Sharing System] was resisted by management, as a waste of resources."* (Van Vleck, 2001)

Mr. Van Vleck, one of the vocal detractors to the news of Ayyadurai's invention of email in March 2012, after the Washington Post's news of the February 16, 2012 Smithsonian's acquisition of Ayyadurai's documents, went to the extent of revising his own Multicians.Org history of email website, in March of 2012,

which had remained unchanged for many years, by **inserting** the word "initially" to the sentence referenced above to read:

"The idea of initially sending 'letters' using [the Compatible Time-Sharing System] was resisted by management, as a waste of resources." (Nightingale and Song, 2014b)

This revisionism was done deliberately to give the false impression that somehow, he was allowed, back in his time, by his "management" to implement the "letter", or interoffice memo, afterwards following an "initial" resistance. Mr. Van Vleck made this revision to his website after the authors of this manuscript's research team discovered and published Mr. Van Vleck's original comment that he was not allowed to work on "letters."

By revising his own website, after our exposure of his lack of intent to invent anything close to email, Mr. Van Vleck was performing historical revisionism on his own material. The research team was fortunate, at the time, to capture in screenshots as shown in Figure 6, which documents this revisionism. Mr. Van Vleck's historical revisionism was done retroactively to substantiate that he was allowed to work on an electronic system for "letters" so as to take credit for the invention of "email."

BEFORE	AFTER
Note: Van Vleck clearly states that CTSS management resisted allowing him to create a system for sending "letters" e.g. To, From, Cc, Bcc, etc., but would allow him to create a system for sending/receiving, requests, e.g. text messages.	Note: Now, "initially" added --- subtle but a BIG difference.
Here is the Original Text	Here is the Revised Text
"The idea of sending 'letters' using CTSS was resisted by management, as a waste of resources. However, CTSS Operations did need a faclility to inform users when a request to retrieve a file from tape had been completed, and we proposed MAIL as a solution for this need."	"The idea of sending 'letters' using CTSS was **initially** resisted by management, as a waste of resources. However, CTSS Operations did need a faclility to inform users when a request to retrieve a file from tape had been completed, and we proposed MAIL as a solution for this need."
(a)	(b)

Fig. 6. Blatant example of historical revisionism conducted by Mr. Tom Van Vleck after hearing of Smithsonian's acquisition of documents validating Ayyadurai's invention of email at UMDNJ. Before the Smithsonian news of February 16, 2012, Mr. Van Vleck's website had the content as shown in (a). After the Smithsonian news (c. March 2012), Mr. Van Vleck changed the content to as shown in (b). (Nightingale and Song, 2014b).

This was not the only instance of this kind of revisionism that Mr. Van Vleck deliberately performed. On another part of his website, again after the Smithsonian's acquisition on February 16, 2012, Mr. Van Vleck revised his own published timeline of the history of email where in that timeline Mr. Van Vleck inserts that he invented email in 1965, as shown in Figure 7A and Figure 7B below (Nightingale and Song, 2014b)

Fig. 7. Another blatant example of historical revisionism conducted by Mr. Tom Van Vleck after hearing of Smithsonian's acquisition of documents validating Ayyadurai's invention of email at UMDNJ. Before the Smithsonian news of February 16, 2012, Mr. Van Vleck's website had the history of email timeline as shown in (a). After the Smithsonian news (c. March 2012), Mr. Van Vleck changed the content to as shown in (b). (Nightingale and Song, 2014b)

10.2. Misuse #2: Ray Tomlinson Invented "Email" and Sent the First "Email" Message

The statements such as these:

"Ray Tomlinson invented email in 1971." ("Ask.com - What's Your Question?", 2012)

"Ray Tomlinson sent the first email." ("A Brief History of Email in the Federal Government.", 2012)

"Ray Tomlinson is credited with inventing email in 1972. Like many of the Internet inventors, Tomlinson worked for Bolt Beranek and Newman as an ARPANET contractor." ("History of Internet/Email.", 2012)

misuse the term "email," since Mr. Ray Tomlinson did not invent email --- the system of interlocking parts which is the full-scale emulation of the interoffice, inter-organizational paper-based mail system.

The invention referenced in these statement(s) and attributed to Tomlinson is the simple exchange of text messages between computers. Tomlinson simply modified a pre-existing program called SNDMSG, which he did not write, but

made some minor modifications to, in order to enable the exchange of simple text messages across computers.

SNDMSG required a set of cryptic and highly technical computer codes to instruct the computer to transfer a message from one computer to another. Only trained technical personnel, such as computer scientists and technicians, not end users, such as a secretary or office worker with minimal to no computer knowledge, could use such a method. Tomlinson updated this previously existing SNDMSG command program to transmit text strings over a network connection. SNDMSG was not a system of interlocking parts designed for laypersons to manage routine office communications; thus, it was not designed to replicate the interoffice, inter-organizational paper-based mail system.

As primary references show, SNDMSG was not only not email but also was just a very rudimentary form of text messaging (Vittal, 1981):

"The very simple systems (SNDMSG, RD, and READMAIL) did not integrate the reading and creation functions, had different user interfaces, and did not provide sufficient functionality for simple message processing." (Vittal, 1981)

Moreover, Tomlinson, to his own admission, said his work was a "no-brainer" and was merely a minor contribution (Tomlinson, 2012):

"I was making improvements to the local inter-user mail program called SNDMSG. The idea occurred to me that CPYNET could append material to a mailbox file just as readily as SNDMSG could. SNDMSG could easily incorporate the code from CPYNET and direct messages through a network connection to remote mailboxes in addition to appending messages to local mailbox files. The missing piece was that the experimental CPYNET protocol had no provision for appending to a file; it could just send and receive files. Adding the missing piece was a no-brainer—just a minor addition to the protocol." (Tomlinson, 2012).

Tomlinson's work was in no manner comparable to the enterprise-class system that Ayyadurai developed at UMDNJ, that was a complete end user application consisting of 50,000 lines of code, built from the ground up, to create email --- the full-scale emulation of the entire interoffice, inter-organizational paper-based mail system in 1978.

What is also alarming, in this context, is that Michael Padlipsky's famous essay, originally linked on Van Vleck's site, in which Padlipsky exposed Tomlinson's conflated claim as being the "inventor of email," (Padlipsky, 2000):

"I don't believe Ray Tomlinson invented 'e-mail.' And not because of the quibble that we called it netmail originally, though that does offer an excuse to observe that I personally

find the term 'e-mail' awfully cutesy, and references to 'sending an e-mail' syntactic slime. Nor because of the semi-quibble that 'mail' had been around intra-Host on several of the Host operating systems since well before anybody realized they were Hosts, though that one has a great deal of abstract 'historical' appeal. No, it's because I have a completely clear memory that Ray wasn't even at the FTP meeting where we decided to add mail to the protocol." (Padlipsky, 2000)

was deleted and removed by Van Vleck (Nightingale& Song2014b), after the Smithsonian event. Van Vleck's website used to link to Padlipsky's article prior to the Smithsonian event.

Prior to the Smithsonian event, Van Vleck also questioned the claim that Tomlinson was the "inventor of email,"; however, after the Smithsonian event, Van Vleck, who by all indications had close and collegial relationships with members of the ARPANET community who were threatened by Ayyadurai's facts exposing their false claims, change his sardonic position of Mr. Tomlinson being the "inventor of email," fell in line with the revised propaganda of Raytheon/BBN, after the Smithsonian event, to deem Tomlinson as the inventor of "network email," a new term crafted to bequeath credit to the ARPANET community in the face of the mounting facts, following Ayyadurai's documentation of inventing email in 1978.

10.3. Misuse #3: The Use of the "@" Symbol Equals the Invention Of "Email"

The statement:

"When [Tomlinson] is remembered at all, it is as the man who picked '@' as the locator symbol in electronic addresses. In truth though, he is the inventor of e-mail, the application that launched the digital information revolution. And yet the breakthrough he made was such a simple evolutionary step that hardly anyone noticed it till later." ("The Invention of Email," 1998)

misuses the term "email" since it implies that Ray Tomlinson's use of the "@" symbol is equivalent to inventing email --- the system of interlocking parts which is the full-scale emulation of the interoffice, inter-organizational paper-based mail system.

The "@" symbol is used to separate the user name from the domain name. The invention referenced in the above statement is the use of the "@" symbol to distinguish two computers when sending a text message. The "@" symbol is not a necessary component of email --- the system of interlocking parts. In some cases "-at" was used (Van Vleck, 2012), or the "." symbol as in the first email system developed by Ayyadurai.

"Because the '@' was a line kill character in Multics, sending mail from Multics to other hosts used the control argument -at instead." (Van Vleck, 2012)

Some have mistakenly characterized the "@" symbol as something very unique, "underused" and novel. As a point of fact, the "@" symbol was the line-kill character on Multics, (Pogran, 2012), another early timesharing system, and created a character conflict for those Multics users trying to use Tomlinson's SNDMSG.

As Kenneth Pogran recalled:

"Do folks remember that '@' was the Multics line-kill character? We were opposed to Ray Tomlinson's famous (or is it infamous?) selection of @ as the character that separated the user name from the host name…. Early versions … allowed the use of space-a-t-space (i.e., 'at') in place of the '@' to accommodate Multics (and the mail composition software I wrote used the syntax -at on the command line)" (Pogran, 2012).

"Early versions of ARPANET email specs allowed the use of space-a-t-space (i.e., " at ") in place of the '@' to accommodate Multics and the mail composition software I wrote used the syntax -at on the command line to begin composing an email…." (Pogran, 2012)

The "@" symbol was "underused" only to the extent that it interfered with some users' host environments. Equating of the "@" symbol with the invention of email was a result of the branding and marketing effort of Raytheon/BBN as obvious on their web site in 2012. After the Smithsonian's acquisition of Ayyadurai's documents, which began to expose the false claims of Raytheon/BBN (Padlipsky, 2000), Raytheon/BBN escalated their PR and marketing efforts as documented on the history of email section on www.inventorofemail.com. Raytheon/BBN, in fact, cleverly juxtaposed the "@" symbol with Tomlinson as their brand mascot, with the false claim that he "invented email".

10.4. Misuse #4: RFCs Demonstrate "Email" Existed Prior to 1978

The statement:

"…email underpinnings were further cemented in 1977's RFC 733, a foundational document of what became the Internet itself." (Biddle 2012)

misuses the term "email" since Requests for Comments (RFCs) were simply written documentation, not a computer program, nor software, nor email ---- the sys-

tem of interlocking parts which is the full-scale emulation of the interoffice, inter-organizational paper-based mail system.

RFCs were literally meeting notes following meetings by electronic messaging researchers. RFCs, such as RFC 733, were written documentation not a computer program or code or system. Moreover, statements such as, and others like it:

> *"In 1977 these features and others went from best practices to a binding standard in RFC 733."* (Biddle, 2012)

are hyperboles and conflation of RFCs.

Mr. Sam Biddle, neither a computer scientist nor a software developer, who wrote the statement referenced above, in an article in Gizmodo referencing Ayyadurai as an "asshole" and "dick," is known for his puerile, sensationalist, and yellow journalism. For example, a few weeks after writing this outrageous article on Ayyadurai, Biddle wrote an article about a virtual Internet dog name "Boo," which had died. It was later found out that "Boo" had not died. Anderson Cooper, a CNN journalist, later exposed Mr. Biddle's quality of journalism on his TV news show "The Ridiculist."

What is unfortunate is that even scholarly "historians," like Mr. Thomas Haigh, a leader of the SIGCIS group, and others either purposely wanting to deny the facts of email's origin from 1978 at UMDNJ, or unconsciously cutting and copying the Gizmodo article, believing Biddle's sensationalistic article to be the truth, continue to use Biddle's article as a primary and scholarly source reference to deny email's invention by Ayyadurai in Newark, New Jersey. Such tabloid articles are referenced as the primary source on Wikipedia and some major media to attempt to perpetuate false assertions that RFCs are email, and predate Ayyadurai's invention.

Specifically, RFC 733, for example, is a document that was drafted in November 1977, and was simply, at best, a specification attempting to provide a standardization of messaging protocols and interfaces. RFC 733 should not be conflated as "email underpinnings" (Biddle, 2012) and equated as email --- the electronic system of interlocking parts emulating the interoffice, inter-organizational paper-based mail system created by Ayyadurai at UMDNJ in 1978.The RFC 733 is explicitly described as:

> *"This specification is **intended strictly as a definition** of what is to be passed between hosts on the ARPANET. It is **NOT intended to dictate either features which systems** on the Network are expected to support, **or user interfaces to message creating or reading programs."***

RFC 733 did not even dictate which features of the interoffice, inter-organizational paper-based mail process would be included, such as the basic components of the user interfaces for message creation and reading. Moreover, RFC 733 attempted to define a standard **that was never even fully accepted nor implemented.** (Crocker et al., 1977).

"Some of RFC #733's features failed to gain adequate acceptance." (Crocker et al., 1977)

The very term "RFC" means "Request for Comments" and were typically lists, notes and at best specifications (Shicker, 1981) on what could be in the future, but were neither computer code nor software application, such as email, the system and software application developed by Ayyadurai.

"Prospective users, system designers, and service offering companies often compile lists of potential services [of electronic mail systems]…Nobody claims that these lists are complete, and most often it is admitted freely that these lists represent a first cut synthesis of services offered by other communication facilities. Unfortunately, these lists mostly convey just a number of buzz-words which everybody interprets in his own fashion."
(Shicker, 1981)

In summary, RFCs only proposed an interface for message format and transmission, but said little about feature sets of individual electronic messaging or mail systems. The RFCs' authors, by their own admission, clearly state this was not their intention. RFCs were the definition of command-line terminology, at best, but certainly not email --- the system of interlocking parts intended to emulate the interoffice, inter-organizational paper-based mail system.

10.5. Misuse #5: Programs for Exchanging Messages were "Email"

The statement:

"By the mid-1970s, other user-oriented e-mail programs arrived on the scene. Two of the more popular examples were 'Hermes' at Bolt, Beranek, and Newman, now BBN—a wholly owned subsidiary of Raytheon — and 'Laurel,' which was in use at Xerox PARC."
(Crocker, 2012)

misuses the term "email" since programs like Hermes and Laurel were not email --- the system of interlocking parts which is the full-scale emulation of the interoffice, inter-organizational paper-based mail system. Laurel was really, in fact, a single component, front-end for the independent, lower-level Grapevine messaging platform (Schroeder, 1984).

*"A client program of Grapevine generally obtains services through code…. The primary clients of Grapevine **are various mail interface programs, of which Laurel is most widely used.**"* (Schroeder, 1984)

Though Laurel was beginning to incorporate some elements of the interlocked parts such as folders and the inbox, it was still like nearly all messaging systems of the period: heavily dependent on external system resources, and not designed as a system of interlocking parts to be a full-scale emulation of the interoffice, inter-organizational paper-based mail system.

Furthermore, internal Xerox documentation (Schroeder, 1984), such as:

"…the Grapevine system was first made available to a limited number of clients during 1980." (Birrel, 1980)

shows that independent Grapevine component was still being prototyped with five dedicated servers in 1981, well after Ayyadurai's invention of email (from 1978) which had been in use in routine communications at UMDNJ for several years by 1980. No word of Laurel or Grapevine, moreover, is publicly available until 1982 (Tesler, 2012). Larry Tesler, who worked at Xerox during 1973 to 1980 on the internal development of Laurel, acknowledges that he himself did not

"…know what if any email systems based on unofficial internet standards were implemented before 1979." (Tesler 2012)

Tesler, however, was aware that Laurel was still under development in 1979 (Tesler, 2012), when the Xerox work would be published in the Communications of the ACM (Schroeder, 1984, Birrell, 1980).

Hermes was similar. It was not a system of interlocked parts and not something user-friendly that an ordinary office worker could use. Users had to learn about twenty commands to use it (Vallee, 1984):

"In systems like SEND MESSAGE and its successors, such as HERMES, ON-TYME, and COMET, there is no provision for immediate response. A message is sent into a mailbox for later access by the recipient. No automatic filing is provided: any searching of message files requires users to write their own search programs, and to flag those messages they want to retain or erase. The burden is placed on users to manage their own files, and a fairly detailed understanding of programming and file structures is required. Both senders and receivers must learn about 20 commands, and if they misuse them they can jeopardize the entire data structure. Some messages may even be lost in the process." (Vallee, 1984)

Another program, PLATO, which was an invention for computer-assisted instruction, which some reference as "email," also is best understood from Vallee's comments, which also help to place in context PLATO relative to Ayyadurai's invention (Vallee, 1984). In 1979, all known messaging systems were itemized in RFC 808 by the leading researchers who worked at the big universities, large companies and for the military (Postel, 1982b):

> *"Dave Farber gave a bit of history of mail systems listing names of all the systems that anybody had ever heard of (see Appendix A).... It was noted that most of the mail systems were not formal projects (in the sense of explicitly sponsored research), but things that 'just happened'."* (Postel, 1982b)

Note, Laurel and PLATO do not appear on this list in Postel's "Appendix A" as late as 1982.

For a review of individual systems of the period, it is best to look at the 1979 RFC ('IETF Tools', 2012), which contains a listing of the names of all the computer mail systems anybody had ever heard of, at the time. The vast majority of the systems, itemized in this list, such as MSG, MS, SNDMSG, RD, and HERMES, all share a common ancestry, and inherit features (and deficiencies) from this heritage. John Vittal tried to distinguish the features and qualities of his MSG message system relative to its antecedents (Vittal, 1981):

```
MSG started from a set of primitive message processing operations.
Several of the commands listed above were not implemented in the
initial version of MSG:

    o  Creation: Answer and Forward
    o  Motion: Move
    o  File operations: Write
    o  Marking: Mark and Unmark
    o  User-interface and Profile: Koncise, Verbose, and Zap
       profile
    o  Miscellaneous: Print date and Comment

It became clear, even before MSG was first publicly released, that
the operations of Put and Delete were so commonly used together that
a combining operation (Move) should be included in the functionality
of the system.  This was the first major modification.
```

```
COMPARISON WITH OTHER SYSTEMS

Many of the other CBMSs of the time have already been alluded to.
The very simple systems (SNDMSG, RD and READMAIL) did not integrate
the reading and creation functions, had different user-interfaces,
and did not provide sufficient functionality for simple message
Processing.

On the other hand, two systems came very close to MSG.  BANANARD
gained acceptance, but seemed to not have the right functionality.
The user-interface seemed to be a little too verbose for experienced

users.  However, it is important to note that some users still
prefer to use BANANARD.  These tend to be users who view mail rather
than respond to it.
```

In Vittal's conclusion, he was careful to stress the limitations of MSG as a general communications tool:

```
However good MSG is, it is not perfect.  Its major drawback is that
it does not have a directly integrated message creation facility
with the same style of user-interface as the rest of MSG.  The
result is that users are forced to use two separate interfaces for a
single conceptual process -- dealing with mail.  In addition, the
decision to use SNDMSG limits users because it has no way to edit
various fields of the message after a specific field has been
completely specified, especially address lists.
```

Vittal states,

> *"Its major drawback is that it does not have a directly integrated message creation facility…."* (Vittal, 1981)

MSG was at best a rudimentary text messaging client. It was lightweight messaging system, designed to aid users of the TENEX operating system. It served its purpose well, but was crippled by a limited feature set, and was not email --- the system of interlocked parts intended to emulate the interoffice, interlocked paper-based mail system.

10.6. Misuse #6: Mail on CTSS Developed in 1960's was "Email"

The statement:

> *"Electronic mail, or email, was introduced at MIT in 1965 and was widely discussed in the press during the 1970s. Tens of thousands of users were swapping messages by 1980."* (Crisman et al., 2012)

misuses the term "email" since the reference to CTSS MAIL, the method refer-
enced and attributed to MIT, was an early text messaging system, not a version of
email --- the system of interlocking parts which is the full-scale emulation of the
interoffice, inter-organizational paper-based mail system. This invention refers to
the MAIL command on MIT's CTSS timesharing system. The basic usage of
MAIL, as documented in CTSS Programming Staff Note # 39 (Crisman et al.,
2012), is below:

The MAIL Command

```
A new command should be written to allow a user to send
a    private  message  to  another user  which  may  be
delivered at the receiver's convenience.  This will  be
useful for the system to notify a user that some or all
of his files have been backed-up.    It  will  also  be
useful for users to send authors any criticisms.


             MAIL  LETTER  FILE  USER1  USER2  USER3 ....
             MAIL  'ME'

LETTER FILE is the name of a BCD  file  which  contains
        the message to be sent.
USERn  is the designation of the user who is to receive
        the message.  USERn may be a programmer's name  or
        programmer  number  or  the  problem-programmer
        number.  It may also be just the problem number if
        the message is to go to  all  users  of  the  same
        problem number.

MAIL ME is the command given by the  receiver  when  he
        wants the mail to be printed.  The files  will  be
        left in permanent mode and should  be  deleted  by
        the receiver at his convenience.

The MAIL command will  create or append to the front  of
a file called MAIL BOX.  System messages  to  the  user
will be placed in a file called URGENT MAIL.  The LOGIN
command will notify the user if he has either  kind  of
mail.  MAIL ME will always print URGENT  MAIL    before
MAIL BOX.
```

This invention, MAIL, was not a system of interlocked parts emulating the in-
teroffice, inter-organizational paper mail system. MAIL allowed a CTSS user to
transmit a file, written in a third-party editor, and encoded in binary-decimal for-
mat (BCD), to other CTSS users.

The delivered message would be appended to the front of a file in the recipi-
ent's directory that represented the aggregate of all received messages. This flat-
file message storage placed strict constraints on the capacity of MAIL, and re-
quired users to traverse and review all messages one-by-one; search and sort
mechanisms were not available. Corruption to the MAIL BOX file could result in
the loss of a user's messages. From the CTSS Programmer's Guide, Section
AH.9.05, (Crisman, 1965):

```
BOX'. Because of the appending feature of the MAILing
process, the command 'DELETE MAIL BOX' should be issued
after a message has been PRINTed, to avoid having to run
through previous mesages to get to the latest one.)
```

The design choices in MAIL—lack of search and sort facilities, need for an external editor, dependence on CTSS-specific user IDs, and flat-file message storage—put strict constraints on the use and capacity of the command. This was not email --- the system of interlocking parts, created to emulate the interoffice, interorganizational paper-based mail system. MAIL was well-suited to the low-volume transmission of informal (i.e. unformatted) messages, at best, like text messaging of today.

The creator of MAIL admitted this fact:

> *"The proposed uses [of MAIL]," wrote Tom Van Vleck, "were communication from 'the system' to users, informing them that files had been backed up, communication to the authors of commands with criticisms, and communication from command authors to the CTSS manual editor."* (Crisman, 1965)

The limited feature set of MAIL would be carried over to its progeny (SNDMSG, MSG, HERMES), creating headaches for even the most sophisticated technical staffers (Vallee, 1984):

> In systems like SEND MESSAGE and its successors, such as HERMES, ON-TYME, and COMET, there is no provision for immediate response. A message is sent into a mailbox for later access by the recipient. No automatic filing is provided: Any searching of message files requires users to write their own search programs, and to flag those messages they want to retain or erase. The burden is placed on users to manage their own files, and a fairly detailed understanding of programming and file structures is required. Both senders and receivers must learn about 20 commands, and if they misuse them they can jeopardize the entire data structure. Some messages may even be lost in the process. These drawbacks are compensated for by the fact that the cost per message is very low.

Those who promoted MAIL as "email," when the term "email" did not even exist in 1965, are misusing the term "email" to refer to a command-driven program that transferred BCD-encoded text files, written in an external editor, among timesharing system users, to be reviewed serially in a flat-file.

One would be hard-pressed to draw a historical straight line from MAIL to today's email systems. MAIL was not "email," but a text messaging command line system, at best, and perhaps the predecessor to early forms of online discussion boards.

10.7. Misuse #7: In 2012, the Term "Email" now Needs to be Defined

This statement (made following news of Ayyadurai's invention of email in 2012, after the Smithsonian's acquisition of Ayyadurai's work):

> *"...we need a more specific definition that captures the essence of computer based electronic mail as it actually emerged. Here is one that was developed in discussion with email pioneers Ray Tomlinson, Tom Van Vleck and Dave Crocker:*
>
> *'Electronic mail is a service provided by computer programs to send unstructured textual messages of about the same length as paper letters from the account of one user to recipients' personal electronic mailboxes, where they are stored for later retrieval.' "*
> ('SIGCIS Blog', 2012)

serves to misuse and confuse the term email --- the system of interlocking parts which is the full-scale emulation of the interoffice, inter-organizational paper-based mail system, since they conflate the term "electronic mail" with "email" by referencing Ray Tomlinson, Tom Van Vleck and David Crocker as "email pioneers." Neither Tomlinson nor Van Vleck nor Crocker invented email --- the system of interlocking parts intended to emulate the interoffice, inter-organizational paper-based mail system, which specifically Crocker had as of December 1977 concluded "impossible" to build.

Moreover, this attempt to provide a "specific definition" by Mr. Haigh in 2012, 34 years after email was precisely defined in 1978 by Ayyadurai, as the electronic version of the interoffice, inter-organizational paper-based mail system, is historical revisionism. Mr. Haigh leads SIGCIS, which is a group of computer "historians" that denies the invention of email in 1978 at UMDNJ, in spite of the clear facts. Their disinformation and historical revisionism is based on equating "electronic messaging" with "email." These "historians" had already written "email history," prior to Smithsonian's acquisition of Ayyadurai's artifacts on February 16, 2012.

The fact is "email" was already clearly defined in 1978 as the electronic interoffice, inter-organizational paper-based mail system, and formally recognized in 1982 by the issuance of the U.S. government's issuance of the first Copyright for "Email" to Ayyadurai. Such an attempt to provide a revisionist definition of "email" by industry insiders, in 2012, served one purpose, to allow them: Tomlinson, Van Vleck and Crocker, who worked with the early messaging systems SNDMSG, MAIL and MS, respectively, to retroactively define their work as "email" so as to ensure their primacy to "email," which they did not create, and had no intention of creating, while misappropriating credit from Ayyadurai.

The documentation of that period reveals that the term "email" did not exist prior to 1978. More importantly, the definition of the juxtaposed terms "electronic" and "mail," and a specification of its functions, was anything but clear-cut. In fact, prior to 1978, the term "electronic mail" and "electronic message" were used interchangeably to refer to the "electronification" of any type of text message, dating back to the telegraph of the 1800s.

Email, created by Ayyadurai in 1978, however, has a precise definition as the system of interlocking parts emulating the entire interoffice, inter-organizational paper-based mail system. Prior to Ayyadurai's invention, the confusion about the term "electronic mail" existed:

As Gordon B. Thompson of Bell Northern Research wrote in 1981 (Thompson, 1981):

> Electronic Mail Systems give me some major concern. The use of the word "mail" brings with it a lot of baggage, and most certainly people are going to get some surprises because of this. A conventional letter always presents itself to the reader in the same format as it had when it left the writer. In the electronic situation, unless rigid controls are exercised over the terminals allowed on the system, there is no guarantee that the recipient will see the same lay out at all. Designers tell us that the way text is presented can significantly alter the attitude the reader has towards printed text. In electronic mail this variable is left wide open!

Peter Schicker wrote of similar concerns of messaging service and feature lists (Schicker, 1981):

> Users of such computer based mail systems are less intrigued by the various internal mechanisms and resource allocation strategies but require exact definitions of the facilities and services that these systems offer. Prospective users, system designers, and service offering companies often compile lists of potential services, e.g., like the list shown in appendix A. Nobody claims that these lists are complete and most often it is admitted freely that these lists represent a first cut synthesis of services offered by other communication facilities (e.g., postal service, telephone, telegraph, telex, etc.).
>
> Unfortunately, these lists mostly convey just a number of buzz-words which everybody interprets in his own fashion. For example, a multitudiness of shades of different services can

Even normally well-defined terms like "memo" and "conferencing" took on confusing, often conflicting meanings (Vallee, 1984):

> sary obstacle. Much confusion still exists about the requirements for effective communications. One person calls "conferencing" what another calls "mail."

Or, as James Robinson wrote in the opening lines of his master's thesis on a review of electronic mail, messaging systems (Robinson, 1983):

'Electronic Mail' is a term that means different things to different people. To one person, electronic mail may represent a technology as old as the telegraph, while to another, it may mean high-powered computers that relay digitized information. Part of the confusion about what electronic mail really is can be traced to how the term is defined. Usually, electronic mail is defined as any process

The term "email," however, has had a clear definition based on Ayyadurai's invention of email, the electronic emulation of the interoffice, inter-organizational paper-based mail system, which he explicitly named "email."

Therefore, any attempt, in 2012 to redefine it, is clearly an attempt to inappropriately assign "the inventor of email" moniker to those who are not the inventors of email.

10.8. Misuse #8: Email is Not an Invention, but Visi-Calc is an Invention

The statements (in reference to VisiCalc being an invention but email not being and invention since):

"To 'invent' something you have to devise some kind of new technology or capability that had not existed before. A computer program is not invented; it is 'written' or 'developed.' So, for example, it would make sense to say that Dan Bricklin and Bob Frankston invented the spreadsheet when they wrote Visicalc. It wouldn't make sense to say that Google invented the web browser when it developed Google Chrome, as many previous browsers existed, or even that it 'invented the world's first Google Chrome' as that is a specific system rather than a technology." ('SIGCIS Blog', 2012).

and,

"The system [created by Ayyadurai] will still be of interest to historians as a representative example of a low-budget, small scale electronic mail system constructed from off-the-shelf components, including the HP/1000's communications, word processing, and database programs." ('SIGCIS Blog', 2012)

demonstrate ignorance on the fact that "email" is a system just as VisiCalc is a system and is a deliberate attempt to denigrate the significant contribution of Ayyadurai, who invented "email," the system, which is the electronic version of the

interoffice, inter-organizational paper-based mail system, consisting of the inter-locked parts: Inbox, Outbox, Folders, Attachments, etc.

Like VisiCalc, which was an electronic metaphor of the accounting paper-based ledger system, EMAIL, the first email system, also created an electronic metaphor for the interoffice, inter-organizational paper-based mail system.

The accessibility of Ayyadurai's invention of email was its essential attribute. It wasn't a simple text messaging system inspired to support battlefield communications for soldiers, and usable only by highly trained technical personnel, with cryptic codes and commands. It embodied the definition of "email" as we define the word today. Along these lines, we should remember that Bill Gates, in the early years of Microsoft, stated that the company's mission was to place a personal computer in every American home. Steven Jobs was determined to make a computer that could be bought in a box just like any other product. Consumers didn't have to shop for components in various electronics stores. They didn't have to do anything except plug the machine in and start using it. Microsoft and Apple were defined by the accessibility of their products.

Unquestionably, that was the real innovation on the part of Gates and Jobs. In just the same way, Ayyadurai's 1978 application, EMAIL, invented email. It created something – a practical, user-friendly electronic communication system on the model of the interoffice, inter-organizational paper-based mail system – that simply had never existed before, and one which experts of the time had thought "impossible."

The absurdity of Haigh's statements, therefore, is simply evidence of the bias of the SIGCIS "historians," who in collusion with industry insiders, seek to misappropriate credit of Ayyadurai's invention of email. The assertion that email is not an invention, but that VisiCalc is an invention, assumes that the reader will acknowledge such illogic.

There is a clear analogy between the invention of EMAIL and the invention of VisiCalc. Bricklin's title as the Father of the Modern Spreadsheet belies significant contributions to the field of data processing completed prior to the release of VisiCalc. It was the subject of Iveron and Brooks's seminal Automatic Data Processing and a major research topic for industry and academia.

What Bricklin did was to create an integrated system for data processing, complete with a consistent user interface (UI) and a strong metaphor, which was targeted towards end users. Bricklin's accomplishment wasn't that he invented data processing, but that he integrated it and increased accessibility, just as Ayyadurai's accomplishment wasn't that he invented electronic messaging, but that he integrated and created a new electronic system for making the paper-based system

of interoffice, inter-organizational communications accessible to ordinary office workers.

In the same way that Bricklin's VisiCalc digitized the system of paper spreadsheets, Ayyadurai's email digitized the interoffice, inter-organizational paper-based mail system. Both took well-defined social processes, and gave them the power of computation, freeing users from the drudgery of manual recalculation in the former case, or the delivery of physical interoffice memos in the latter case.

This puts both projects in stark contrast to the messaging systems of early timesharing architecture, which evolved to address the administrative and technical needs of mainframe users. As stated in RFC 808, most of these message systems "were not formal projects (in the sense of explicitly sponsored research), but things that 'just happened,'" and Jacques Vallee wrote of these early systems (Vallee, 1984):

> The human factors of communications are still largely ignored. As new companies get into the field, they hire the best programmers they can find to implement message systems. These programmers are often compiler writers or experts in operating systems and have had no experience in dealing with end users. They have operated in a completely different environment, where communications had a much narrower meaning. Some early successes have also had the unfortunate result of freezing the technical reality of the field for too long. Network mail on the ARPANET is a case in point. Introduced in the early 1970s, electronic mail systems have been very successful on the ARPANET, where they served a highly trained community of technical experts. When it came time to design new systems for wider communities, these same technical experts found it very difficult to be creative in ways that differed from what they had first learned.

The statement by the SIGCIS "historian," part of the industry insider clique, has asserted, with reference to Ayyadurai's work that:

> *"The system will still be of interest to historians as a representative example of a low-budget, small scale electronic mail system constructed from off-the-shelf components, including the HP/1000's communications, word processing, and database programs."*
> ('SIGCIS Blog', 2012).

is simply a false, unscholarly, and denigrating statement.

This statement reveals deliberate and reckless ignorance of the facts, which are accessible now at the Smithsonian. EMAIL, the first email system, was designed as an integrated system—it included all its own facilities for message handling, distribution, composition, archival, and user management. It was "small scale" only in the sense that it did not need the ARPANET, in contrast to systems like MAIL and MSG, which leveraged a host of facilities in the host environment. EMAIL the program and system, consisted of nearly 50,000 lines of FORTRAN

IV code, unlike Van Vleck's MAIL command, which comprised less than 300 lines of MAD, a high-level language on the CTSS (Crisman et al., 2012).

EMAIL was far from a "small-scale electronic mail system." EMAIL was a full-scale emulation of the entire interoffice, inter-organizational paper-based mail system, with all the features we now experience in modern email programs and many features, which some email programs even in the late 1990's, did not have.

What also needs to be investigated, by likely an independent professional ethics body, is the biased, unscholarly, and defamatory attacks on Ayyadurai('SIGCIS Blog', 2012),and the clear conflict of interest, as exemplified in the list of individuals in Mr. Haigh's "Acknowledgements" section thanking those who helped him in denigrating Ayyadurai:

> *"Acknowledgements: Thanks to the dozens of people who sent me hundreds of messages after learning that I was working on a response for the Post. Many helped to read and shape earlier drafts. In no particular order: Evan Koblentz, Catherine Lathwell, Peter Meyer, Dave Walden, Debbie Deutsch, Marie Hicks, James Sumner, Ken Pogran, Tom Van Vleck, Dag Spicer, Mark Weber, JoAnne Yates, Murray Turoff, Al Kossow, Ramesh Subramanian, David Alan Grier, Paul McJones, Nathan Ensmenger, David Hemmendinger, Jeffrey Yost, David Moran, Peggy Kidwell, Debbie Douglas, Alex Bochannek, Bill McMillan, Len Shustek, Petri Paju, Elizabeth Finler, Dave Crocker, Ray Tomlinson, Pierre Mounier Kuhn, James P.G. Sterbenz, Ben Barker, Jim Cortada, and Craig Partridge."* ('SIGCIS Blog', 2012)

A significant cluster or coalition of the individuals listed in the Acknowledgements have a direct and indirect, and/or close affiliation to Raytheon/BBN, who claims they "invented email," as evident on their website (Raytheon/BBN, n.d.), which brandishes the '@' logo with its numerous press and marketing releases claiming that it is the home of the "inventor of email," Mr. Ray Tomlinson.

10.9. Misuse #9: DEC and Wang Created "Email"

The statement:

> *"By 1980, electronic mail systems aimed at the office environments were readily available from companies such as DEC, Wang, and IBM."* ('SIGCIS Blog', 2012)

conflates all forms of electronic communication, from telegraph services, to Telex or CBMS systems with the email --- the system of interlocked parts intended to emulate the interoffice, inter-organizational paper-based mail system. This conflation is confusing, and an attempt to equate the broad term "electronic mail," dating back to the 1800s, with email, the system.

The offerings of "electronic mail" systems by private suppliers varied greatly, and were largely incompatible. Wang Laboratories, for example, had already been well established for its line of word processing equipment (Wang Systems Newsletter, 1979). When network facilities became readily available, it bolted on file transfer facilities to its machines, creating a line of "communicating word processors" (Trudell et al., 1984). This networking of word processors is not email --- the system of interlocked parts intended to emulate the interoffice, inter-organizational paper-based mail system.

In 1980, there was tremendous pressure to innovate in the "office automation sector." However, as addressed in James Robinson's 1983 thesis, "An Overview of Electronic Mail Systems" (Robinson, 1983), these offerings were part of a larger defensive strategy:

> *"[Computer-based message systems] are sold to users who have an interest in implementing electronic mail on their current equipment. Not surprising therefore, many of the vendors in this grouping tend to be minicomputer manufacturers such as Data General and Prime. The reason for this is not so much that minicomputer manufacturers have a real interest in electronic mail, but rather have devised messaging systems in an attempt to prevent other firms from selling a system that would run on their hardware. Thus, this type of electronic mail system has evolved as part of a defensive strategy by original equipment manufacturers (OEMs). An excellent example of a product by an OEM is Wang Laboratories Inc.'s Mailway"* (Wang Systems Newsletter, 1979)

The "electronic mail" offerings by private industry in 1980 were not the system of interlocked parts emulating the entire interoffice, inter-organizational paper-based mail system. They were, at best, wildly unstable and inconsistent.

10.10. Misuse #10: Laurel was "Email"

The statement:

> *"...the PARC email software, Laurel, ran on the user's local computer, was operated with a mouse, and pulled messages from the PARC server to a personal hard drive for storage and filing."* ('SIGCIS Blog', 2012)

is a misuse of the term email --- the system of interlocking parts which was the full-scale emulation of the interoffice, inter-organizational paper-based mail system.

The invention, Laurel, was a mail user interface program for the Xerox Alto. It was a graphical front-end to a series of messaging programs akin to SNDMSG and MS (Schroeder et al., 1984). The use of mouse was an innovation of its host environment Alto, not of Laurel itself (Alto User Handbook, 1979). Laurel was capa-

ble of basic message composition, scanning and flat-file storage (through the use of its *.mail files). Like other file-flat approaches, mail management remained in the hands of users (ALTO World Newsletter, 1979).

The Laurel Manual, as it existed at Stanford in September 1980 (Stanford, 1980) provided a thorough explanation of what Laurel was, and what its capabilities were. Laurel was just a user interface, and not the system of interlocked parts to emulate the entire interoffice paper mail system.

Laurel was disconnected and relied on "Piping" other small programs which were loosely connected to each other.

Mention of MSG in the official Laurel documentation refers to the same command program discussed earlier, created and critiqued by John Vittal, and listed in RFC 808 as running on a TENEX operating system. Maxc referred to a Xerox-produced machine that emulated the facilities of PDP-10 TENEX-based systems. Its operation is well documented (Fiala et al., 1974). It follows that Laurel, as it existed in 1979 and 1980, fundamentally depended on MSG and Maxc, for message transmission. It was an Alto-based front-end for a more pedestrian MSG program. Ironically, the revealing kinship of Laurel and MSG is well described in the 1979 Whole ALTO World Newsletter (ALTO World Newsletter, 1979). The sentence, "Eventually, the services of Laurel will surpass those of MSG, but at present, the two are roughly equivalent in function," should not be overlooked.

The "distributed message system" mentioned in the Laurel Manual would eventually be realized in Grapevine, tested on a limited number of clients in 1980, and not publicly documented ('ACM Transactions on Computer systems', 1984) until 1982, well after Ayyadurai's invention of email was well established in a production environment. Larry Tesler, who was at Xerox throughout Laurel's development, corroborates these points (Tesler, 2012).

A review of period documentation helps to put Laurel in perspective. It was, as of 1979 and 1980, an Alto-based graphical front-end for MSG. It stood on the foundations of the beautifully sophisticated Alto environment, and contributed Alto-specific operations like menu picking and Bravo-type editing, which were not available in other MSG environments.

However, Laurel 2.0 provided only a small subset of the features available in Ayyadurai's EMAIL, lacking an attachment editor, relational database, administrator/postmaster functionality, prioritization and search tools, among others. The Alto was a brilliant machine, the precursor to the Apple machines, and Laurel would evolve to become a worthy Alto application. However, as of 1980, Laurel was not the state-of-the–art technology. Readers are encouraged to read the Laurel Manual for details.

10.11. Misuse #11: The Term "Email" Belongs To Compuserve

The statement:

> *"For years CompuServe users could type "GO EMAIL' to read their messages…."*
> (Compuserve Information Service User's Guide, 1983)

is a misdirection to attempt to convince readers that the term "email" existed prior to the invention of email --- the system of interlocked parts intended to emulate the interoffice, inter-organizational paper-based mail system.

The term "email" was created and coined by V.A. Shiva Ayyadurai in 1978 at UMDNJ. Those five characters E-M-A-I-L were juxtaposed together to name the main subroutine of the first email system. Ayyadurai coined the term email for the idiosyncratic reason that in 1978 FORTRAN IV only allowed for a six-character maximum variable and subroutine naming convention, and the RTE-IV operating system had a five-character limit for program names.

By 1980, Ayyadurai's email system was in production use at UMDNJ. Needless to say, EMAIL, the program, and its user manual were already in distribution around the UMDNJ campus. Email was a CompuServe trademark in 1983, but that remains a moot point for discussions of primacy. CompuServe applied for an EMAIL trademark on June 27, 1983, an effort that it abandoned in August 1984, likely because of the prior arte of email dating back to Ayyadurai's Copyright in 1982. However, for the sake of clarity and transparency, two instances of CompuServe's 1983 EMAIL advertising are included below:
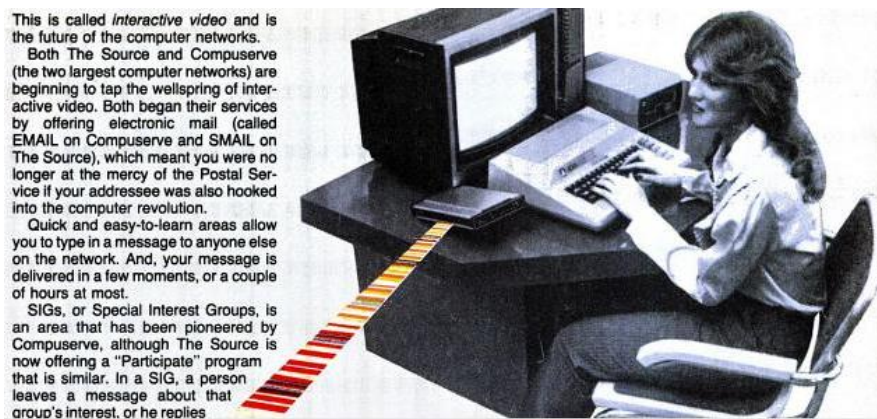

Fig. 8. Taken from the August, 1983 Edition of Popular Mechanics Magazine, pg. 107.

Fig. 9. Taken from the January, 1983 Edition of Byte Magazine.

It's important to note that CompuServe "popularized" the term 'Email' only to the extent that it triggered animosity and ridicule from system users; it was notoriously buggy and feature-light (Compuserve Information Service User's Guide, 1983).

10.12. Misuse #12: "Email" Has No Single Inventor

The statement:

> *"Email has no single inventor. There are dozens, maybe hundreds, of people who contributed to significant incremental 'firsts' in the development of email as we know it today. Theirs was a collective accomplishment, and theirs is a quiet pride (or at least was until recent press coverage provoked them). Email pioneer Ray Tomlinson has said of email's invention that, 'Any single development is stepping on the heels of the previous one and is so closely followed by the next that most advances are obscured. I think that few individuals will be remembered.'"* (Crocker, 2012)

is a misuse of the term "email" --- the system of interlocking parts intended to be a full-scale emulation of the interoffice, inter-organizational paper-based mail system. The individuals being referenced here as having been "email pioneers" and contributing the to the development of "email," including Mr. Tomlinson, did not contribute to the development of email, but rudimentary systems for text messaging.

More importantly, this statement is an attempt to feign humility with a "collaborative spirit," with the deliberate aim of isolating and dismissing Ayyadurai's singular and rightful position as the inventor of email. Ayyadurai did singularly create email, the system of interlocking parts emulating the entire interoffice, inter-organizational paper-based mail system.

The assertion that "email has no single inventor" and "email cannot be invented" are statements, which industry insiders began promoting after an article in the Washington Post appeared that "V.A. Shiva Ayyadurai honored as the inventor of email" (Kolawole, 2012).

For many decades, Raytheon's subsidiary, BBN, has been falsely promoting that it employs the "inventor of email," referring to Ray Tomlinson. Yet, prior to the ceremony to honor Ayyadurai's accomplishment and acquisition of the 50,000 lines of code, tapes, papers and artifacts documenting his invention, these insiders and the SIGCIS group did not expose or ever question the false statements attributing Mr. Tomlinson as "the inventor of email."

Raytheon/BBN put a great deal of effort into their own branding as innovators, by claiming publicly that they are the "inventors of email." This branding involves juxtaposing the "@" symbol with the face of Ray Tomlinson as the "inventor of email." In fact, on Raytheon/BBN's home page, the word "innovation" is visually juxtaposed next to the @ logo, with Tomlinson's picture overlaid (Raytheon/BBN, n.d.).

After the Smithsonian ceremony of Ayyadurai's invention, Raytheon/BBN sent press releases re-asserting that Tomlinson was the "inventor of email." Concomitant with these efforts, as the timeline shows of attack on Ayyadurai (Abraham, 2014) industry insiders, supported by SIGCIS "historians," Ray Tomlinson, BBN supporters, and ex-BBN employees continued to perpetuate a false history of email by discrediting Ayyadurai's invention as well as character assassinating him as an inventor and scientist. They used historical revisionism and confusion to re-define and misuse the term email. Through these efforts, they re-declared Tomlinson, and thereby the Raytheon/BBN brand, as the singular "inventor of email," the "Godfather of email," and the "King of email" (Hesse, 2012; Hicks, 2012).

One ex-BBNer, Dave Walden, though part of the Tomlinson coterie, acknowledged the following:

> *"Naturally this was discussed on the ex-BBN list. In my view, this "new guy" [Shiva Ayyadurai] has described something not quite like what the rest of us understand when we say 'email.'"* ('SIGCIS Blog', 2012)

Walden recognized the misuse of the term "email" as the transmission of text messages between terminals, as was the case with the early messaging systems such as MAIL. This text-message transmission can signify nearly all forms of digital communication—facsimiles, communicating word processors, online bulletin board systems, instant messaging clients, and formal communication.

However, email has a very clear meaning, as established by Ayyadurai in 1978: it is the electronic interoffice, inter-organizational paper-based mail system. It includes all the features one expects from paper mail systems: memo composition, editing, drafts, sorting, archival, forwarding, reply, registered mail, return receipt, prioritization, security, delivery retries, undeliverable notifications, group lists, bulk distribution, and managerial/administrative functions. It had to be fault-tolerant, familiar, and universal. By this definition, Ayyadurai's invention is the only instance in which this level of integration was first achieved, the same level we all experience nearly every other email products such as Gmail, Hotmail and others.

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