Black Coffee Table Book

Foreward

Welcome to *The Black Coffee Table Book*; a different kind of book about several subjects---none related to black coffee or black tables. Its subjects pertain to some work performed by two members of the Black family, my brother Tom and me.

The motivation for creating this book is three-fold: (a) to display my brother's craftsmanship of knifemaking; (b) to show some of the covers of my books in relation to Tom's knives; and (c) to draw parallels of the animal kingdom (wildlife) to modern communications networks. Well, I said the subjects were different.

The beautiful pictures of the mammals, birds, reptiles, and fish you see in this book are taken from the covers of a series of books I wrote about computer networks and the knives Tom made by using these pictures as models for his creations.

The analogies in this book (of computer networks to wildlife) are changed slightly from those in the original books. I simplified the comparisons of creatures to computer networks after several of my technically-impaired friends informed me they could not understand the books *or* their analogies.

Tom helped me write a short tutorial on how he makes a knife, from start to finish. If you wish to learn some of the details about custom-made knives, this explanation begins on page 42.

A brief note about the book cover artwork: With few exceptions, the publisher used non-copyrighted material. If you wish to copy some of the art, I have been informed you do not need permission from the publisher. Of course, the same goes for the pictures of the knives.

I hope you enjoy this book and I hope you enjoy your coffee while you are reading it. By the way, just in case you want to order one of the finest hand-made knives created, Tom can be reached at 505-344-2549.

1. The Horse

The cover for this book contains a beautiful picture. Tom's knife rendition of the horse and the colors on the cover is stunning. The motivation for using this creature on the cover of *Emerging Communications Technologies* was a reference I made to a quote from Henry David Thoreau's *Walden* regarding the fast pace of our lives. At the time of the book's writing, it seemed we were becoming so enamored with the fast-paced tempo of our everyday lives that we sometimes forgot about the quality of our day-to-day moments. I wrote this book several years ago and I have not changed my mind about this matter.

Many of us now have broadband connections to our computers at our homes, through our cable TV, or telephone company providers. No question, once you have broadband, it is painful to fall-back to those slow dial-up connections. But the information is the same. It may still be Spam---we just get it faster. As I said in the preface to this book:

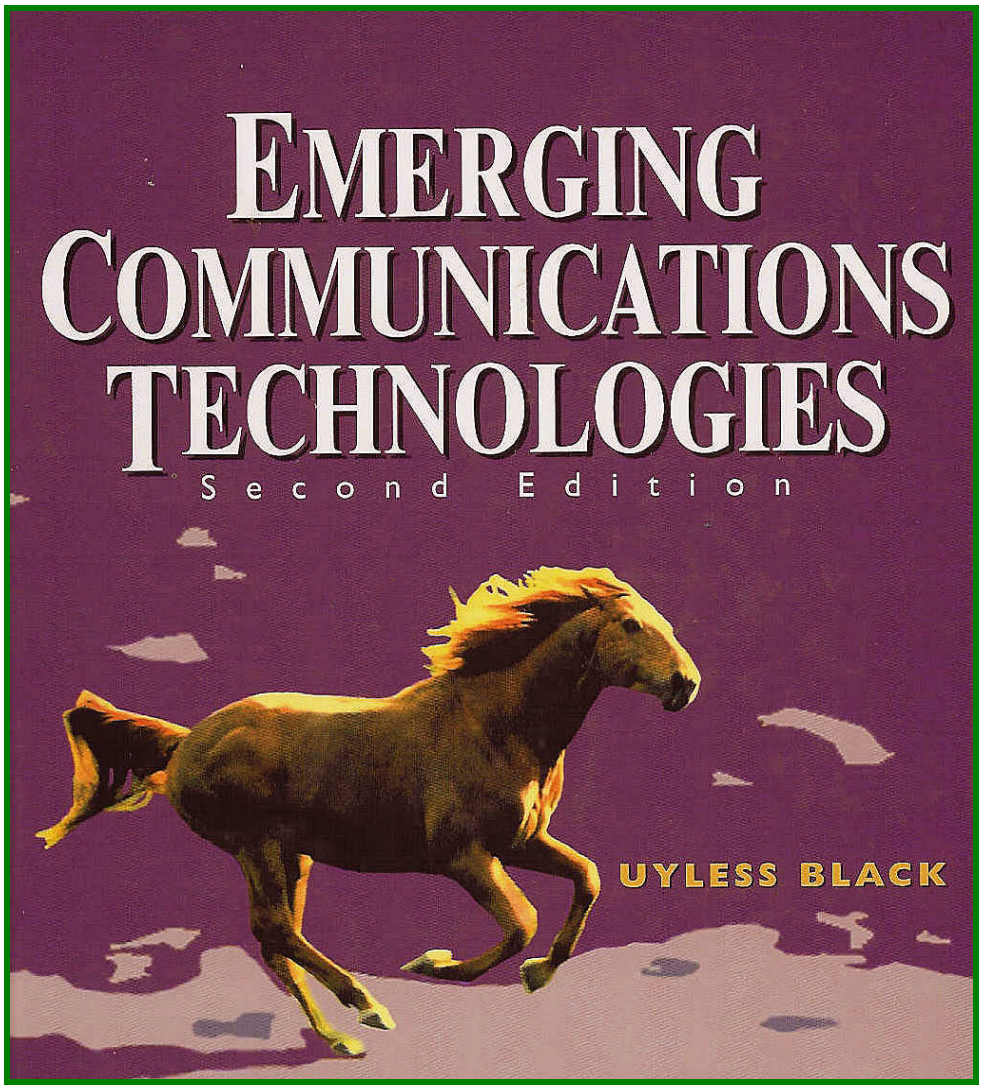
> With no disrespect intended to the citizens of Maine and Texas, this book is dedicated to Henry David Thoreau who, in 1845, said:
>
> > We are in great haste to construct a magnetic telegraph from Maine to Texas; but Maine and Texas, it may be, have nothing to communicate.
>
> It appears now, after some 150 years, that not only do the citizens of Maine and Texas have something to communicate, but much of the world as well. This book is a modest attempt to explain the technical underpinnings of the new "magnetic telegraphs" that will carry our information age into the twenty-first century. At the same time it is a good idea to remember another Thoreau thought, also from *Walden*:
>
> > After all, the man whose horse trots a mile a minute does not [necessarily] carry the most important message.

Tom used an unusual stone for the knife handle, the distinctive pinkish/purple material shown in the figure. It is called Sugalite, which is a relatively soft material that can be shaped with a conventional grinding process.

Tom is a gifted knifemaker but he is not an engraver. The metal engraving on the knives featured in this book, including the creatures, was rendered by Bruce Shaw, of Pacific Grove, California. Bruce can be reached at 831-646-1937 and I wish to thank him for his very fine work on these knives.

This knife shows the bladed folded into the handle. Tom's signature is shown on the blade, but upside down because of the closed blade position. Notice the notch on the top of the Sugalite stone, also on top of the handle. By pressing the metal in this notch, the open blade can be closed.

Although I don't use any of these knives for cutting, Tom has promised I can cut with them as much as I want and he will keep them sharp and polished. Fine, but I carry around a Swiss army knife for any pedestrian cutting requirements I might encounter in my sojourns outside our kitchen. And for our kitchen, Tom has made us many paring knives and meat cleavers. I hope to "commission" him to make us a carving set. Now that I have retired, my wife Holly has delegated the title of meat carver to me. Thus far, I had successfully mangled two turtle doves, three French hens, four calling birds, and several partridges---but no pear trees…at least, as of this writing.


EMERGING
COMMUNICATIONS
TECHNOLOGIES
Second Edition
UYLESS BLACK

2. The Seagulls

When you read the seagulls analogy in the book *Asynchronous Transfer Mode* (ATM), it might appear I have a fixation on speed. Nope; just looking for an excuse to put a bird on my cover and I have been fond of seagulls for many years. You may remember the book to which I refer in this analogy; it is *Jonathon Livingston Seagull*. Yes I read it, and I liked it; I also read (and liked) *Love Story*. I suppose my taste in recreational reading disqualifies me from understanding and appreciating deep tomes but I do draw the line with Danielle Steele, as well as Ann Coulter, Rush Limbaugh, Bill O'Reilly, Al Franken, and other extreme right/left wing zealots.

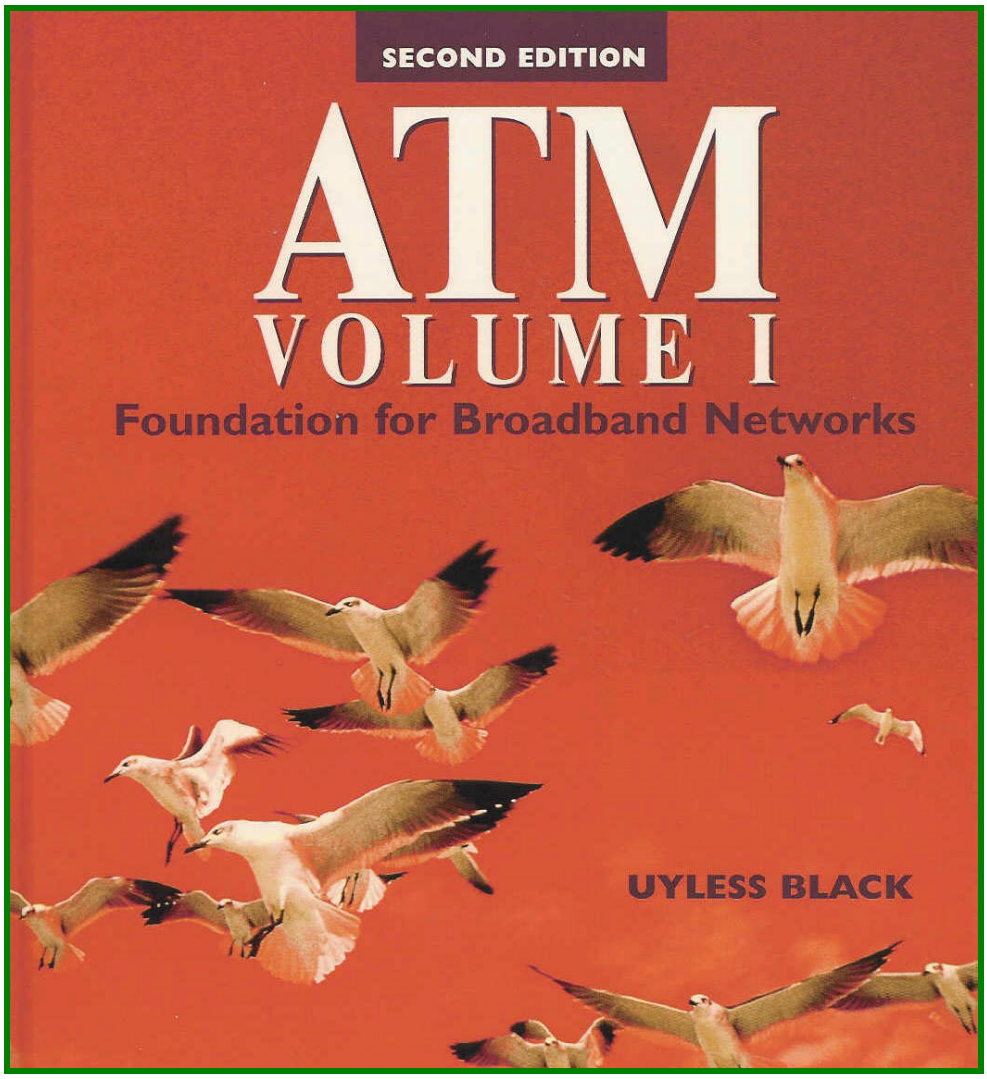
Here is the analogy for the ATM book, which by the way, does not explain how to make withdrawals from a bank.

> Once upon a time, a fictional creature in a novel was discussing the speed of the flight of birds and proclaimed, "Perfect speed is being there." I have thought about this idea in relation to telecommunications and computer networks.
>
> Aside from the physical limitations of the bird's abilities and the philosophical implications of this utterance, it is appropriate to bring to mind that many of our modern technologies are attempting to close the gap (the time) between being in one place, and then another. Just consider the progress made in air transport over the last century: travel to a distant part of our planet has been compressed to a few hours.
>
> For this book, the issue is not the flight of birds, or the transport of humans, but the movement of messages of information, such as email, through a communications network.
>
> With our current knowledge, we cannot achieve the bird's goal of attaining perfect speed, due to the delay inherent in the physical aspects of travel. So, until we conquer other dimensions of travel, we are restricted to interpreting "being there" as the bird's physical flight from one point to another and its quest to make the flight a shorter duration.
>
> This goal has been an important aspect of communications networks since their inception, and the speed and efficiency of modern networks has surely had a profound effect on our personal and professional lives. It is certain you would not be doing email if the Internet had not made inroads into Jonathan Livingston Seagull's notion of speed.
>
> At the same time, it is instructive to remember our reading a "faster email" does not necessarily make its contents any better. There is surely a big difference between the speed of information we receive and its quality.

Tom's knife handle is made up of a special wood, often used for knife handles, called maple burl. The wood gets its distinctive color due to its being dyed---for this handle, an orange color.

Notice the four small metallic circles on the maple burl. They are called "pins." Tom runs them through the cross-section of the knife to anchor all the parts together. Their number and their placement vary, depending on the size of the handle cover, the amount of engraving, and the possible existence of scrimshaw on the handle (scrimshaw will be explained when we see it for the first time in this book).

Notice also the butt of the handle. This part of the knife will vary in shape, depending on Tom's view of how he wants the knife to look. If you pay attention to this part of the knives in this book, you will see they take several shapes.


SECOND EDITION
ATM
VOLUME I
Foundation for Broadband Networks
UYLESS BLACK

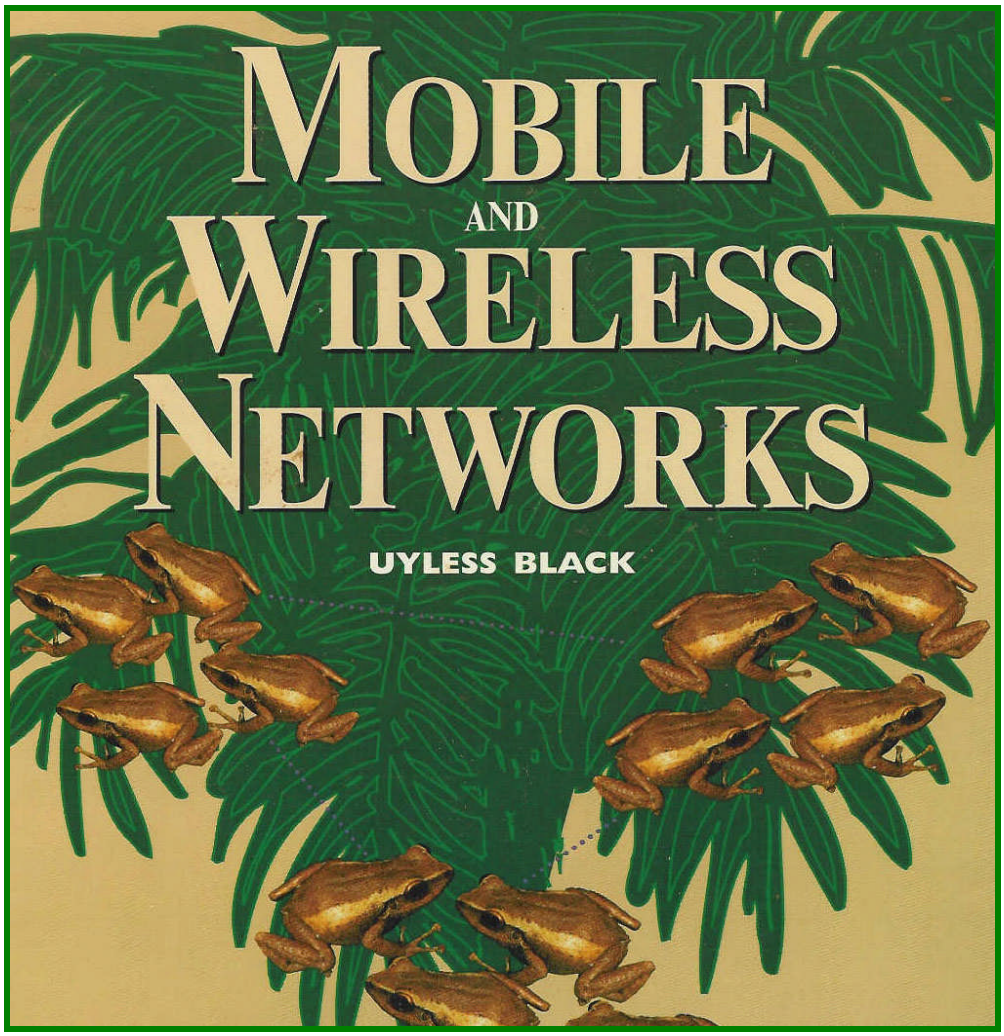
3. The Frogs

Frogs were the first wildlife to appear on one of the covers of my books. The book was successful and several positive reviews came from the critics, but the most interesting critique was a complimentary review---not on the book's content but on my analogy comparing cell phones to frogs living in Puerto Rico. The reviewer offered no comments whatsoever on the main body of the book! I was tempted to call the reviewer and ask for his opinion about the material that followed the cover but I decided to let sleeping dogs (well, in this case, frogs) lie.

If you use a cell phone, I think you will find this analogy interesting.

> The creature analogy for this book deals with your cell phone. The example is a frog: specifically, the diminutive coqui (36-millimeters in length). This amazing amphibian displays many of the sophisticated features we find in mobile and wireless communications, which in effect, imitate the frog's communications skills.
>
> In the tropical rain forests of Puerto Rico, where the coqui makes its home, many frogs live in each part of the forest. Because of this population density, the coqui must share the audible frequency spectrum with other frogs, something like two people talking at the same time, but using high and low pitched speech. To ensure that a frog communicates effectively with another, each frog uses a variety of different frequencies when it croaks to its intended listener. The frog listener is capable of filtering the extraneous croaks of its neighbors and processing those signals relevant to the communications. Your cell phone network uses these ideas to share the available radio spectrum.
>
> What is equally extraordinary, some of these frogs "place calls" (emit croaks) at particular times of the day so they do not interfere with their neighbor's conversations. So do cellular networks.
>
> As if these special capabilities were not impressive enough, the coqui uses these slots of time not only during a particular time of day, but during *each split-second* of the day (so does your cell phone!). The frog knows when (and when not) to croak in order to reduce or eliminate possible interference with a neighbor in the same area of the forest. In wireless and mobile jargon, this capability is called a "talk spurt." Perhaps we can dub the capabilities of these frogs as "croak spurts."
>
> Our society has invested extensive resources in developing the sophisticated technology called cell phones. Yet, in the ancient reaches of a primitive rain forest, we find a tiny frog that has been developing and refining these communications capabilities for millions of years.
>
> With all due respect to certain special people in my life to whom I have dedicated my books, the dedication for this book is not meant to slight them. Nonetheless, this book is dedicated to that wonderful little amphibian, the frog.

My friends who have viewed this collection of knives often comment on the handle of the frog knife. It is made of Paua shell, a crustacean, whose shell is similar to mother-of-pearl. Paua is easy to work with but care must be taken when grinding it. If inhaled into the lungs, it remains there until the afflicted person inhales from an Anti-Paua Shell Respirator, which as of this writing, has not yet been invented.


MOBILE
AND
WIRELESS
NETWORKS
UYLESS BLACK

4. Fire Flies (Lightning Bugs)

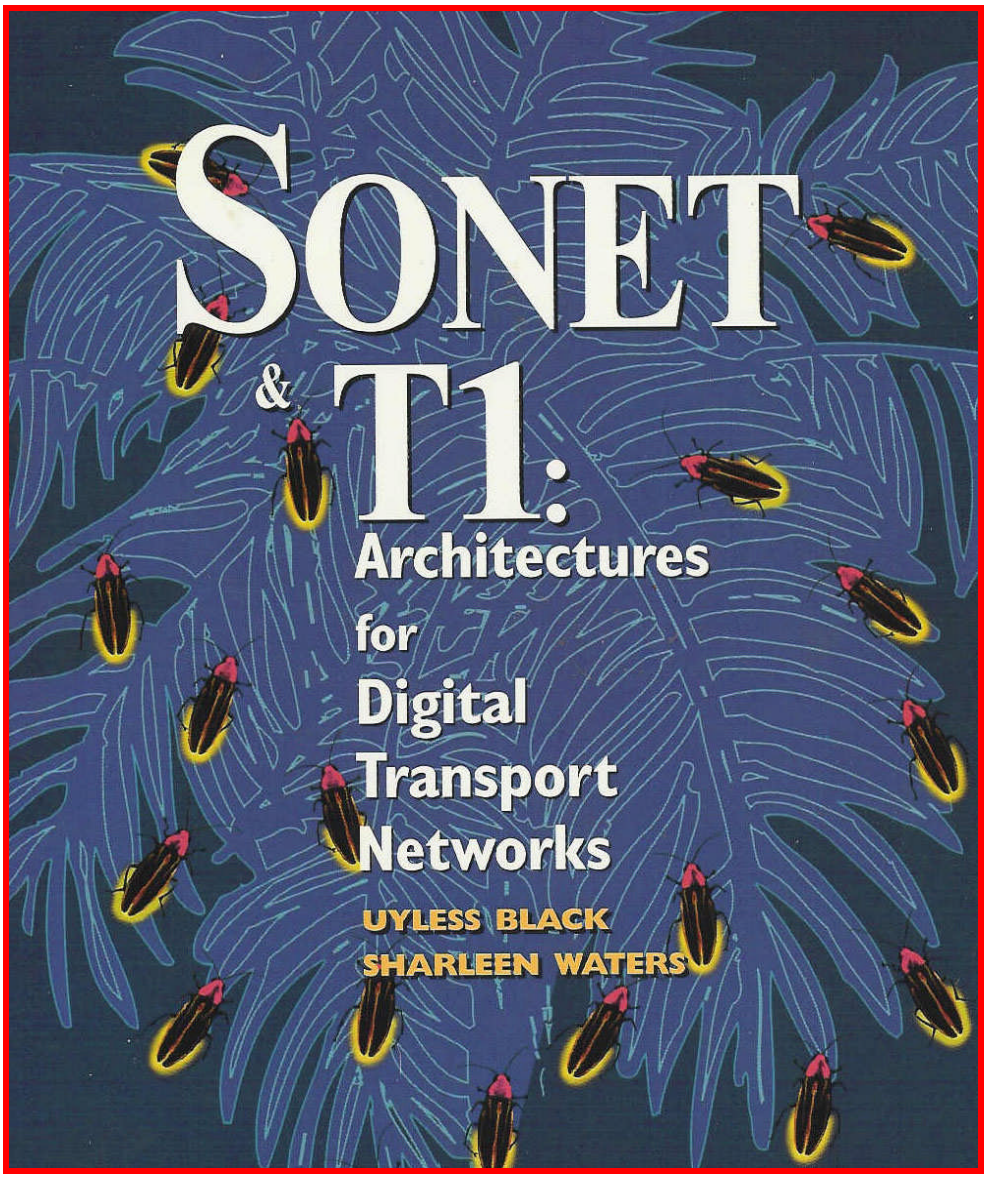
The insects on the cover of the *SONET and T1* book are difficult to identify. I was disappointed with the artist's depiction and informed my publisher the artwork was not acceptable. After all, the subject matter of this book is abstract enough; it did not need an equally abstract cover. This picture was the third rendition from the publisher's artist. The first two were scarier than a Michael Jackson picture. And in fairness, I paid a visit to the local library, looked up a picture of a firefly, and concluded the depicted the fire flies accurately. You will also notice another name on the cover of this book, Sharleen Waters, my sister-in-law. We co-authored this book. Here is the preface:

> The focus of this book is the subject of modern telecommunications systems conveying information with digital, light signals (1s and 0s over optical fibers). I used the term modern in the previous sentence but communications with light signals have been in existence for many years.
>
> For example, light semaphores with fire (and later mirrors) have been used for centuries in both commercial activities and in warfare, and the earliest digital light-sending machine in existence is probably the firefly (or lightning bug).
>
> Firefly experts (yes, they do exist, probably funded by your tax dollars) claim fireflies use their lights to signal to each other to find mates (the subject matter for this book is not quite so interesting). Some tropical species congregate in groups and flash their lights in unison. Who knows? Perhaps they are having a party, but the experts do not know the reason for this behavior. Several authorities believe the flashing is a protective mechanism to warn predators of the firefly's bitter taste. Some predators don't care; certain frogs eat such large numbers of fireflies that they themselves glow. (I wanted to include a frog's glowing stomach on the cover of this book, but my publisher insisted on adhering to a kill-joy clause in my contract: a cover must be in good taste).
>
> The firefly's signals are much more complex than those described in this book. There are over 2,000 known species of fireflies and each species produces different signaling patterns. For example, when a female detects a nearby male flashing a specific signal, she answers with her own signal. But these signals differ within each species, if only by a small degree.
>
> While the signals may be complex, the firefly's signaling speed is not very impressive. Most species emit only two or three pulses every few seconds. The systems in this book are capable of signaling rates of well over 10 billion signals per second.
>
> Nonetheless, as stated in the other books in this series, it is instructive to know the technical marvels of the modern world are once again preempted by nature; in this case, an insect.

Tom's choice for this handle is ivory Micarta$_{TM}$. For the PETA readers, don't become upset. It is not ivory from an elephant or walrus. In fact, Tom no longer hunts---he is a born again creature lover. The material looks like ivory so someone dubbed it "ivory" Micarta.

Micarta is made of paper. Tree huggers, don't be upset. I am told the paper comes from recycled paper. Thus, ivory Micarta is politically and environmentally correct.

The creature is rendered in scrimshaw and the artist is Dennis Holland, of Lubbock, Texas. He can be reached at 806-799-8427, and I thank him for his wonderful artistry and contribution to these knives. We will return to Dennis' work later in the book and examine the art and craft of scrimshaw.


SONET
&
T1:
Architectures
for
Digital
Transport
Networks
UYLESS BLACK
SHARLEEN WATERS

5. The Fish

Writing books was an easy chore for me. But I am certain the ease I experienced was due partially to the nature of my books' subjects. Computer networks are relatively new in our lives and they are continually changing. Thus, I had an abundance of material with which to work. I read that many writers experience writer's block; Norman Mailer explains the malady well in his book, *The Spooky Art*.

I am now writing essays, short stories, and a science fiction/social commentary novel, but I still find writing to be an easy chore. I do not lack for material or the motivation to write (No writer's block thus far). I don't write much anymore, perhaps ten to twelve hours a week, and luckily, I do not need income from my writing, so I can write about anything I find of interest.

The reason I am discussing writer's block is two-fold. First, to tell you a funny story, and second to introduce my fish analogy.

During the height of my technical work, I was writing four or five books a year, plus creating lectures and articles---coupled with running my consulting and training company. To say the least, I was focused. Like most writers, I quickly discovered discipline was essential to getting the manuscript completed. I took very few days off for years and wrote several to many pages of text each day.

My publishers seemed to have insatiable appetites. I would merely mention a possible title for a book, and the response would be, "We'll put a contract in the mail today."

I am not complaining. I was gratified to know my work was accepted in the industry (so were the tax people). But at times, I felt like the character in the movie *Amadeus*, who had the musical grim reaper knock on his door every few days, demanding more sheets of music. My counterpart to this macabre person was my publisher. …Of course, no one twisted my arm to sign another book contract.

Here is my fish analogy for the *ISDN and SS7* book.

> The subject of this book is signaling systems in computer networks, a subject akin to an instant sleeping pill to many people. But it is a vital technology, because it deals with how computers discover the existence of each other in, say, the Internet, and send messages to one another to establish a connection on behalf of computer users. One result is our ability to send email to each other.
>
> We do not see this process when we send the email, or engage in a chat session, yet it is there, and we could not use the Internet if these signaling systems did not exist.
>
> The email process is similar to the exchanges that take place in a conversation between humans. In a nutshell, computer networks mimic human communications; signaling systems have ways of saying hello, goodbye, I don't understand what you are saying…even stop talking!
>
> And in a remarkably similar fashion, computer networks also mimic the "signaling" of other creatures on this planet. In fact, some animals, birds, and fish have long possessed the signaling facilities that have recently been placed in telephone networks and the Internet. Albeit for these modern networks, they have been set up with excruciating exactitude and at enormous expense.

5. The Fish, continued

One of the most remarkable signaling creatures I have come across is the fish, at least certain fish. While writing this book, I read an article about how some fish have the ability, through electrically generated signals, to signal to other fishes important facts, such as the type of fish sending the signal, the territory the fish controls, whether the fish is going to fight or not, and for mating purposes, the sex of the fish. The "messages" exchanged between the fishes are much like those described in the first paragraphs of this preface--they discover the existence of other fish; they establish communications. In effect, they send their own versions of email.

As computers become more "intelligent," it is assumed by many people that these machines will someday be able to replicate not just the brains of fish, but the human brain. Bill Gates stated in an interview, "All the neurons in the brain that make up perceptions and emotions operate in a binary fashion. We can someday replicate that on a machine. Eventually, we'll be able to sequence the human genome and replicate how nature did intelligence in a carbon-based system."

This scenario may indeed happen someday in the future, but it is appropriate to quote another noted individual, Albert Einstein, about this topic, "Try and penetrate with our limited means the secrets of nature and you will find that, behind all the discernible concatenations, there remains something subtle, intangible, and inexplicable.....The most beautiful and deepest experience a man can have is the sense of the mysterious."

But of course, Einstein did not have the use of the computer during his time, nor did he have the advice of Bill Gates. He had only his brain.

Tom and I were not ecstatic about the engraving on the handle of the fish knife. Tom's instructions to Bruce for all knives was to render the image of the wildlife on the cover of the book as closely as possible to the final engraving on the knife. I emphasize again: Bruce is a talented artist and did very fine work on these knives. And I suspect some of the minor problems that occurred between Tom and Bruce were due to their sensitive, artistic natures.

Anyway, back to the fish engraving. It appears Bruce did not look at the book cover or Tom did not send it to him. His interpretation of the fish is a noble, combating trout---jumping from the water, fighting the fisherman's hook and line. The fish on the book's cover could not appear any more placid and noncombative. In fact, they seem to be gliding along in their quiet, aqueous ether---oblivious to their surroundings. Actually, they appear to be dead. Maybe they are; who knows where my publisher obtained the model from which this cover was made? Ah well, the term artistic license was coined a for good reason.

The knife's handle often draws comments and compliments from those who have viewed this collection. I like it, too. It is made of a metal called Mokume, which is a combination of copper, nickel, and brass. I find it striking, and my brother gave me a gift of a small folder with a Mokume handle. I carry it around for good luck; seems to be working---I am alive and well to write this paragraph.

Take a look at the blade of this knife. It is our first example of a blade made with Damascus steel. We will have more to say about Damascus steel later in this book. As you can see, the blade differs from the knives we have examined thus far. For now, it is fitting to identify the gifted, talented man who makes this material for Tom's knives. His name is Devin Thomas, of Panaca, Nevada. Devin can be reached at 775-728-4363.

5. The Fish, continued

Earlier, I mentioned the use of certain substances for knife handles can be a sensitive issue. It would seem this handle of Mokume, again a combination of various metals, could not possibly raise any dander. But it did. A couple years ago, I was showing this knife collection to some acquaintances at a neighborhood party. I explained the handles were chosen to reflect the color and theme of the book, and if possible, the creature on the cover. To my surprise and bewilderment, one of the neighbors thought the Mokume was some type of fish skin!…and an innocent fish had been sacrificed to make a knife handle. She was irritated with my possession of the knife and my contribution to the decline of the fish population in earth's waters.

For the life of me, I don't know how this person made this inference. In fact, I think the Damascus *blade* on this knife more closely resembles a fish skin than the *handle*. I explained that the handle was not any sort of vulcanized, calcified, or petrified fish skin---that it was metal. As I explained this fact, I was hoping none of the other neighbors would accost me for contributing to the strip-mining industry.

It is impossible to satisfy some people. Earlier, I mentioned some of the knife handles are made of ivory Macarta, a composite of many sheets of paper, bonded together with sophisticated, highly technical combination of: intense heat, immense pressure, and Elmer's glue. Just joking, the bonding material is a special epoxy.

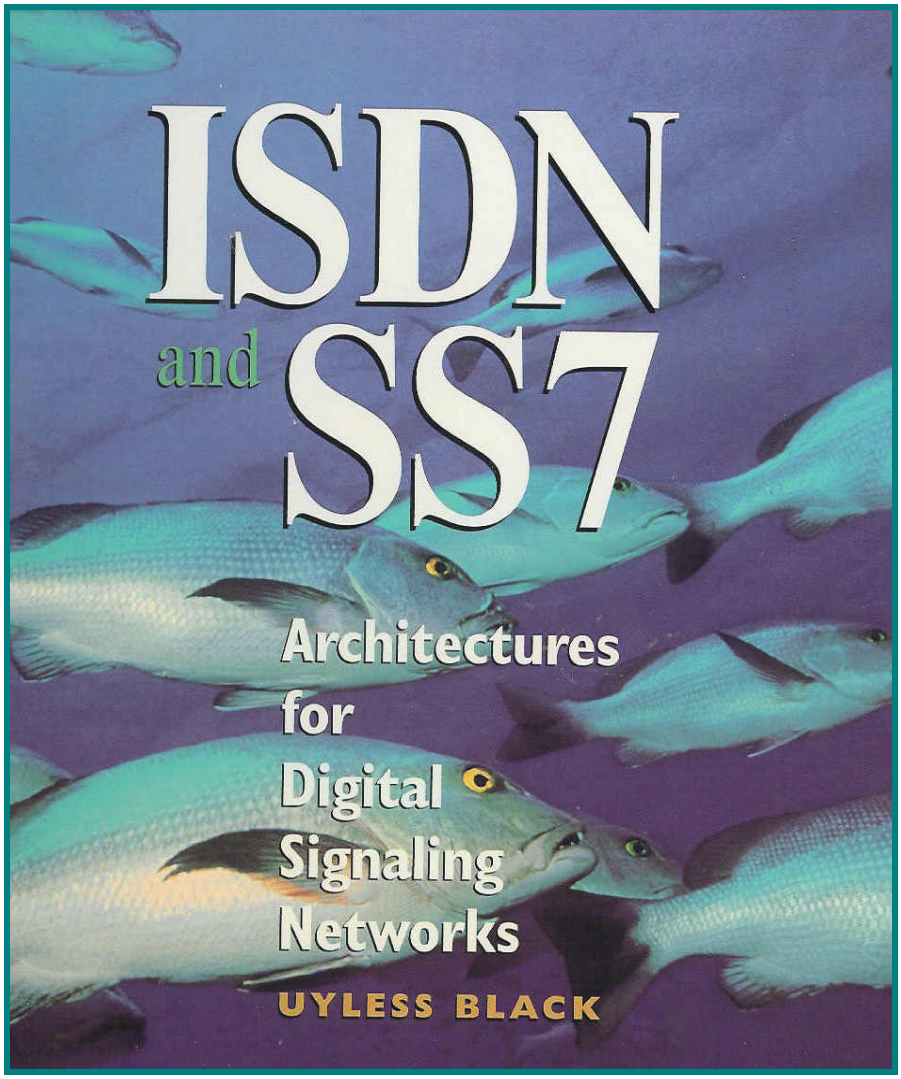
Regarding this handle material, Tom told me he was once assailed by a person at a knife show who said something to the effect of, "If you call it ivory, people think it is real ivory. Therefore, you are implying it is OK to kill ivory-endowed animals."

Tom implied nothing of the sort. The person inferred what that person choose to infer, based on his values, biases, and prejudices. Indeed, after attending several knife shows, I came away with a heightened awareness of the problems of indiscriminate use of body parts from endangered creatures. Many exhibitions have signs proclaiming the materials are not taken from any endangered species, and some signs urge the reader to protect all extant critters.

Let's change our pace and let me tell you a funny story about the engraving on Tom's knives, again executed by Bruce Shaw. At one of the knife shows, Tom was awarded a "runner-up" trophy for best dagger of the show. The knife maker (let's call him Bill) who won the first prize was married to a gifted engraver, who did the engraving for this trophy knife. While talking to one of the judges about the contest, the judge informed Tom he might have fared better if he had done his own engraving! Strange, the judge seemed to imply the other knifemaker's marriage to an engraver somehow morphed his wife's skills into those of the knifemaker.

Tom and I looked at each other for a moment, both puzzled and amused. And Tom, seldom at a loss for words or a tart response, replied, "True. I do use an engraver. But so does Bill. The difference between Bill and me is that Bill sleeps with his engraver and I don't sleep with mine."

The judge seemed oblivious to Tom's sarcasm. In hindsight, we were not surprised. His recommendation regarding Tom's engraver demonstrated an obtuseness usually absent in knife show judges---but prevalent in ice skating judges. On the other hand, he may have been pulling Tom's leg.


ISDN
and
SS7
Architectures
for
Digital
Signaling
Networks
UYLESS BLACK

6. Dolphins

This book is titled *ATM, Volume II*. Another book on bank machines? No, it's more information on the Asynchronous Transfer Mode. ATM was so popular in the mid to late 1990s that I wrote three books on the subject. Here is my analogy of dolphins and computer networks.

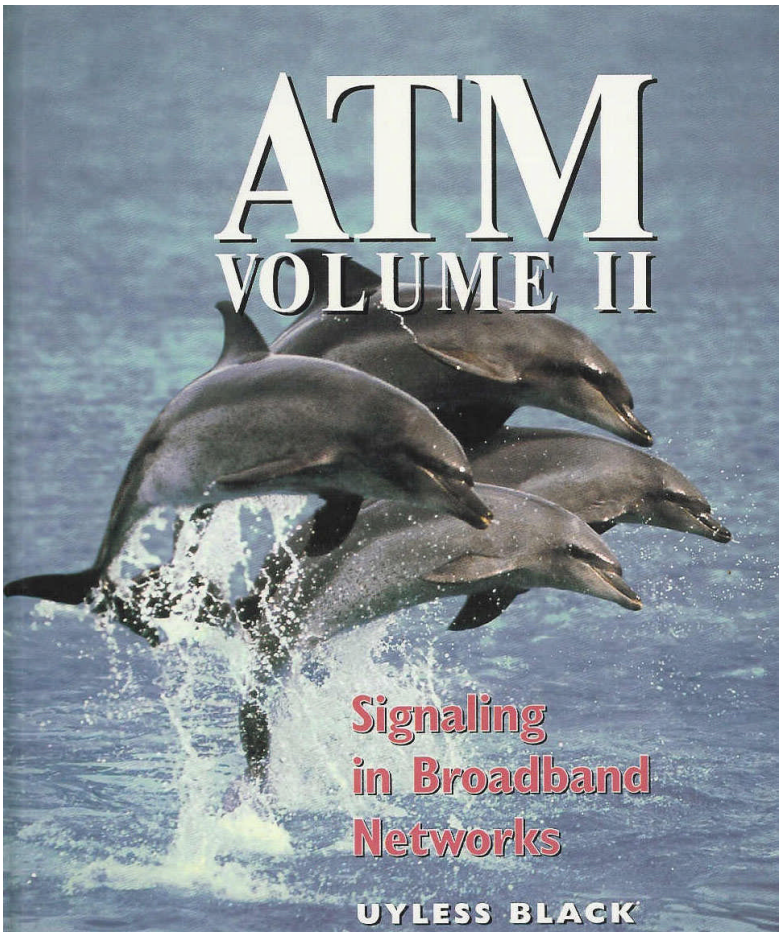
> During the time I was writing this book about communications networks, I happened to watch a film about dolphins. The film demonstrated how dolphins communicate among themselves with certain types of audible signals and how they use different signals for selected purposes such as location detection and mating behavior.
>
> I was intrigued by the nature of their communication signals. At times they seem to send digital "clicks" -- something like the binary pulses employed by modern computer-based networks. At other times, they emitted different audible signals similar to a squeal or a high-pitched analog whistle---something like our telephone voice conversations. In a remarkable display of communications versatility, they alternated between transmitting "digital pulses" and "analog audible signals" depending upon the occasion. These capabilities are performed by human-made systems with great difficulty and awkwardness (something like our mobile phone technology).
>
> Upon further study, I discovered the dolphins' digital clicks are also used as sonar signals and through a process called echolocation, dolphins can navigate and stay aware of their location and surroundings (something like our use of the global positioning system [GPS]). Some researchers even claim dolphins can use their signals to stun or kill a prey of another species with an acoustic shock (something like our use of the boom box on our own species).
>
> Dolphins are quite social and scientists state they possess an intelligence level far above most other mammals. They are said to be great imitators and some can emulate parts of human speech. But in the final analysis, it is we humans who are the imitators. Time and time again, we find that our human creations and inventions are antedated by the natural world; in this case, the dolphin.

The knife for the dolphin book is shown on the facing page. I expect you might first notice the handle material. It is made of imitation tortoise shell…not actual tortoise shell. The real stuff can no longer be used on knife handles, guitar picks, pipe stems, or the dashboards on Elvis Presley's cars.

I found an empty tortoise shell a few months ago on my property in Virginia. The resident had either gone for a visit to a turtle nudist camp or met its demise in the forests surrounding its home. I asked Tom if I could use this shell for, say, a knife handle. After all, this shell had no future. Tom's reply, "No can do. Tortoise shell is forbidden."

So, the material on this knife is a celluloid substance; a concoction of soluble guncotton, camphor, and other materials that stink to high heaven when heated. The material is also subject to spontaneous combustion; if Tom grinds a celluloid handle too fast or with too much pressure, it will burst into flames in his hands. Overall, celluloid is hard to work with because it is soft and requires a deft touch when grinding it.

One short anecdote before we move on. When I was younger, I carried a fantasy of swimming with dolphins (Just look at those dolphin faces on this book cover; who wouldn't want to join in their frolic?). During those times, only a select few people had this rare privilege; The Sea Hunt movie stars, Jacques Cousteau, Easter Williams (ok, I also had another fantasy about swimming with Easter….). Anyway, in my recent travels, I have discovered that swimming with dolphins has become as common as a visit to DisneyWorld. A sign on a Florida beach reads, "Ten dollars gets you two minutes of side-stroking with Danny the Dolphin."…So much for my fantasy.


ATM
VOLUME II
Signaling
in Broadband
Networks
UYLESS BLACK

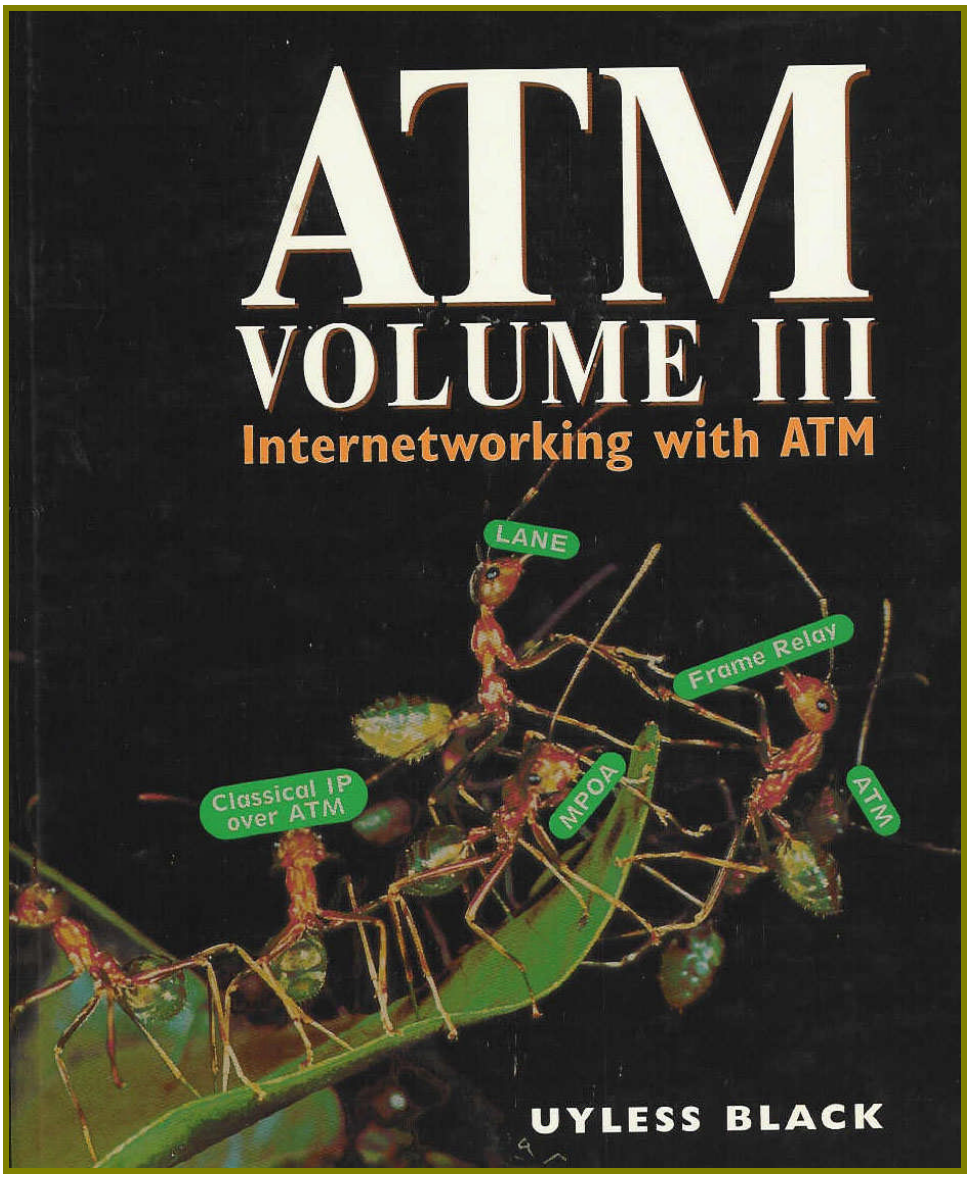
7. The Ants

The ants on the cover of *ATM volume III* were not a big hit with my publisher's staff. They thought the insect was unattractive and would discourage a potential reader from selecting the book from a shelf in a bookstore or from ordering from the publisher's Web page. I was insistent because I thought my analogy was appropriate and also entertaining. Without too much resistance, Prentice Hall went along with my idea.

I must define one technical term before you read further. The words *virtual network* mean you think the network exists but it does not. Technical mumbo-jumbo? Not really. For example, many of us use virtual private networks. This term means were are actually using a public network---say, one operated by AOL or MSN. However, these network providers give us security features (and other things) that make it appear we are using a private network. Thus, virtual means you think you have it but it really does not exist. Here is the analogy for this book.

> Our ability to send emails through the Internet requires a great deal of cooperative interaction between our computers, and many other computers in the Internet. In a sense, these machines must have some type of "social structure" in order for them to be able to send our email back and forth. Since they may be in different geographical areas of our planet, perhaps far-apart from each other, they must discover where each is located---like finding a route on a road map.
>
> In conducting research for the books in this series, and as part of my interest in nature, I have noticed the similarities of computer networks' behavior to that of creatures in the natural world. For this book, I have chosen the common ant as an analogy to computer networking.
>
> In my youth, I spent a lot of time watching ants (I was a pre-TV child and thus had a lot of spare time). I watched the ant wander around during its foraging efforts. Yet the ant always knew where its residence was --- its home ant colony---and always found its way home.
>
> I learned the ant finds its way by environmental clues. But on occasion, the ant is not very efficient. For example, some ants use a process called light-compass orientation and take their clues from the sun's angle to them. Try placing a box on top of an ant that is walking about in your yard. If the box is left over the ant for, say, an hour, and then removed, the ant will strike out in a different direction from its original course, by an angle equal to the number of degrees the sun moved during the ant's confinement. Well, perhaps not too impressive, but an ant should not have to deal with a curious boy attacking the unwary insect with a match box cover.
>
> Aside from their navigational skills, one of the most remarkable attributes of ants is their prodigious strength. Some can lift a stone 60 times their own weight. This impressive fact lead me to use the ant for the cover of this book, symbolized by their carting-around different kinds of networks.
>
> The ant is quite efficient; it does not waste much time hauling non-productive things to its colony. So, even though virtual networks are part of the subject matter of this book, I chose not to show this term on the cover. After all, no self-respecting ant would waste its time transporting something that doesn't exist.

For this knife, Tom used Buckskin Micarta and Dennis did a masterful job on the scrimshaw work. His choice of the reddish-brown ink makes for a comely combination with the Micarta color.


ATM
VOLUME III
Internetworking with ATM
LANE
Frame Relay
Classical IP over ATM
MPOA
ATM
UYLESS BLACK

8. The Chameleon

My publisher liked my creature choice for the *Advanced Internet Technologies* book. They told me it would catch a potential reader's eye (so would ants, but I think they had a prejudice against insects). I agreed but I never selected a creature based on its visual appeal. I had enough difficulty coming up with a creature-computer network analogy. Therefore, I let the marketing people worry about how the book cover might appeal to a potential reader.

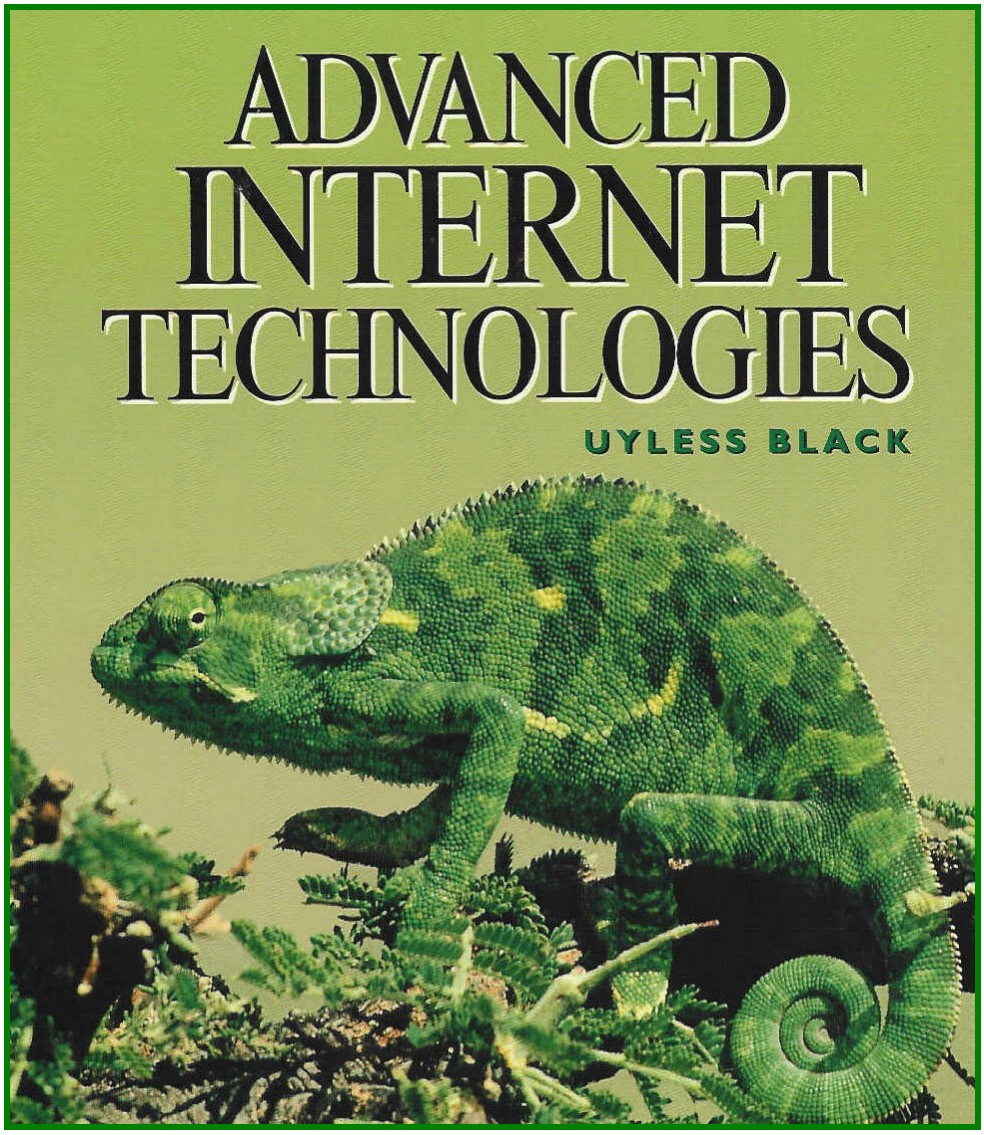
It will be interesting to see if my predictions in this analogy come to pass. My view now is the same as when I wrote this book: eventually all our communications will take place over data networks designed for any application, be it voice, video, data, or a computer game. You name it, and it will be supported by one network---probably owned by the software dictator, Bill Gates. He is becoming omnipresent; even Andy Rooney *on Sixty Minutes* complains about his systems. Here is the analogy for this book.

> I have chosen the chameleon to grace the cover of this book because of its ability to change its color. This change is in response to stimuli such as heat and light. Some scientists believe the chameleon also changes its color due to emotions such as fear, its reactions to a fight with another chameleon, and other feelings. The researchers think the color changes have survival value.
>
> Like a chameleon, the Internet is trying to change its colors from a data-only shade to a multimedia hue. And in order to survive, the Internet must change. If it remains a data-only network, it will be by-passed by users whose applications demand a network to support the integration of voice, video, and data.
>
> For the public Internet, the task is a challenging one, because its basic architecture is not tuned for the efficient support of voice and video traffic. With a private internet, the task will be easier because the network manager will have more control over network resources.
>
> But the Internet will (and is) changing. Voice, video, and multimedia conferencing applications are emerging and finding their way into products. And eventually, the final tint of the Internet will be a fully integrated multimedia network.

Tom chose dyed maple burl for the handle for the knife. The combination of the work on the knife, its color, and the super engraving by Bruce result in a knife that is one of my favorites of this collection. Its close relationship to the chameleon is accentuated by the use of Damascus for the blade. Also, Devin's design of this Damascus looks a bit scaly---like that of the skin of a reptile.

Speaking of Devin and Damascus, the rich multi-dimensional look of Damascus comes from two different kinds of steel that have been softened with intense heat (1,900 degrees), forge-welded together by using a trip hammer (a hydraulic device that pounds steel), then repetitively folded over one to many times (between each forge-weld), to create multi-layers of steel.[1] The different patterns you see in the figures are the result of Devin's crafting techniques. For example, one method is to put small dents in the steel; when folded and forge-welded, these dents will create small circles in the steel. The results, as shown in several knives in this book, are stunning.

[1] The number of layers increase exponentially with each fold: 2, 4, 8, 16, 32, 64, 128, 256, 512, etc.


ADVANCED
INTERNET
TECHNOLOGIES
UYLESS BLACK

9. The Bees

I am not bursting at my seams with enthusiasm about the cover of the *Residential Broadband Networks* book but I think Tom's associated knife is superb. The publisher's artist and I worked on the picture for several weeks (well, he worked, and I complained). I edited the picture---changing the contrast and the brightness---which improved the image considerably, but it still is less than stellar. No wonder the book did not sell well. Who wants to buy an expensive book with an ugly cover…even if the cover has absolutely nothing to do with the book's subject. Just joking. The book sold well for a few nanoseconds. Then, like most topics in the computer networks industry, it was out of date and placed on the back shelves of book stores and users' libraries. Here is the preface and the creature analogy.

> Not long ago, I read an article about how bees establish and maintain their residence, the beehive. Since my business is communication networks and I was in the middle of doing research on residential broadband technologies, I was curious about how the bee communicates with the other bees in its hive. I was especially interested in the scout bee and field bees that fly-off from the hive---one searching for nectar, and the other bringing it back.
>
> My curiosity was heightened by watching bees forage in beds of flowers; it seemed there would be one bee initially involved in the excursion, but before long, a group of bees would be at the same flower bed. After more reading, I discovered the bee possesses a remarkable signaling capability, one that allows the bee to inform other bees about the location of the nectar and its type. I also discovered the bee culture is similar in some aspects to the culture found in modern businesses.
>
> Before I describe the bee's communications skills, as well as its organizational behavior, let me digress a moment and say that (from an anthropomorphic view), the field bee must have the best job in the hive (except for the queen bee, if one likes couch potatoes). The role of the field bee represents the last in a series of "promotions" within the hive.
>
> Most of the bees in the hive are worker bees, and these bees must perform lesser jobs when they are younger, such as feeding the larvae and guarding the hive. But the last job is that of the field bee, the one that fetches the nectar.
>
> Like humans in organizations, worker bees are promoted. An interesting aspect of this part of the story is that, like many organizations in which I worked earlier in my career, the worker bees are promoted based on tenure (sound familiar?). In fact, bees have no notion of merit. Promotion rests on age alone.
>
> Worker bees start as custodians by cleaning the hive. On the third day of their lives, they move to a new job as larvae feeder, which must be demanding, because each larvae must be fed 1300 times a day during a nine day period.
>
> Their next job is to receive the food brought in by the field bees; during this time they enter a job-training program, practicing to become field bees. And no distinction is made to merit; put in the time, and any worker bee can become a field bee.
>
> Before assuming the field bee job, the worker bee must be a security guard. During days 17-21 of their lives, these bees guard their home from intruders and predators. Finally, on day 22, they become field bees, responsible for carrying the nectar to the hive. They keep this job until they are to old for the task, at which time they scout around for nectar, but do not carry it back to the hive (no heavy lifting in their senior days).
>
> At the risk of stretching this analogy, the bees' organizational behavior resembles the way some modern organizations promote their employees. (For an authoritative study on this phenomenon, as well as a scientific comparison of worker bees to company employees, see Dilbert).

9. The Bees, continued

Regarding their communications skills, bees engage in an amazing routine called a dance language, or honey dance (the Schwanzeltanze). When the scout bees return from their reconnoitering, they inform other bees about the distance and position of the nectar sources by elaborate, acrobatic flying movements. Flights with figure-eights indicate the nectar is more than 100 yards away; circular flights indicate a closer location. Sickle shaped flights are also used as part of this location process. The speed of the promenade plays a part, as does the nature of how the bee wags it tail.

This promenade (in computer networks, a communications protocol) is executed by the bee within the dark hive and part of the procedure is based on the position of the sun outside the hive. Some scientists tell us bees have an innate ability (which is not understood by these researchers) to go to the right flower (when the nectar is at its best) at the right time, without wasting time browsing at unproductive sites (a capability sorely needed in the Internet).

Earlier in this preface, I used the term anthropomorphism, which according to Webster, is ascribing a human to a being or thing that is not human. And some people do not like the word, because they think it equates "lesser forms of life" to us humans. After all, bees can't think.

Fair enough, but my view is that most aspects of human behavior (and the elaborate residential communications networks discussed in this book) mimic the natural world. Indeed, the communications skills of insects, fishes, and animals have long predated ours, and our methods resemble theirs, not vice-versa. The bee is just one more example. After all, the beehive doesn't behave like corporation X; rather, corporation X behaves like the beehive.

I mentioned earlier in this book that the scrimshaw work was performed by Dennis Holland. I am amazed at skill Dennis' skill. The amazement comes from my reading about scrimshaw. The image (in this knife, the bee) is created by the artist carving or engraving a hard substance, such as a bone, or in this example, mammoth ivory.

The old meaning of scrimshaw was "time waster," a slang expression referring to the time spent (idle time) performing the work. Its origin was in the whaling industry over 200 years ago. Sailors at sea took up the craft to pass their idle time.

The basic idea of scrimshaw is first to polish the bone (or Micarta, ivory, etc.) to the point where it will not accept ink. When a cut is made in this polished surface, any applied ink will appear only in the cut area to produce the image the artist carved.

For a black-only scrim (the original method), the ink is applied to the entire area and then wiped-off, leaving ink only in the cut areas. If colored scrim is executed by the artist, the different colors must be brushed or painted in the desired areas of the image. Colored scrimshaw, usually with India ink, is more difficult to execute than black scrimshaw, because a tiny brush must be employed to paint into *each* cut. A painting error can only be corrected by the artist scratching or cutting away the mistake.

One more point about scrimshaw. You may have seen what is called reverse scrimshaw, in which white ink is used on black material, such as buffalo horn.

9. The Bees, continued

Tom's knife compensates for the poor book cover. The mammoth ivory handle, rendered in the soft bone color looks super as a background for the bee. And Dennis did a beautiful job in rendering the bee.

The knife's handle, mammoth ivory, has (once again) created some problems among those people who think the use of body parts from extinct animals will lead to the extinction of currently extant animals. I am a logical person, of slightly-above average intelligence, and try as I do, I cannot see this association.

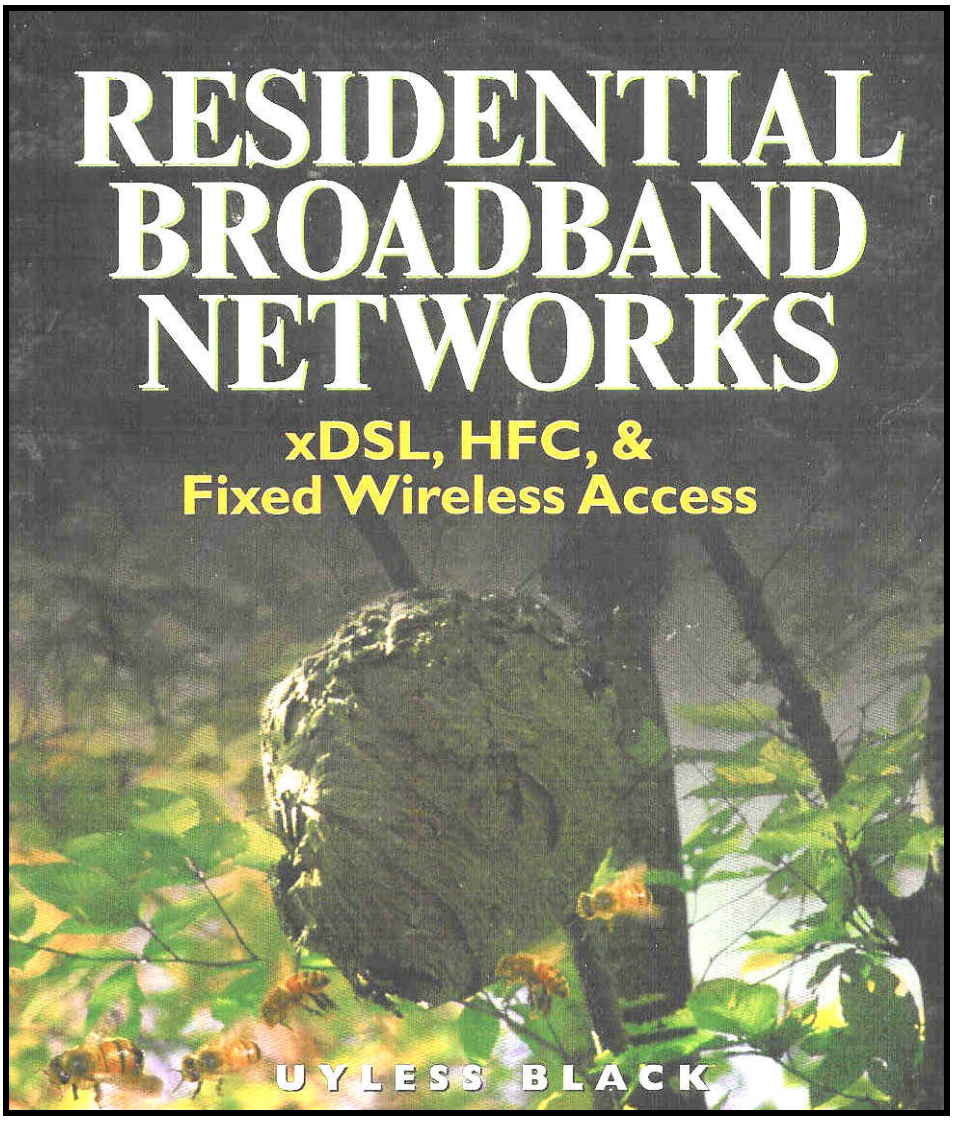
I can certainly understand the concern about mammoth bone merchants raiding and pillaging archeological dig sites, especially before the archeologists and anthropologists have: (a) finished their dig, (b) consigned the bones to never-to-be-seen museum storerooms, (c) written the $n^{x\ power}$ paper on a mammoth thigh bone, and (d) cashed their last pork barrel government grant check. Denying these scientists and academics their place in the mammoth Bone Exploitation Queue would be politically incorrect and would probably put some folks out of work.

Let's take this opportunity to examine Bruce's engraving work in a bit more detail. One technique to create the desired image from the metal is simply to employ a hammer and chisel. Hard to believe the refined engraving art you see in this book could be produced from such a seemingly unrefined process. Yet another reason to marvel at Bruce's talent.

A newer technique is the use of a machine called the GraverMaster$_{TM}$. This tool acts much like a small jack hammer, and cuts into the metal are made by the cutter (a chisel) as it travels back and forth across the metal---just like a jack hammer. The use of the GraverMaster is much faster and yields cleaner cuts than with a hammer and chisel.

Nonetheless, even with be best of care while engraving the metal, the engraving process might alter the action of the blade, or even freeze the blade (where it will not move freely), which then requires the knifemaker to adjust the action by prying the liners apart-ever so slightly. This readjustment must be performed very carefully by the knifemaker; otherwise, he will overdo the correction, resulting in a loose, wobbly blade.

Also, let's return to Devin and his Damascus steel. As you examine the blades of the knives of this book, take a look at the blades made of Damascus steel, then compare the different visual patterns that Devin has created. Through a variety of techniques, he is able to achieve a remarkable diversity of designs and forms. As we will see with the next knife, the use of Damascus steel for the blade *and* the handle can yield a stunning knife.

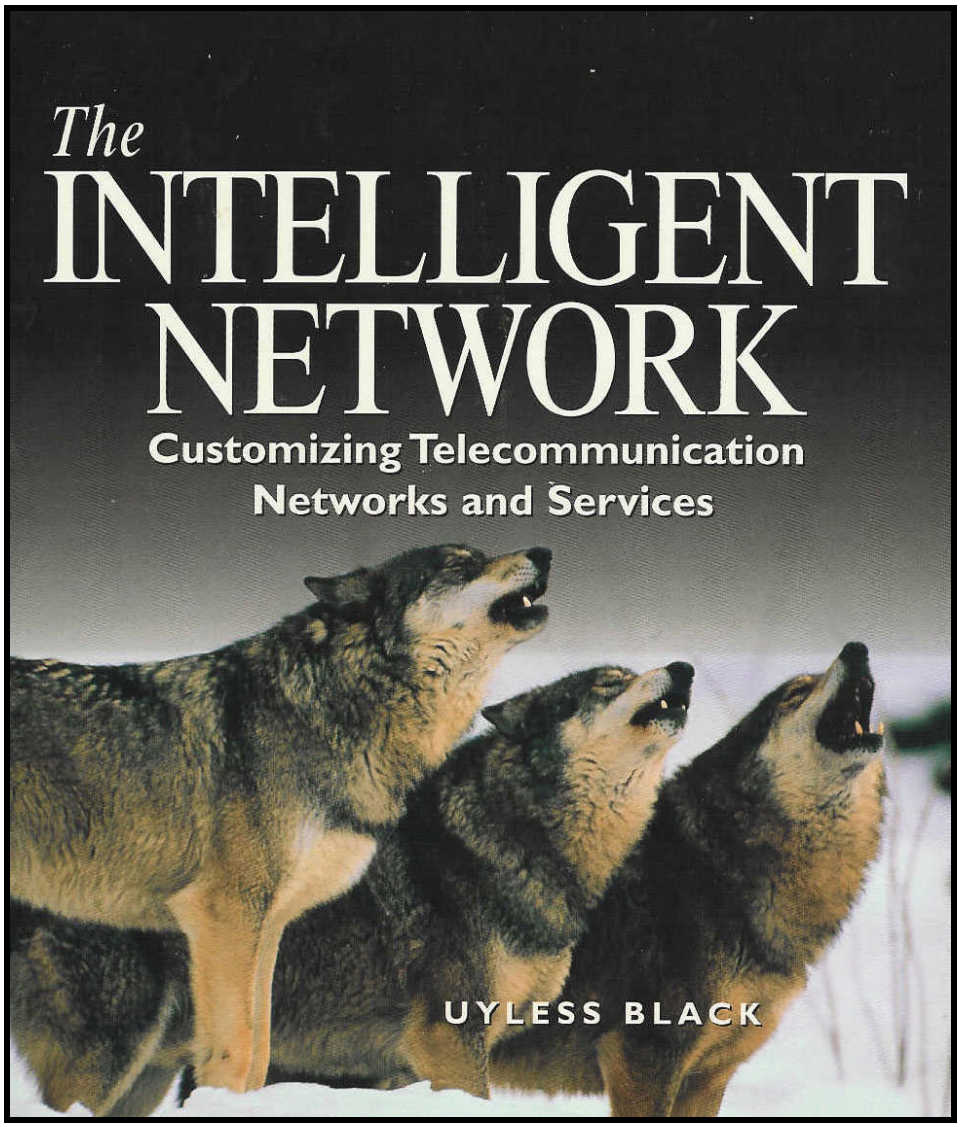

RESIDENTIAL
BROADBAND
NETWORKS
xDSL, HFC, &
Fixed Wireless Access
UYLESS BLACK

10. The Wolves

The cover for *Intelligent Networks* is one of my favorites, so is the knife Tom made. They are both lovely pieces of art and craft; the knife is all Damascus, again from Devin.

The analogy below is one of the few I composed in a serious vein. And after re-reading it five years after I wrote it, I think it is a bit ponderous. But at that time, I had been reading about a lot of murder and mayhem in the newspapers---I still am. Even one who is genetically disposed toward frivolity must have an occasional lapse into the serious world.

> This book deals with the intelligent network (IN), a term coined to describe a computer-based network with sophisticated capabilities, such as advanced security features, ease-of-use, support of voice, data, and video, and so on. Yet, some people take issue with classifying these networks as "intelligent." After all, what is intelligence? Try conjuring up your own definition before reading further, and then see how your view jells with the following thoughts.
>
> Here is what Webster has to say about the topic: "...having a good understanding or a high capacity; quick to comprehend, as persons or animals."
>
> That definition was written before the ascendancy of the computer in our lives and one wonders if Webster would have expanded this definition to include the computer. For my own definition, I would add the notion of intuition and the ability to channel aggression to non-lethal behavior. I believe these traits to be fundamental to intelligence.
>
> A large circle of people view the human as the pinnacle of intelligence and other forms of life to be either devoid of intelligence or lacking the capacity found in humans. We humans have thumbs and that physical feature helps in making tools, at which we are supreme. But I am not convinced our behavior is more intelligent than the other creatures on this planet, especially in how we are applying some of these tools. These creatures are not bent on the pathological destruction of their societies, their species, and the planet. We seem to be.
>
> With our many tools, we have surely mastered much of the physical world around us but we are not so good at mastering in a sensible manner our own societies. Look around you. Who is more intelligent? The vast majority of creatures who use aggression solely to survive and perpetuate their species, or we humans who routinely use aggression because of our pride and failure to deal with what are considered natural conflicts in the animal world.
>
> Time-and-time again almost all members (and in fairness and accuracy, there are exceptions) of the natural world exhibit behavior toward their own species in a manner that is meant to preserve the species. Aggressive behavior is channeled. If it does occur, the creature warns its potential adversary of the same species with well-known ritualistic behavior and the aggression may be fierce, but its intent is not to kill. For example, the wolf has well-defined ways of positioning its ears, eyes, nose, and mouth that convey its feelings and intent. It attacks viciously only if it is cornered, hunting another species, or protecting its young.
>
> As noted, there are exceptions to this behavior. The social organization of humans, rats, bees, termites and others are such that encountering different cultures of the same species often result in furious attacks, designed to kill the other culture. Bees and termites resort to this behavior if their turf is invaded. Humans and rats are not so selective.
>
> Unfortunately, we tool-building humans have very efficient and deadly tools to apply against the fellow members of our species. The sobering aspect of this trend is that our tools to destruct are gradually but surely finding their way into the hands of those who don't mind using these tools if it furthers the pride and power base of those doing the destruction.
>
> So, after all things considered, my vote is still out on the "lofty" pinnacle of human intelligence. Sometimes, the wolf's behavior seems preferable.


The
INTELLIGENT
NETWORK
Customizing Telecommunication
Networks and Services
UYLESS BLACK

11. The Parrots

The cover for *Voice over IP* is another of my favorites---so is Tom's knife. I was so taken with this cover that I also placed parrots on the follow up to this book. It is titled *Internet Telephony* and is not shown in this book because of its similarity to the knife on the opposite page.

The *Voice over IP* book was one my best sellers and was voted *Obtuse Book of the Month* by Web sites selling these kinds of documents. Just joking. Granted, the book's subject is a bit abstract but it was actually voted as a book of the month by a Web book seller. And it is probable you are making phone calls with the support of the technology described in this book.

Tom did not make another folder for the second book on voice over IP. But he did make a beautiful fixed blade, and his scrimshaw artist created a striking parrot for the handle. This piece is the only knife in this series that is not a folder.

It is also the only knife that is not part of this collection; I gave it to my brother-in-law, Brad Waters, as a present---and I dedicated the book to him, with the annotation that he was my favorite brother-in-law. To keep him in a humble frame of mind, I remind him he is also my only brother-in-law.

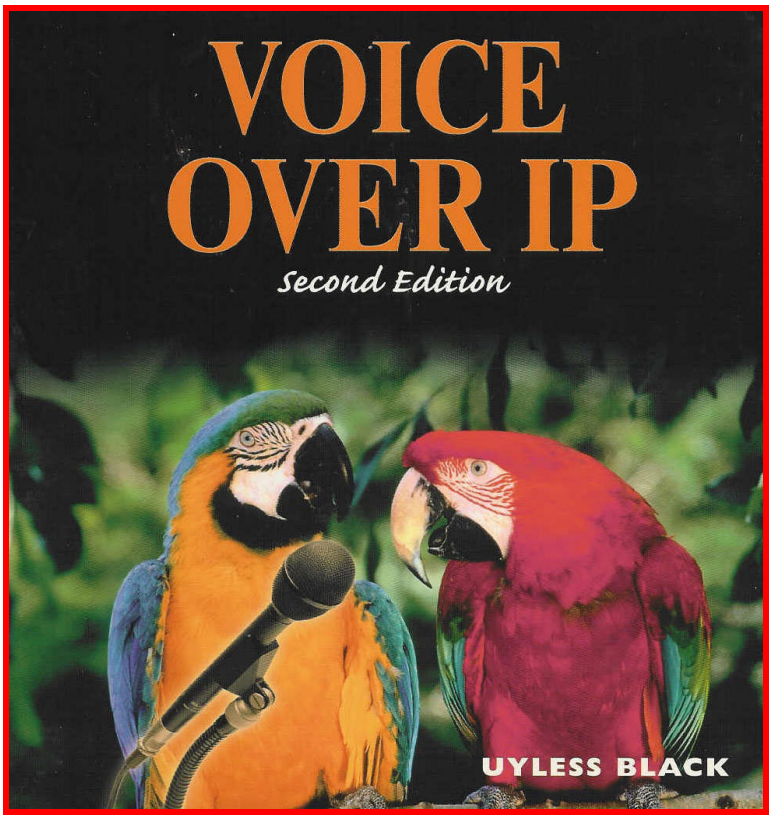
The facing page shows a collage of the knife (on the left) and the folder (on the right).

Here is the preface to *Voice over IP*. I won't bore you with the preface to the second book on the subject because it has the same theme as the thoughts below.

> I have chosen the parrot for the cover of this book because of its ability (at least as told in many stories) to be able to speak parts of a human language.
>
> On several occasions, I have had an opportunity to listen to some of the utterances of a parrot and on the whole, I found this bird's speech about equal in audio quality to that of a human's conversations over the public Internet during periods when the Internet is busy. I am being a bit harsh, because speech quality on the Internet varies. Sometimes it is acceptable but some of the time it is not very good, and it is not "toll" quality---like the telephone network.
>
> Why is it difficult to understand the parrot's "speech"? Why is it sometimes difficult to understand speech over the Internet? The problem with the parrot is the bird's lack of a vocabulary, its inability to form phonemes, and of course its inability to know what it is uttering. The problem with the Internet is its long delay in delivering speech packets, its tendency to lose or discard traffic, as well as the variable delay in the delivery of the traffic to the receiving end user.
>
> The parrot will never improve its human speech capabilities unless DNA manipulation reaches new highs (or lows). The Internet will improve its ability to support speech traffic, and is improving its "speech capabilities" almost weekly.
>
> As you read this sentence, the Internet is being re-wired and re-worked to support voice traffic. Eventually, the Internet and the telephone network will be one-and-the same. It is only a matter of time.

In spite of the folks who continue to believe the mammoth is an endangered species, Tom once again chose mammoth ivory for the knife handle. Most of this ivory, as well as walrus ivory, comes from Alaska, where it can be found in a number of ways: construction sites, eroded parts of the earth, or archeological digs. The color of the ivory depends on the minerals present in the ground when the bone was fossilized.

I don't want to upset the Green readers, but some knife handles are also made of whales' teeth and even wart hogs' tusks. Again, Tom does not use material taken illegally from any endangered species.

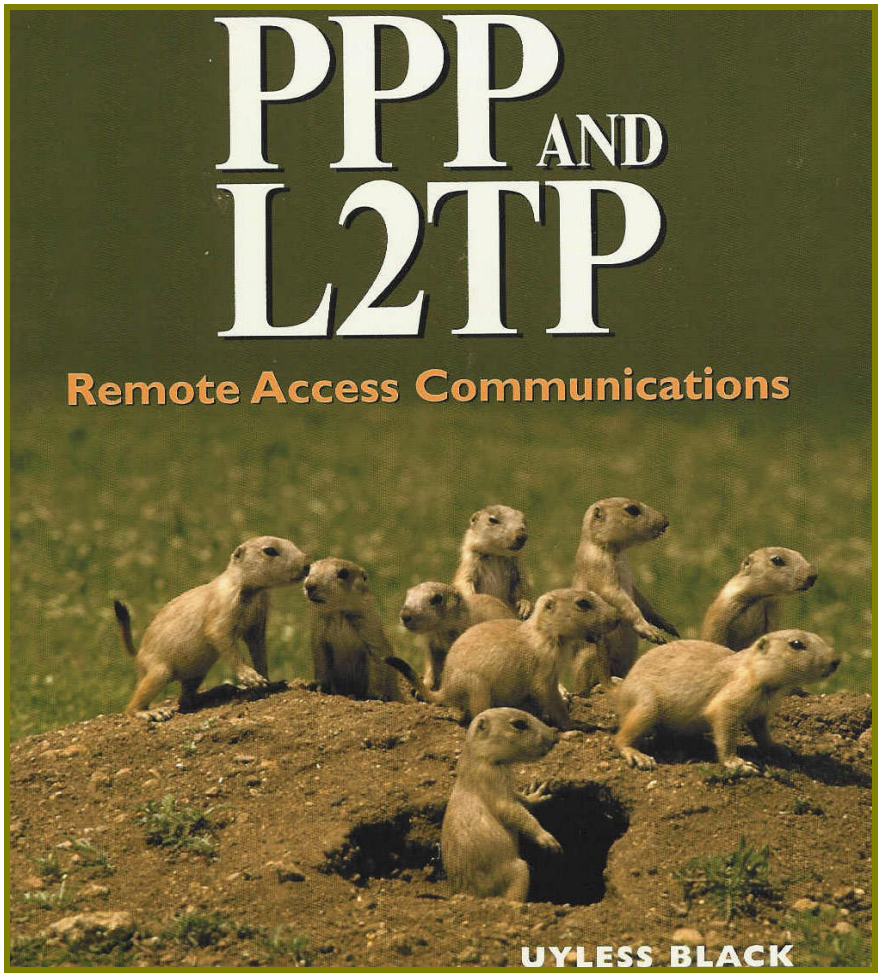

VOICE
OVER IP
Second Edition
UYLESS BLACK

12. Prairie Dogs

This cover came into being after considerable dialogue between my publisher and me. It is explained in the preface of the book.

> What image comes to your mind when you read or hear the term "tunnel"? I returned from Europe recently, so my image is the "chunnel" under the English Channel between England and France. In the winter, my images are the tunnels I pass through to travel from Denver to Vail to reach the ski slopes.
>
> I have chosen the prairie dog for the creature for this book in the series. The reason? It is a tunneling creature, and the subject of this book deals with tunnels……well, not earth tunnels, but protocol tunnels. (And I won't bore you in this preface with an explanation of protocol tunnels.)
>
> I had originally selected a mole for this book's cover. I chose this animal against the advice of several people, who said the mole was so unattractive its appearance would discourage potential buyers of this book. As you can see, the mole was not chosen. Let me explain why.This tiny mammal (about 6 oz.) is a burrowing wonder. It is capable of digging a tunnel at a rate of 18 feet per hour, considerably better than some mechanized burrowing machines.
>
> Its tunnels are often berated due to the perception the mole's diggings damage plants and trees that are rooted above the tunnel. While this view is somewhat true, the tunnel is also an aerator, sometimes serving useful purposes. Moreover, the damage to the flora often comes from other creatures that use the mole's tunnel. For example, mice are often the culprits that eat the roots exposed by the mole's tunnels. The mole does not dig the tunnel to eat the roots. It digs in search of worms, grubs, and small insects—but not your rose bush.
>
> The analogy I had intended for this write-up was to liken the mole to some Internet systems that we all use each day when we send and receive email, and explained in this book.
>
> But the mole analogy did not fare so well when the idea was analyzed by my publisher's marketing people. They said the mole was too ugly; it would not stimulate a potential reader to open the book and read it (and of course buy it).
>
> The marketer's' declaration was a revelation to me. I had thought people actually bought books based on their titles and contents. hey indeed do but I learned an attractive cover entices a person to pick up the book, and browse through it. I had never given this idea any thought but studies have confirmed this fact. Can you imagine my surprise at the discovery of my marketing skills? I had created these creatures and the analogies for fun, never realizing I was a retailing whiz.
>
> I must admit I succumbed to my own prejudices when I saw the pictures of the mole and the prairie dog my publisher sent me. The mole picture was as flattering a picture of a mole as one would ever see. I think the artist even air-brushed it. Faced with these two choices, you see the results of my decision on the cover of this book. Nonetheless, the mole is still on the cover, but you cannot see it, because it is inside the tunnel on the cover. Can't see it? Of course not, it's a virtual mole. And I'm on my may to Madison Avenue, fresh from my marketing coup.

Tom's knife handle is Micarta, a material we discussed earlier and a popular item of knife makers' handles. It is attractive to view and is relatively easy to cut and polish.


PPP AND L2TP
Remote Access Communications
UYLESS BLACK

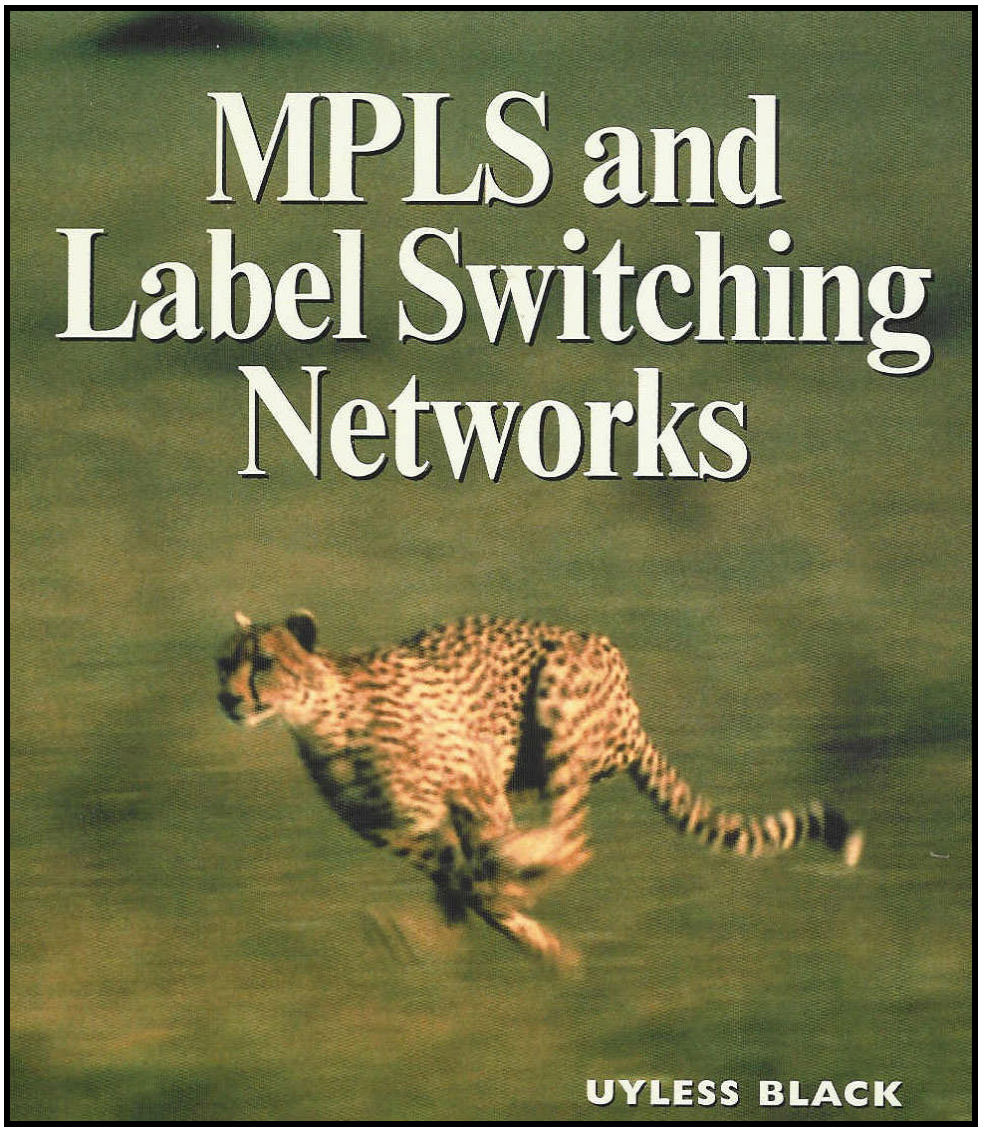
13. The Cheetah

Tom, Bruce, and I encountered some problems with this knife. One challenge facing the engraver is to render accurately the image of the creature as it is shown on the book cover. To my eye, the first rendition of the engraved cheetah had an excessively large left upper leg and buttock. Like scrimshaw, once an engraving is engraved, it is often difficult (and sometimes impossible) to change the image. But Bruce was able to reduce the size of this part of the animal, with the result you see here. I think his interpretation of the picture on the book cover, as well as his rendition of it, is remarkable.

And I say again, I am glad Tom chose Bruce as the engraver, Devin as the Damascus steel maker, and Dennis as the scrimshaw artist for this knife collection. They helped make it an exceptional set of knives. Here is the creature analogy.

> How can one make-up an analogy of our everyday life relating to the topic of label switching? Hardly anyone knows what label switching is, and yet if it did not exist, most of us would be unhappy in our dealings with the Internet.
>
> I asked some of my label switching impaired friends (everyone) about the term, and what thoughts came to their mind when they heard "label switching." One person told me she first thought was that of a person, lurking about in a store, switching labels on a product. I liked the idea but it would not translate into an appropriate book cover, unless the subject was how to stop shoplifters.
>
> So, I began to think about the basic premise of label switching in regard to writing a creature analogy.
>
> The keystone of label switching is speed. It is designed to move traffic, say our email or voice conversations, rapidly from the sender to the receiver. After thinking about the idea of speed, the selection of the creature for this book cover was easy, the cheetah. It is the world's fastest land animal. Its speed is almost bewildering. The animal can accelerate from a dead-stop to 45 miles per hour in two seconds. It can run for about 300 yards at about 60 miles per hour. One recorded event clocked a cheetah at 71 miles per hour.
>
> Label switching networks operate at considerably higher speeds. To use the cheetah analogy, they "run" on the order of thousands of miles per second. But then, the label switching networks need not be concerned with things vital to the cheetah when it is running, such as leg muscle movement, body movement, spine flexing to coordinate the legs and body, and a "few" other dynamics.
>
> We could go on but let's end the analogy with a salute to both: the remarkable speed of the cheetah, and the remarkable speed of label switching networks. The latter is the subject of this book.

As you can see, the handle for this knife is Mokume, a combination of copper, nickel, and brass. Mokume is a Japanese word for "wood grained metal." Tom's source for Mokume is his Damascus steel maker, Devin Thomas, who makes it in much the same way as Damascus steel. After Tom receives the metal from Devin, he etches it with ferric chloride acid (after it has been polished). This operation oxidizes the different alloys, which "deepens" the colors of the brass and copper, and gives them a greater contrast in relation to the unaffected nickel silver.


MPLS and
Label Switching
Networks
UYLESS BLACK

14. The Kangaroo

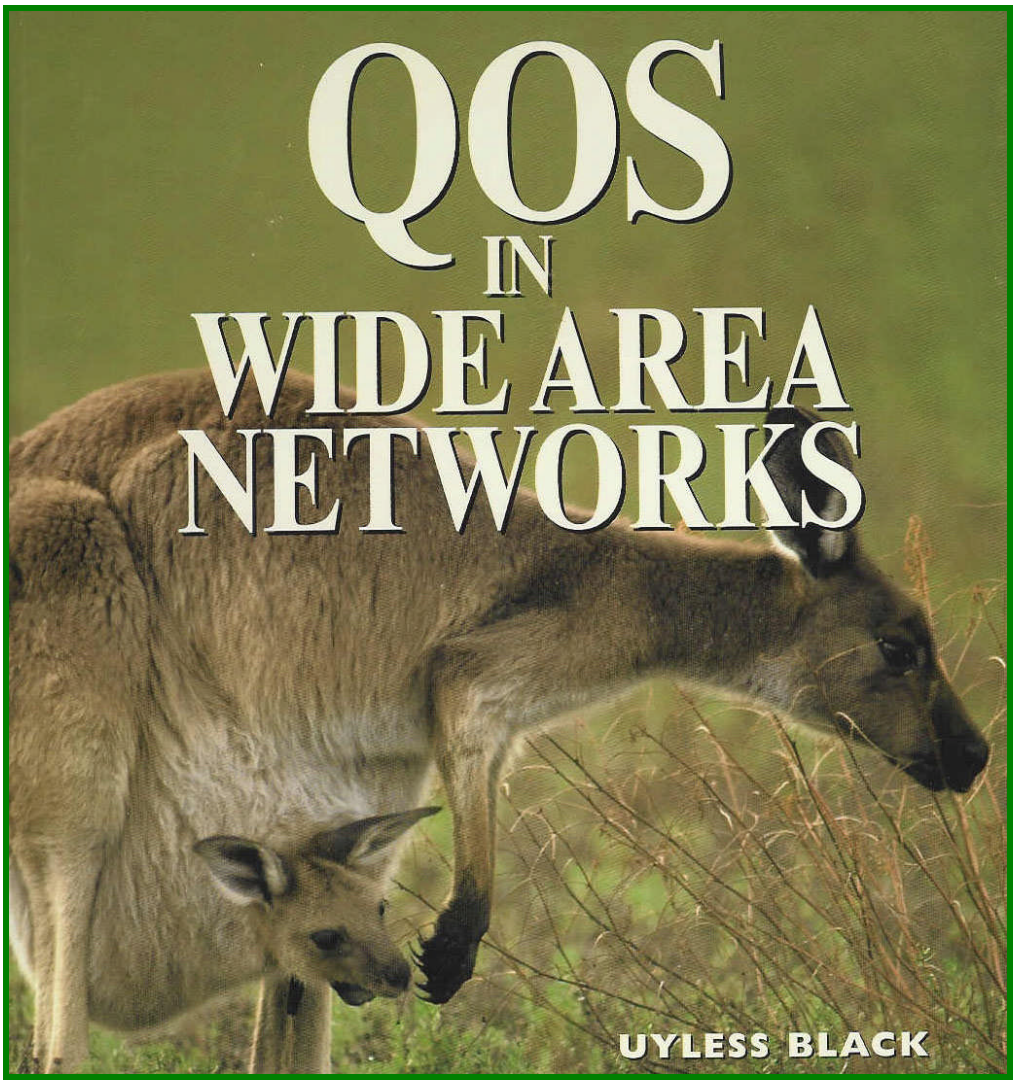
One day a few years ago, I was browsing in the Border's Book Store in Falls Church, Virginia. I had walked over to the section of books about computer networks to check-out which of my books were in stock. A man and woman were standing in front of the shelves looking at my book covers---but I noticed they did not look at the chapters in the book. I was curious about their examination, and after introducing myself, I asked them why they were looking at the covers, but not perusing the books' contents. The man replied one of his college classes used my books and he had taken his wife to this section to show her the creatures on the covers. It turned out she was an illustrator for *National Geographic* and was interested in the pictures and wanted to use them as "models" for some of her work. I referred her to my editor for more information.

Here is the animal analogy for this book, which is titled QOS in Wide Area Networks. To help you in understanding the preface, QOS are initials for quality of service. The term refers to a feature in networks which offers customers enhanced services, such as call forwarding, call screening, Spam blocking, and privacy of your transmissions.

> While I was writing this book, I came across an article on the kangaroo. A picture accompanied the article showing a mother kangaroo with its young nested in the mother's pouch, looking serene and content. And why not? The mother kangaroo's pouch offers a very high "quality of service" to the new-born infant, about as high as there is in the animal kingdom. Where else can one find a warm ready-made bed, transportation, only one off-spring to use these accommodations, plenty of food, not to mention complete security?
>
> All-in-all, a hassle-free environment, something like the old days in the communications world when Ma Bell gave us a cradle-to-grave telephone service.
>
> For the baby kangaroo, or Joey as it is called, there is just one problem in obtaining these wonderful services: making its way to the mother's pouch once Joey is born. Just after birth, Joey (all 0.03 oz) must crawl up the mother's body to reach the pouch, with little help from the mother. But once there, the effort is worth it, and Joey stays in and around mom's pouch for 7 to 10 months—almost unlimited quality of service, at no extra charge.
>
> But alas for the small kangaroo, this good deal ends. After these many months, the mother must prepare for another Joey, and off the growing kangaroo goes into the big, bad world, never again to experience this level of service.
>
> It's something like our leaving Ma Bell (well, the old Ma Bell, not the new ones) for the brave new world, and the big, bad Internet.

Tom choose (uh oh) elephant ivory for the handle. He bought this ivory from a supplier years ago, who furnished Tom with proper documentation that the ivory was not taken from an illegally slain animal. New ivory is no longer available, because the import of "fresh" elephant ivory is now banned. Ivory received before the ban can still be used, as long as the piece is properly documented. Mammoth ivory is much more common in today's custom made knives than elephant ivory.

I think Dennis' scrimshaw work on the kangaroo knife is sensational. The photograph is of high quality, but it can't do justice to the lovely details of the kangaroos' coats of hair, as rendered by Dennis. And take a look at how accurately Dennis depicts the face of the baby kangaroo. Of course, the engraving from Bruce, and the knife creation from Tom, all combine to make something more than a fine piece of *craft*. I think these knives are really fine works of *art*.


QOS
IN
WIDE AREA
NETWORKS
UYLESS BLACK

15. The Butterflies

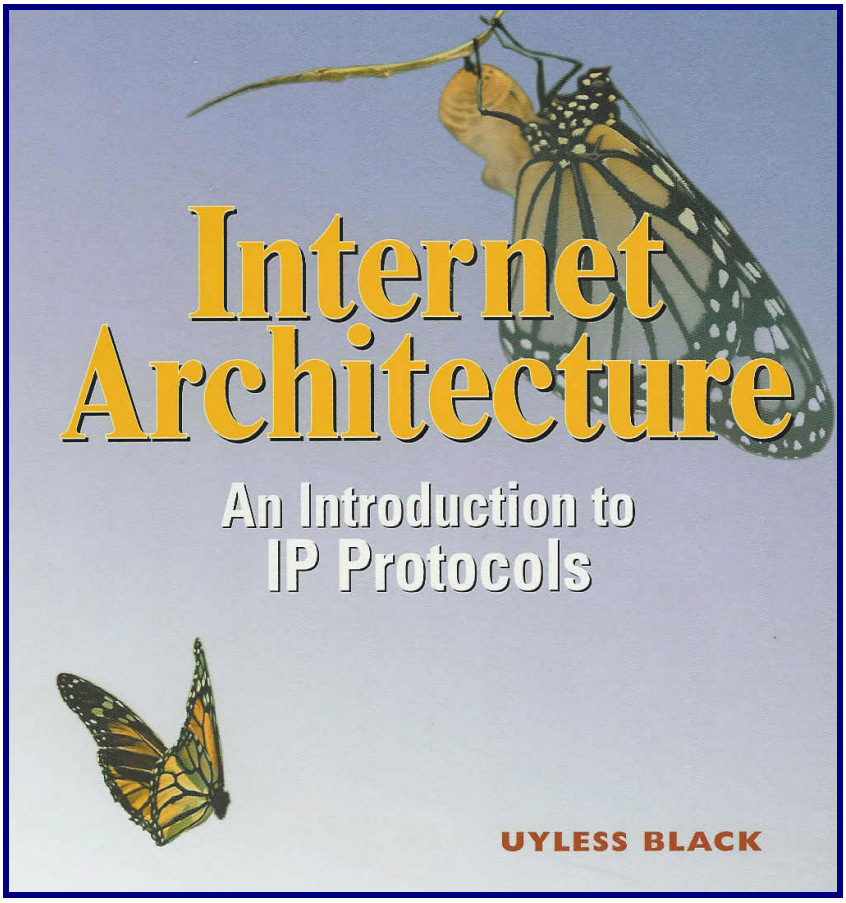
The publisher's artist did a splendid job with the cover for the *Internet Architecture* book, and Tom's knife beautifully captures the beauty of the picture. Here is the preface.

> In a few short years, and after the advent of the Web, the Internet has emerged from its cocoon. It has grown from a small research-based network to a commercial monolith. It is the monarch of data networks and has become a major presence in the lives of millions of people.
>
> It can surely be likened to the Monarch butterfly, for like this butterfly, it has experienced a metamorphosis from its "larva" stage in the 1980s and 1990s to the mature "creature" we see today.
>
> For the Monarch butterfly, its adult stage represents the last period of its life and the analogy to the Internet could end here. Stretching the comparison a bit more, when we consider what it will be in the future, the Internet is still a mere caterpillar. In a few years, the Internet will represent the first truly global village. This town will be an electronic community and its avenues will be the Internet technologies discussed in this book.

For a while in my late twenties, I was a software developer (programmer), and worked on several Department of Defense (DOD) contracts. One job was funded by the Advanced Research Projects Agency (ARPA). This DOD organization was the principal entity responsible for the creation of the Internet (plus Al Gore, of course). At that time, ARPA was granting software development contracts dealing with its ARPAnet. Eventually, the non-classified part of ARPAnet was spun-off to become the Internet.

My project team was working on an ARPA-funded system that simulated submarine warfare with China and we thought our contract was about as good as it could get. Forget ARPAnet and unrealistic packet networks; our code really counted. We thought it would have a significant effect on our Cold War efforts.

Of course, China had almost no submarine fleet at that time and this fact made our programming considerably easier than if our code would have had to deal with an actual threat. Our China submarine warfare code was put on the shelf after a few runs on the computer; eventually it want to software heaven. As for the ARPAnet code? It went on to the Software Hall of Fame.


Internet
Architecture
An Introduction to
IP Protocols
UYLESS BLACK

Later Books in the Series

A few of the books in my *Advanced Technology Series* did not have wildlife for an analogy. The covers to these books are shown on page 39. I chose other images because the subject matter lent themselves to the use of other metaphors.

Tom did not create knives for these books because they had no creatures on their covers. After all, how attractive can a knife be with the Tower of Babel in scrimshaw…or an off-beat spy engraved around a Damascus handle. Such artistic interpretations seem to lose something in their translation and interpretation.

Also at this time, I was sixty-one years old. It was time to leave writing books about computer networks and the Internet and move to other interests. On the last week in December 2001, I called my editor and told her I was through writing technical books. I called my clients and told them I was through with consulting. I called my student administrators and told them I was through with lecturing. On January 1, 2002, I gathered about 30 large trash bags of research material, communications standards manuals, data communications books (many of my own), and took them down to the local refuse dump.

Adios Ethernet; farewell optical networks; so long Internet; adieu to the Web and email names. I'll see you again, but in a different life.

As I reflect back on the 34 books I wrote about computer networks, I think the effort on optical networks might be my best book. I presented some advanced concepts about how optical fibers and optical switches could (and someday might) interwork with Internet protocols.

Thrilling stuff, eh? And the problem with my brilliant ideas is that most of the manufacturers who were building prototypes of these switches went out of business when the Internet bubble burst in 2001. Consequently, I don't think my thoughts ever became something real, other than words on a page. I hope as the industry picks-up, the concepts in this book will be implemented in vendors' hardware and software.

I consider my ideas in my books to be in the "public domain," so to speak. If optical IP Internets find their way into Cisco routers using any of my ideas, fine. That is one reason I wrote technical books.

Here is my swan song preface, written in the optical networks book.

The ultimate challenge for the world's communications networks does not deal with the subject matter of this book. The biggest challenge of communications networks in general, and the public Internet specifically, is not the sending of user data across communications links to machines such as Web servers. The challenge is (a) knowing where the needed data are located in hundreds of thousands of locations across the planet; (b) assembling and presenting these data as useful information to a user; (c) all in a few seconds, or even fractions of a second.

Considering how much data are stored in an automated fashion in untold numbers of Web servers across public and private networks, the challenge is not insignificant. The amount of data to search is daunting enough. Add the difficulties of assimilating, correlating, sorting billions of bits, then presenting them as meaningful information---it's almost staggering in this magnitude and complexity.

Regarding this challenge, I have told my readers in earlier books, "Knowledge is power, if we know where to find the data." For the Internet and other modern communications networks, it should be added, "…. and the data can be assimilated into meaningful information."

This adage fits the situation today with modern communications networks: *Knowledge is power, if we know where the data are located that make up that information, and if the information can be presented to the user in a rapid and intelligible manner.*

Rapid and intelligible means the Internet's future servers and other nodes must become much faster *and* much smarter.

It does little good if the Internet presents data to us at several trillion bits per second, while the Web servers are laden with slow processors *and* the inability to filter and assimilate these trillions of bits of "potential" information into "meaningful" information.

My point is that the WWW should not mean "World Wide Wait." Nor should it stand for the "Whole World is Wallowing in Data," and we can't find it!

It will take a while before the Web's clients and servers, the supporting Web content providers, and the Internet Service Providers will be able to provide a retrieval (say something less than a few thousand bits) back to the user in any semblance of a truly intelligent search.

But make no mistake, this is where we are headed. Eventually, (assuming sufficient bandwidth is made available to the mass population) many more people will be using the Internet in their daily activities. The Internet's Web will prove to be too cost-effective, convenient, and enticing.

One such alternative is hard copy mail. The tragic events of 9/11 and thereafter will spur the use of electronic communications and email even more than they are used today. Electronic viruses in an email attachment are nasty things but they pale in comparison to the damage that can be done by chemical viruses in a mail package.

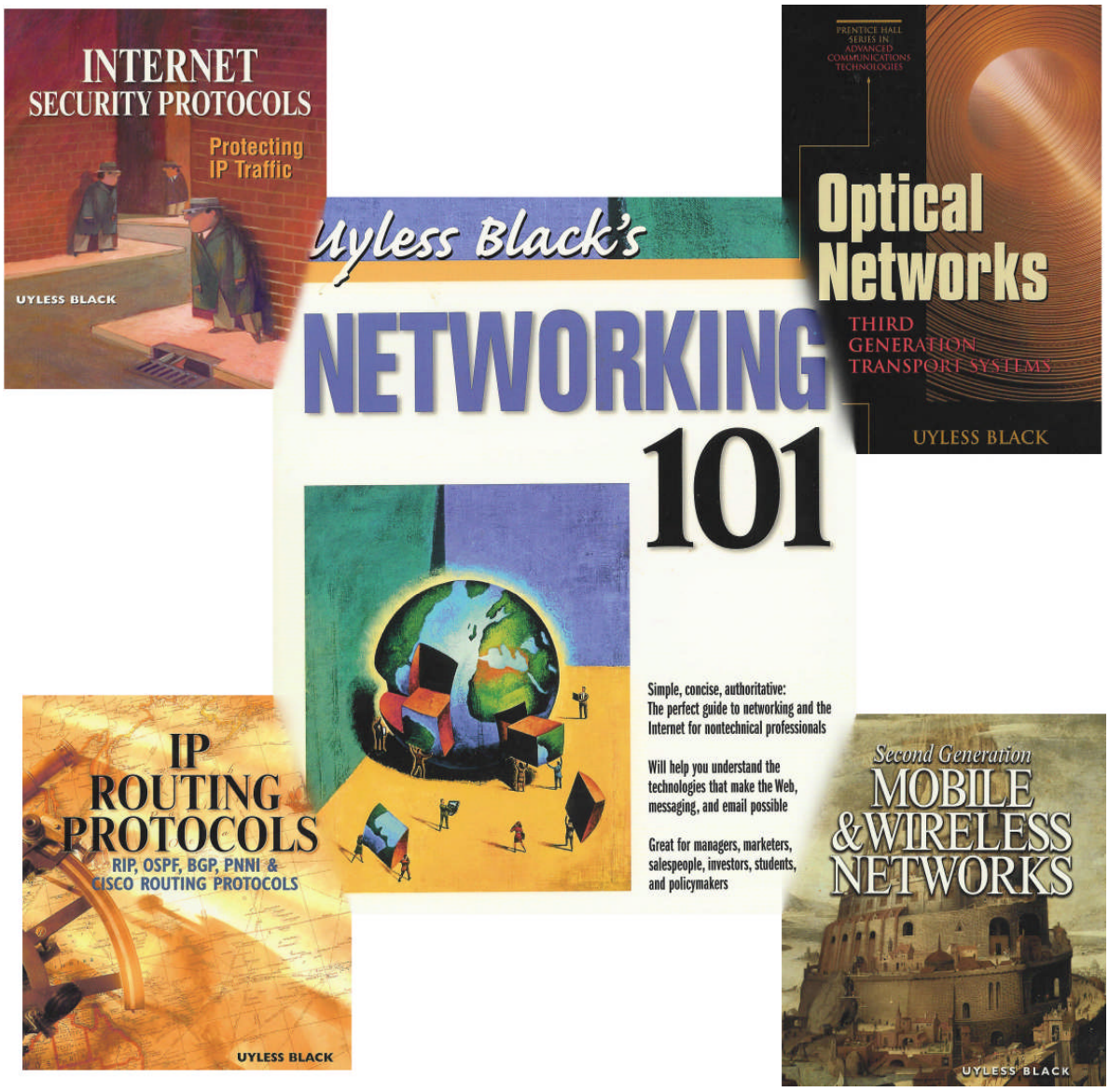
It is not my intent to start this book on a down note, but it should be recognized that the subject matter of this book, transport networks, have played an indispensable part in our personal and professional lives for many years.

With the recent recognition of the vulnerability of many aspects of an open society to terrorists, the role of the transport networks, and their protection, become even more important in our lives. Indeed, nowadays, they are absolutely vital to our existence in our automated, industrialized, democratic, and republican society.

Final farewell to my Readers

In my previous books, my dedication prose had been one or two lines of text. This last book was an exception. I wrote two pages about the people I had come across during my twenty years of writing, citing those that helped me in my endeavors. Then, I finished this part of my life and career with these lines:

> It is now time to move to other aspects of life beyond bits and bytes, and the Internet. It is possible I will follow the path of the great football player John Riggins, who said upon his return from retirement, "I'm bored, broke, and back." Yes, it is possible, but not probable. There are other subjects to explore, to occupy my time, and perhaps to write about.
>
> My final thanks go to my readers. After all, it is you who really kept me going through two decades of writing technical books. If you had not read my books, I would not have written them.


INTERNET
SECURITY PROTOCOLS
Protecting
IP Traffic
UYLESS BLACK
Uyless Black's
NETWORKING
101
PRENTICE HALL
SERIES IN
ADVANCED
COMMUNICATIONS
TECHNOLOGIES
Optical
Networks
THIRD
GENERATION
TRANSPORT SYSTEMS
UYLESS BLACK
Simple, concise, authoritative:
The perfect guide to networking and the
Internet for nontechnical professionals
Will help you understand the
technologies that make the Web,
messaging, and email possible
Great for managers, marketers,
salespeople, investors, students,
and policymakers
IP
ROUTING
PROTOCOLS
RIP, OSPF, BGP, PNNI &
CISCO ROUTING PROTOCOLS
UYLESS BLACK
Second Generation
MOBILE
&WIRELESS
NETWORKS
UYLESS BLACK

Other Knives and Other Thoughts

That is about it regarding the story of my books and Tom's knives. I hope it was an easy read for you. I find I enjoy looking at the beautiful artwork of the book's covers and Tom's knives. The text could be ignored in this coffee table book and I think the other material would still be fun to explore.

We are not quite finished; we need to do some mopping-up operations, primarily to show you more of my brother's knives, and especially to explain how Tom makes a knife---from slabs of inert metal, compressed paper, extinct mammoth bones, dead fish skin…and considerable talent.

The first picture on the facing page shows two knives that rest on a stand in my (former) office in our home in Virginia. The knife in back is called a dagger. It is so-named because it has two edges. This knife won an award at knife show in Las Vegas a few years ago. It is a beauty: all metal, a Damascus blade, with a carbon steel guard and handle; 24 carat gold inlays.

The second picture shows five knives on the mantle of the fireplace in my former office. Once again, I add the modifier "former" office, because my current endeavors no longer entail research about computer networks. My current research is on the subjects of sloth, lethargy, and idleness. Of course, the nature of the research precludes my writing about them, so I no longer need an office.

Take a look at the largest dagger on the mantel. This dagger also won Best Dagger at another Las Vegas show. I was with Tom when he won the award for this knife, and during that show, I purchased this beauty for my collection. Although the knife still sat on Tom's display table at the knife show, it now belonged to me.

Tom encourages the knife show attendees to pick up his knives and look them over. At the same time, he is not fond of anyone touching the side of the blade, or generally fooling around with his treasured creations. On more than one occasion, I have seen him grimace when a prospective buyer "soiled" his creations with a small finger print. This situation set the stage for an opportune time to execute a joke on my brother (forgive the "ingredients" for this joke but a peculiar idea was needed to carry off the prank.)

I had been away from Tom's display table for a while. Tom remained at the nearby area, keeping an eye on the knives. While he was talking to a customer, I returned to the area, walked up to the front of the table, picked up this beautiful, clean, pristine knife…stuck one of my fingers in my ear, another finger in my nose, and proceeded to decorate the blade with the elixirs from two of my orifices. Crude? Yep! Effective? Absolutely! I have rarely seen Tom flummoxed; he is usually a cool character, but he sat at the table, aghast---not knowing how to react. I thought he might jump over the table and attack me but he was paralyzed from my crude ploy. But after a few seconds, he saw through my joke and joined in the fun--- as well as cleaning the blade of *my* knife.

Making a Knife

When I look at a handmade knife, I appreciate the talent that went into its creation. I admire its beauty and the precision of its parts. These thoughts are especially true for a knife with moving pieces, such as a folder---those knives highlighted in this book.

Until I watched how a folder was created, I had no idea as to the exactitude required to make a "successful" folding knife. I place the word successful in quotes because there is a big difference between a folding knife and a successful folding knife. With a few more tutorials from Tom, I suspect I could make a folder. It is unlikely I could make a *successful* folder.

What is a "successful" folding knife? It has the following characteristics. First, it can cut; otherwise why call it a knife? Second, it has visual appeal; its shape and colors are pleasant to behold. Third, its pieces are well-made, without imperfections or crafting errors. Fourth, it feels good in your hand. Fifth, its blade opens and closes easily, without wear-and-tear on the moving parts.

Given these requirements, let's begin our examination of the making of a successful folding knife by looking at its parts.[2] The material in the figure on the facing page constitutes the pieces that make up a folder. They are cut, carved, welded, soldered, heat-treated, ground, buffed, and assembled to eventually become a knife. The finished knife shown on this page was explained earlier in this book; it serves as a frame of reference for our discussion.

The yellow material is Micarta, discussed earlier; parts of this sheet will become the handle for the knife. The red material is composed of vulcanized fish fiber; it will serve as spacers between the Micarta handle and the knife's metal sides (the liners). Spacers are placed in the knife for decorative reasons, although Tom says some knife makers use them to diminish the visibility of a poor joint. He employs them only for accent purposes because he does not place a knife into the marketplace if it has a poor joint.

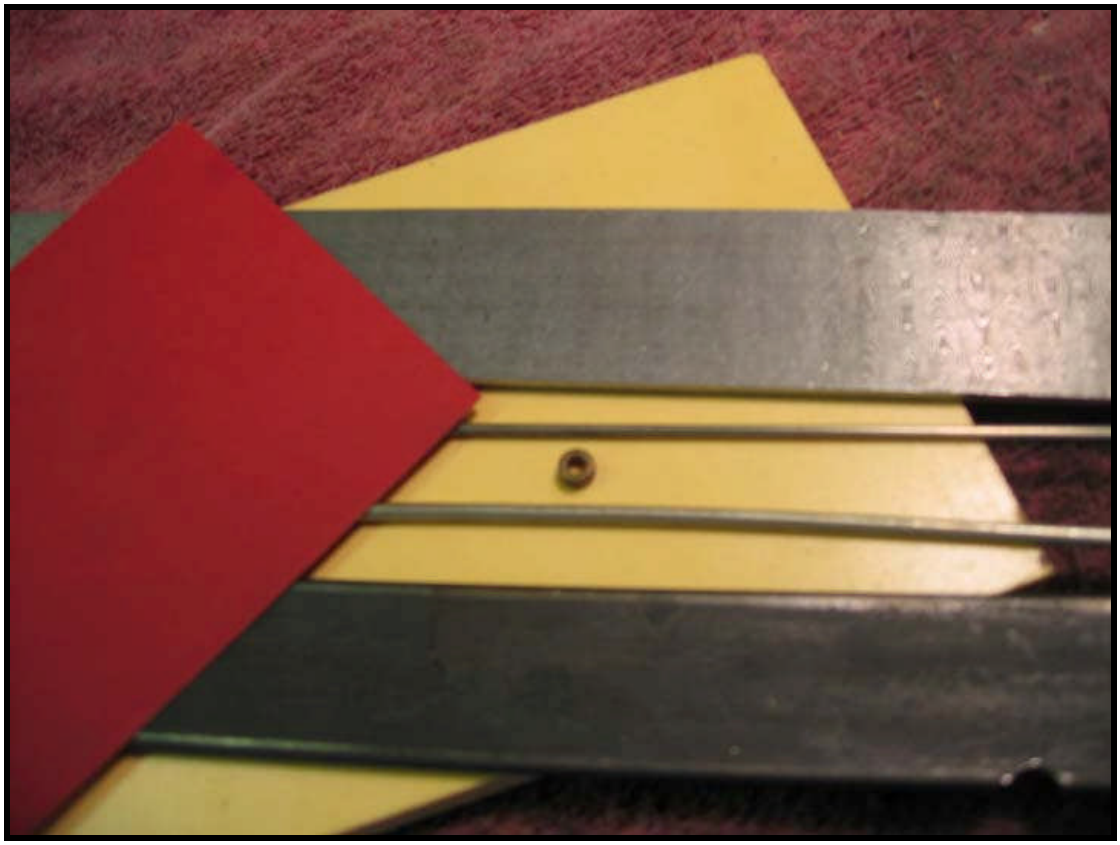
The steel bar at the top of the figure is stainless Damascus steel, also discussed earlier. Part of it will become the blade for the knife. The steel bar at the bottom of the figure is stainless steel. It will be cut in several pieces to become the folder's pieces to support the folding, locking, and unfolding of the knife into and out of the handle.

The two rods are cut into pins and used to secure the parts of the knife together. The small metal (bronze) ring is a bushing; its purpose is hold a pivot pin, which is the pin used to allow the blade to open and close freely. It is important the knife be constructed so the bushing prevents the two sides of the knife from making contact with the blade.[note 1]

One other sheet of steel is not shown in this figure; it will be used to create the knife's bolsters) and its metal sides (liners); both are explained shortly. Finally, the grayish, pinkish substance underneath all the knife's parts is a dirty towel, which Tom uses as a workcloth, spread across his workbench. It is a work of art unto itself.

[2] For the reader who wishes more information, following this general discussion are more explanations that might be of interest to aspiring knife makers. I asked Tom if he were concerned about giving away too many trade secrets. He replied these facts are well-known and it is the crafting itself that makes the difference. Anyway, you can refer to these details that follow this tutorial by noting the "note" numbers interspersed in the text, such as, [Note n].

The ingredients:



The finished product:

The first figure on the facing page shows a pattern of the blade lying on the Damascus steel bar. (And for a later discussion, the round part at the back of the blade is called a *cam*.) Tom uses patterns (which he created) to draw shapes onto the bar. He then cuts the bar to the shape of the pattern. His cutting tool (shown later) is called a bandsaw.

Considerable care must be taken during this cutting process because the knifemaker does not want to cut the blade to a size that is too small. Therefore, this initial cut is made for the blade to be slightly over-sized. Then, by a process called *profiling* the blade will be ground to its exact size and shape.

The second figure shows the patterns for the two parts of the folder's opening, and closing mechanisms, the *locking bar* and the *spring*. They lie on top of the steel bar from which Tom will cut for this knife's moving parts (in addition to the blade). The purpose of the locking bar is to maintain the blade in a fixed and rigid open position. The spring keeps tension on the locking bar at all times. The mechanics of the folder are elegantly simple: The locking bar is in contact with the blade *cam*; thus, the tension from the spring, pushing up on the locking bar from the rear, causes the blade to snap open and snap shut.

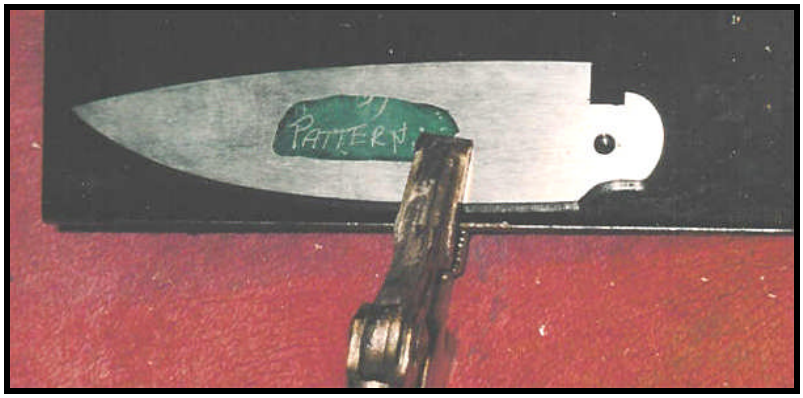
The third figure shows two pieces that have already been cut from pieces of metal: (a) one side of the knife handle (a liner) and (b) its bolster. The purpose of the knife's handle sides is two-fold. First, the moving parts are placed inside them and secured with the pins, mentioned earlier. Second, the decorative part of the handle (ivory, bone, wood, stone, shell, or Micarta) is fastened to these two knife sides. Later pictures and explanations will clarify how the sides "look" in relation to the overall knife. Again, the sides are called liners.

The bolsters may or may not be placed on a knife handle. They add strength to the knife and are recommended for knives that are actually used for cutting, as opposed to knives that are made for display only. They act as another layer of metal through which the pins anchor the knife's parts.

Notice the small holes in the liner and the bolster. They will be filled-in with the pins to anchor all the parts of the knife to the two knife sides and hold the handle material in place.

The fourth figure illustrates the relationships of the three moving parts (the blade, the locking bar, and the spring), and their placement onto one side of the knife. Tom has inserted some metal pins in order to fasten and anchor all these parts together. These pins must be pounded into their respective holes to provide a strong, tight fit. A loose fit will result in a wobbly blade.

Later, the other side of the knife handle will also be fastened to these parts by using those pins to anchor the entire knife, including the Micarta handle. In addition, we will see that the handle material will be fixed to the liners with glue. And as stated, it is held in place also with the pins (that run through the spring and locking bar).


PATTERN

In order to strengthen the foundation of the knife, Tom spot welds the two bolsters to their two respective handle sides. The first figure on the facing page shows one side of the knife and this bolster fixed together with vice grips, and placed between the two contact points of a spot welder. Tom applies five to eight spot welds on these two pieces. He must be careful not to place a weld too close to the edge of the handle; if he slips and does so, the weld can cause pitting of the metal, resulting in small voids around the edges of the bolsters and liners. Likewise, he must be careful not to place a weld too close to the *dovetail*. The dovetail is the part of the knife where the handle material fits against the bolster.[note 2]

The second figure shows Tom grinding one of the sides of the front part of the knife (a liner and its associated bolster). He uses a 2 by 72 inch belt made of aluminum oxide (or other materials if, say, stone is being ground), which like sandpaper, comes in different degrees of coarseness. The coarseness of the belts range from 60 to 1,500 grit. Tom says a 1,500 grit belt is as smooth as, "the south end of a northbound baby."

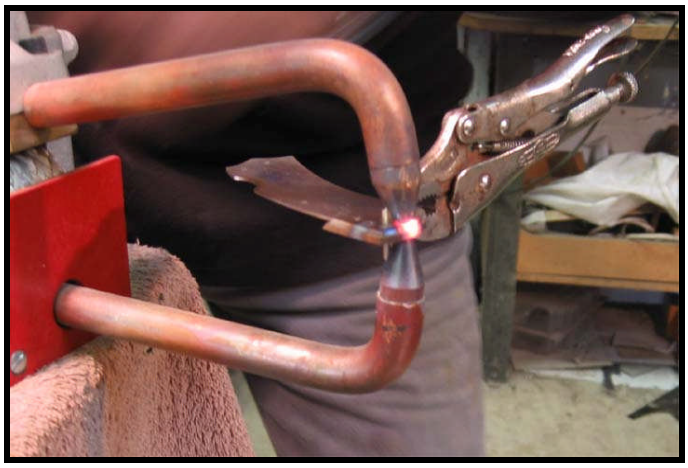
The grinding operations take place on all parts of the knife, including the handle and the blade. It hones the knife to a finer shape, eliminates any (however small) rough edges, and smoothes the surfaces.

Considerable care must be taken on how much or how little metal is taken off the knife with the grinder. As Tom says, "You can always take-off metal from the knife, but you can't put it back on!"

If you look carefully at the part of the knife between Tom's finger and the belt, you can see several small grayish circles. They are the spot welds made with the spot welder to join together the liner and its bolster.

The third figure is another example of grinding operations, in which Tom is working on one of the dovetailed bolster joints. The sparks flying off the metal and grinding belt are a normal part of the process. Several years ago, sparks from the belt ignited a large piece of steel wool resting on Tom's workbench. It silently smolded, and slowly burned a hole in the wall. Tom happened to notice the problem just before he was closing up this shop. …He wears a cap during the grinding to keep from setting his hair on fire.

Also, notice that the ground piece is resting at a 45^{o} angle to the belt. This picture shows how the dovetail is created.



We pause for a moment, and return to the blade, introduced earlier. Recall the blade is cut from a piece of steel. In the first figure on page 45, the pattern lies on top of this steel (and Tom uses Damascus steel or stainless steel). Tom draws around this pattern, making a profile onto the steel. Then he uses a bandsaw to cut the metal. For this cutting, a special blade is used to cut-through the steel. The blade is shown on the right side of the picture.

The delicate aspect of this cutting (and later grinding) operation pertains to shaping of the locking bar notch and the cam. The lock must fit precisely into the notch and the cam must be a closely defined shape to allow it to rotate freely and prevent it from binding during the opening and closing of the blade. The design goal for this part of the knife is to provide constant, even pressure during the opening and closing of the blade. If the cam is not shaped properly, it will cause an inconsistent spring tension, and the knife holder will notice a tightening, resulting in more effort to open or close the blade. A severely ill-shaped cam will prevent the knife from snapping shut.

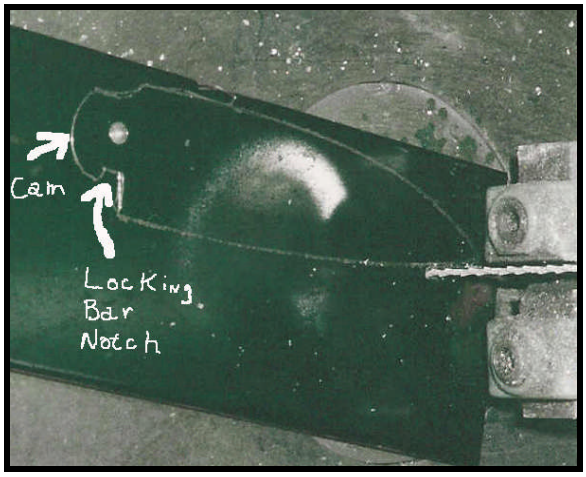
The second figure shows the state of the blade after Tom has cut it from the steel slab. Notice that he does not make an exact cut on this "first" cut. The bottom figure shows the results of grinding the blade to a more precise and exact shape. This operation is called *profiling* the blade.

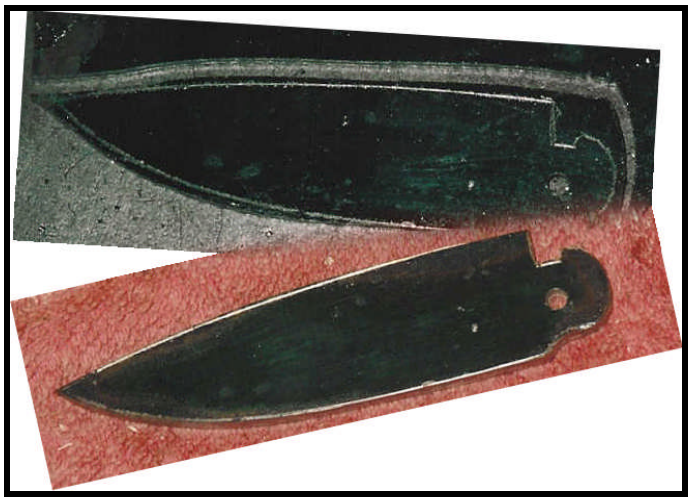
I have used the words exact and precise several times in explaining how a folding knife is made. The words are once again apt, because at this point the blade has a carefully drilled (1/8 ") hole in its tail. This hole will receive the pivot pin and it must be drilled at an exact 90^{o} angle to the surface of the blade. Otherwise, the blade will not fit evenly between the liners when it is closed. Moreover, if the hole is not drilled with this 90^{o} angle, the knife may behave in the following manner (also leading to a very unhappy knife owner): (a) When in a closed position, the blade will likely strike one of the liners on one side or the other, and (b) When in an open position, the blade will not point directly forward (in line with its handle).

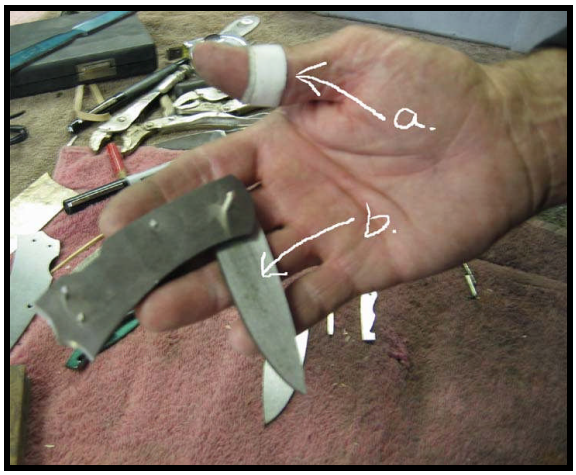
At this point, the blade is in its final, gross shape, although Tom will perform several more operations on this part of the knife, to refine it---so to speak. As stated, these operations are explained shortly.

The third figure shows Tom holding his work-in-progress. I include this photo in the story (with annotations) to make two points about knife making. The first point is that knife making has its drawbacks because the principal function of a knife is to cut stuff like vegetables, fish, fruit, chicken, beef, and noodles. Obviously, the craftsman must make the blade in such as way that it performs the cutting function. Thus, as suggested in annotation b, the knife blade is very sharp. Thus again, this sharpness sometimes results in cuts to the very person who made the knife sharp in the first place, as seen in annotation a. Of course, all the knife did in this illustration is cut into some beef, which is part of the knife's job description. Unfortunately, the beef is *Homo sapiens* beef, and not bovine beef.

The second point is that the writer of this book does not make knives. I have enough problems with paper cuts as I rustle through sheaves of manuscripts. I leave the knife cuts to my brother.


Cam
Locking
Bar
Notch




a.
b.

An important part of the knife making process is the hardening of the blade. In the first figure of the facing page, Tom is pulling the blade from an oven. Notice the display on the right side of the oven shows the temperature to be 1,427 degrees, Fahrenheit. The amount of heat applied to the blade depends on it metal composition. For example, Tom heat-treats his carbon steel blades at $1{,}450^{o}$ to $1{,}500^{o}$.

This high temperature, and subsequent cooling, is necessary to harden the metal in order for it to cut and "hold its edge." Without going into the physics of the process (which I don't know anyway), the heating realigns the molecular structure of the metal.

The blade is left in the oven for several minutes; the exact time depends on the exact kind of metal and its thickness. For example, the blade is left in the oven for one hour for every one inch of thickness.

Many metals can be used in knife making. Tom uses stainless steel, of which there are many types. He also uses carbon steel, of which there are also many types. Again, each type and kind is heat-treated differently.

Tom tells me the debate about which is best, stainless steel or carbon steel, is like the debate of which is best, a Ford or a Chevy. He also tells me tells me he has heard, time and again, (usually from "old timers") that stainless steel won't hold an edge and can't be easily sharpened, because it doesn't have enough carbon in it. Nonsense, and see [note 3] for more details.

The second figure shows Tom immersing the hot blade, just taken from the oven, into warm oil. This procedure is called the *quinching* process.

It is this sudden cooling process that hardens the steel. In contrast, cooling the steel very slowly will make it softer…but who wants to cut butter with a soft knife, much less a thick steak?

The oil should not be cold, but warm. If the oil is too cold, the hardening process will result in a brittle blade. On a cold morning, Tom first warms the oil with a hot piece of steel.

After the blade has cooled, it is placed back in the oven for one hour at 350^{o}. This process is repeated a second time, and is called the *draw* or *temper*.

The third figure shows the knife blade after the heating process. It appears rust has formed on the blade. But is not rust, it is *slag*, a natural result of heating metal in an oxygen-rich atmosphere.

As you can see, at this point in the process, the blade does not present a very pretty picture, but you know from previous illustrations that Tom will have it in fine shape before long. Also, this picture reminds me of one of those old posters showing poor, unfortunate, waifs and/or indigents---with holes in their clothes. From the holes in Tom's glove, it would appear he qualifies for the bread line but his business is thriving. I suspect he might have grown attached to his gloves; after all, they have seen him through some hot times.


DTC 600
1927

The top figure on the facing page shows an annotated view of the work in progress. I am holding the knife, with its front toward the left side of the picture. The circled area labeled a shows the two bolsters. Notice they have been ground to fit with the contour of the knife sides. Also, Tom has ground their rear (handle) sides to create notches at 45^{o} angle to the liners. As explained earlier, these two notches will be part of two dovetail joints between the bolsters and the handle material (for this knife, the Micarta). Not only do the joints enhance the look of the knife, they also add strength to the bond between the bolsters and the handle material.

The circle labeled b toward the rear of the knife shows a notch Tom has put into the two liners. This indentation will allow one of the inner, moving parts (the locking bar) to be pressed down by a finger or a thumb to release the locking bar from the blade notch, thus allowing the knife blade to be closed. (The blade does not lock in a closed position, only in the open position).

So, the locking bar is pressed down to release the lock from the blade, thus allowing the blade to swing down inside the handle. The spring is in contact with the bottom of the locking bar, creating constant pressure on this bar. It is the spring pressure that causes the blade to "snap" open and shut.

The annotation of c and the associated arrow points to the interior of the knife, between the liners, where the blade rests when it is not open. Some knifemakers call this part of the knife the *channel*. Of course, the two other moving parts (the spring and the locking bar) reside in this inner part of the knife.

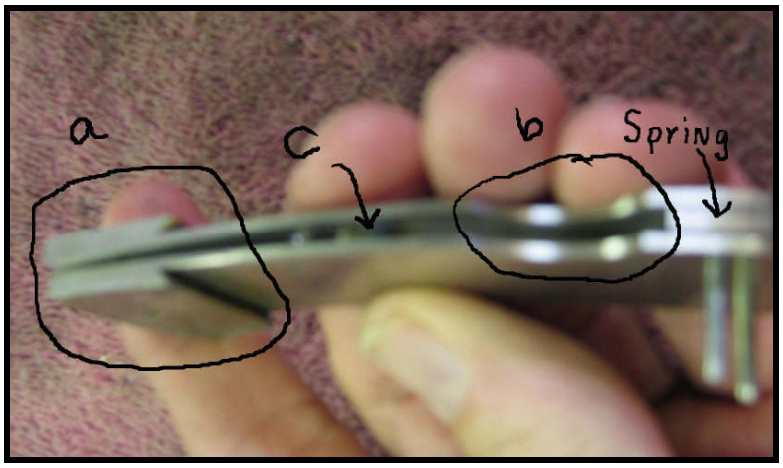
In summary, this illustration shows the two liners, the two bolsters, the dovetail joints, and to the right-side of the figure, the spring.

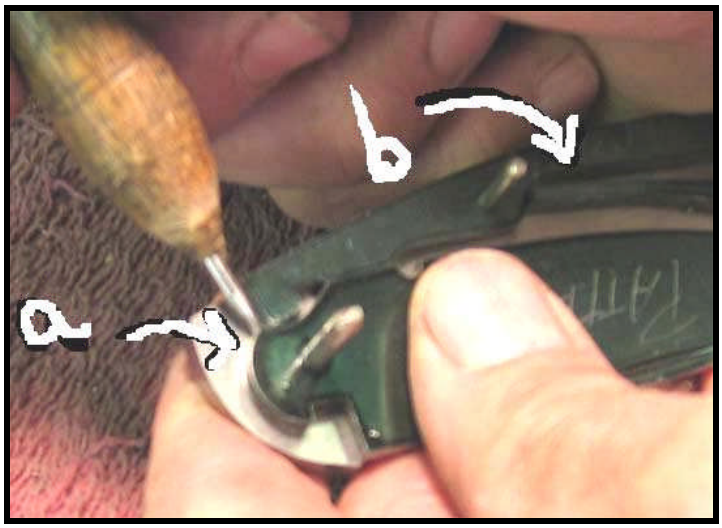
Successful knife making (especially for a folder that has moving parts) requires the knifemaker to cut and grind the material to a very precise (that word again) dimension. If excess metal (in hundredths of fractions of an inch) is left on the part, it will create friction with other parts, resulting in binding. If too much metal is removed, the result will be a loose blade and resulting side movement or up-and-down movement when the blade is in the locked position.

The second figure illustrates the challenge. Annotation a points to the cam of the blade, which is folded-into the handle sides. Annotation b points to the part of the knife that is placed on the notch of the handle, the locking bar. Again, these parts must fit into the knife, almost perfectly. [note 4]

I think superior knife makers must carry the anal compulsion gene in their DNA. (Just joking Tom…only trying to take the edge off some of these edge-cutting explanations.)

The third figure on the following page is included to emphasize the importance of the grinding process to the shape and precision of the knife. In this figure, Tom is working on the knife blade. He is ever-to-delicately pressing the blade to the grinding belt, moving it back and forth across the belt, as he performs the final shaping of the blade. A slight mishap here will mar the blade; if so, it must be replaced. The shape for the blade Tom is grinding in this picture is called a hallow grind.[note 5]


a
c
b
Spring


b
a

The first figure on the facing page shows one side of the knife handle. The bolster is on the left side of the picture; the Mircata handle is the ivory colored part. These two parts of the knife are separated by the red material, the *spacer*, which is the vulcanized fish fiber, explained earlier. Tom has not yet cut the extra part of this material down to the sides of the knife.

The three clamps keep the Micarta firmly affixed to the metal side of the knife. This process entails the application an epoxy between the Mircata and the knife's side in order to bond them together. Additional bonding is gained with the use of the spring and locking bar pins explained earlier (and not shown in this figure).

The second figure shows the work in progress again. I am holding the knife in a position to display one side of it. The red material has been trimmed and is now flush with the handle and bolster. The pins can be seen here, but they have not been cut and ground. The piece of metal sticking up on top of the knife is the rear of the locking bar. The blade has not yet been placed in the channel. Later, Tom will insert the blade; at that time, the locking bar will be positioned flush with the top and rear of the handle, with access to it through the small notch on top of the knife.

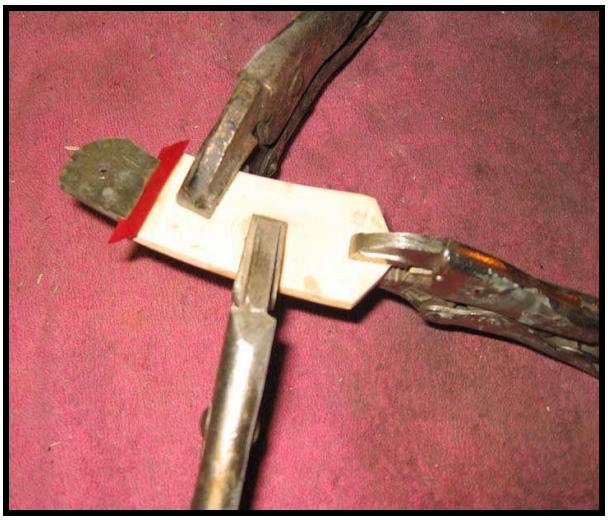
Let's clarify a confusing term: "rear locking folder, or rear lock folder." Even though it does not lock in the rear, that is where the locking bar is depressed to close the blade. It actually locks when the front of the locking bar drops into the blade notch.

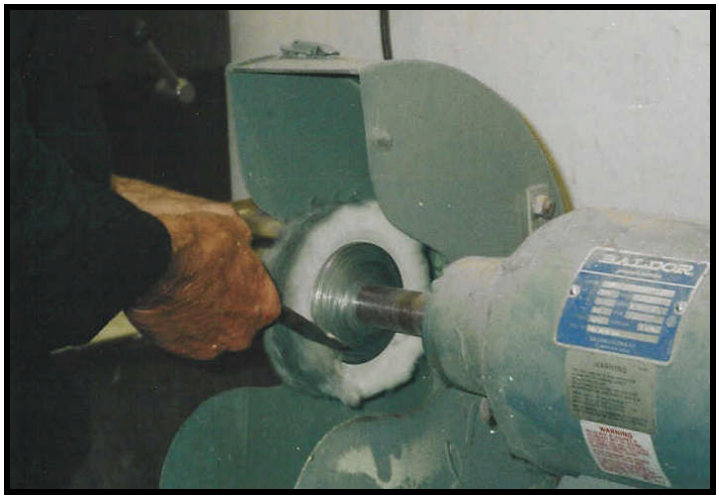
One of the final operations on the metal parts of the knife is buffing. The third figure on the facing page shows Tom buffing the blade. Tom checks for any remaining scratches and marks on the blade, which are almost always present. To eliminate these marks, the knifemaker must "trace back" to the appropriate grinding belt to remove them, because buffing will not do the trick---except for very fine scratches.

Again, during the grinding operations, a mishap may result in a blade that cannot be used in a knife. It is discarded, and another blade must be cut. Therefore, knifemakers are very careful grinders.

Tom uses a loose flannel (cloth) buffing wheel, powered by a 3 /4 horse power motor. The wheel turns at 1,800 RPM, which provides a mirror finish on the blade.

Also, Tom uses two buffing compounds. The first is a green-colored grease-based compound; it helps remove any remaining, small imperfections. The second buff is with a special finishing compound; it is used to obtain the final mirror finish. Both compounds are applied directly to a cloth buffing wheel; one wheel for green and one wheel for pink.




BALDOR

The illustrations on the facing page show the instrument used to measure/gauge the hardness of metal, and an accompanying chart. I have drawn a white circle around the knife to show its position when its hardness is being measured.

The chart in the figure lists various kinds of metals as row items, such as carbon, cobalt and copper. The columns in the chart, such as ATS 34 and ATS 35, describe different kinds of metals. The entries in the table describe the percentages of alloys present in the different kinds of steel. Tom usually uses a stainless steel (its identifier is "440C") that is a meld of several alloys. These compositions are explained in [note 3].

Some knifemakers don't use stainless steel and prefer carbon steel. One reason for this preference is that carbon steel can be heat-treated using a simple blow torch. Whereas, stainless steel must be heat-treated in an oven that can reach and maintain a temperature of $1{,}950^0$.

The instrument in the figure measures "Rockwell Hardness." It presses a point into the steel with a designated pressure. The point makes a small indentation in the metal, and the depth of the indentation determines the hardness of the steel.

Typical values for hardness range from 12 - 62, with 12 being soft and 62 being very hard. Before the heat treatment, the typical hardness of the metal is 12 -15. After the blade has been heated, quinched, and drawn, it hardness ranges between 55-59---of sufficient hardness to cut your butter and your finger.


Steel Chart
ALLOYS STEELS
CARBON
CHROMIUM
COBALT
COPPER
MANGANESE
MOLYBDENUM
NICKEL
PHOSPHORUS
SILICON
SULPHUR
TUNGSTEN
VANADIUM
GIN-1(G-2)*
ATS-34
ATS-55
AUS-6 (6A)
AUS-8 (8A)
AUS-10 (10A)
CPM 420V
CPM 440V
VG-10
MBS-26
440A
440B
440C
440XH
425 MODIFIED
SANDVIK-12OC
W-2
CAUTION
DIAL INDICATOR MAY
GET DAMAGED IF
SMALL POINTER GOES
BEYOND RED SPOT AT

Notes

Note 1. The bushing is a metal donut-shaped piece of bronze. It has a 1/4" outside diameter that fits into a 1/4" hole in the blade. The bushing has a 1/8" hole in it that accepts the 1 /8" pivot pin. When the knife is assembled, the liners inside part of the handle will contact the bushing, which is 3/1000 inch thicker than the blade. This construction also eliminates any wear on the pivot pin because the bushing is fixed, and there is no movement of the pivot pin or the bushing. Therefore, the blade moves on a stationary bushing.

Note 2. The dove tail, is cut at an approximately 45^{o} angle as opposed to a 90^{o} angle. This angle helps to hold the handle material in place and the red insertion adds an attractive color to the knife.

Note 3. The chart below shows the ingredients of two popular metals for making knife blades: carbon steel 01 and 440C stainless steel. Hmm. Stainless steel 440C has more carbon in it than carbon steel 01. Sorry old-timers, but the big difference in the two steels is not the carbon content, but the amount of chromium. 440C has approximately 35 times more chromium than 01. In addition, this chromium is what gives stainless steel it rust resistant capabilities over that of carbon steel.

In addition, how a blade cuts depends on how it is ground. Its edge holding ability is determined by how it is heat treated, quinched, and tempered.

Also, this table does show all the ingredients in the metal. The remainder of the steel is iron.

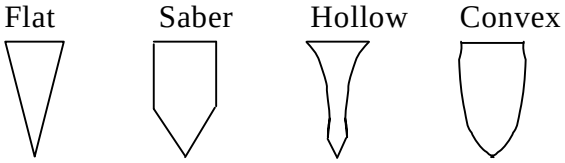
Percentage of Ingredients in Metals

	01 (Carbon)	440C (Stainless)
Chromium	00.40	17.00
Managanese	01.00	01.00
Molybdenium		00.75
Phosphorus		00.04
Silicon		01.00
Sulphur		00.03
Tungsten	00.40	
Vanadium	00.30	
Carbon	00.85	01.20

Note 4. If the cam and locking bar are not properly shaped, the following problems may occur: (a) the blade will be loose and/or misaligned; (b) the locking bar may be too high or too low; (c) the blade may not fit in the middle of the channel (between the two liners); (d) the blade may make contact with the spring or locking bar when closed; (e) the blade may not rest inside the middle of the *channel* (between the two liners). Another problem results if the point of the blade is not completely enclosed in the channel (due to an improperly shaped cam). In this situation, it sticks up, out of the handle, and could give you a painful prick if you were to, say, try to retrieve it from your pocket. Tom does not sell knives that exhibit these deficiencies; if he did, he would not have many repeat customers.

Note 5. The blade grinding is started with a 80 grit belt. This step is followed by successive grinds with 60, 120, 220, 300, 400, 600, 800, 1000, and 1500 belts.

The basic "grinds" are shown below, viewing the blade from the point to the handle. You may recognize the convex shape. It makes for a very strong blade and is used for axes and hatchets. The hollow ground blade is created using a round rubber-backed wheel that drives a 2 x 72 inch grinding belt. The hallow ground is preferred by some knife makers because they think it cuts better and longer. The folder used for this tutorial was hollow ground.



Tom, with a bunch of his knives:

Me, with a bunch of my books: