Throughout our lives we wrestle with the notion of who we are, where we fit in and how to make some kind of lasting mark on the world. Our identity is shaped by gender, race, ethnicity, relationships, profession and our own temperaments and attitudes. As I read the articles in this, our second issue of Quest, I was struck by how most deal directly or indirectly with the question of identity. Somehow (and not by conscious design) we've ended up with a theme this time around.

Read our special section entitled Virtual World and you may well ask what computer simulation has to do with identity. A great deal, I would argue. To represent or model the real, you must understand its characteristics and attributes. In short, its identity. You must determine how best to sum things up, to get at the essentials, if you have any chance of creating a useful real-world representation.

Identity figures most obviously in our third and last stories, on adoption and body image respectively. Sociologist Katarina Wegar and psychologist Thomas Cash are asking basic questions. Where do we come from? Where are we going? How do we see ourselves on our life journey? These are questions that also pre-occupy many of the inhabitants of the former Yugoslavia, as history professor Lorraine Lees eloquently explains in Quest’s first extended question-and-answer segment.

On a lighter note, it’s equally true that barnacles, sea worms and jellyfish have no identity crisis to speak of. Our story on marine biofouling and Karl Schoenbach’s efforts to counteract it, have little to do with self-discovery on the part of sea critters. But it has a lot to do with ingenuity and a novel application of tried-and-true technology.

Speaking of identity, credit for Quest’s sparkling appearance goes to designer Sharon Lomax. Once again, working under unrelenting deadline pressures, Sharon has done her usual superb job of making this Quest a visual treat. We’re very fortunate to have someone of Sharon’s exceptional abilities helping us to look very good indeed.

Now that the weather has warmed, thoughts are turning to vacations, lazy days sunning or catnapping, maybe a dip or two in the ocean or pool. We’ll be taking a bit of a break. We’ll be back in the fall with our third issue, with more stories that we trust will continue to interest and intrigue you.

James Schultz
Editor

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ON THE COVER

Virtual students stroll through a three-dimensional simulated atrium shown from the second level of the structure. In a virtual world, viewers can also move to a more remote vantage point (far left) or zoom down to floor level (right). Images created by 3-D Design (www.3-ddesign.com), courtesy of Shuller, Farris, Johnson & Lindstrom Architects.
FOCUS ON THE Balkans

In the early 1990s, the world watched at first uneasily, then with increasing concern, and finally in horror as the country once known as Yugoslavia went to war with itself. Atrocities were accepted as necessary: Neighbor slaughtered neighbor in the name of "ethnic cleansing" and rape was used as a so-called "instrument of rational policy." In ironic complement to war, Olympic sites near the Sarajevo that became famous during the Winter Games of 1984 were turned into strongholds for artillery and infantry and, in turn, themselves became the targets of shells and bombs.

For the moment, the fighting appears to be over. An uneasy peace holds under the terms of the Dayton Peace Accords, policed by occupying troops, including Americans. But some of the peacekeepers may leave this summer. What will — what should — happen then?

Old Dominion associate professor of history Lorraine Lees is an American foreign policy expert and author of the 1997 book "Keeping Tito Afloat: The United States, Yugoslavia and the Cold War." Lees spoke to Quest editor James Schultz about Yugoslavia’s troubled past and its uncertain future.

Photos by Todd Spencer
People have thought of Yugoslavia as the example of what was wrong with the Soviet Union of empire. Yugoslavia's fundamental divisions gnawed on eventually rend a country apart.

It's a good example of ancient hatreds that are refreshed every generation with more blood being spilled. It's a perfect example of how peoples' emotions can get the better of them. Yugoslavia was a country that worked, as an entity brought together under one umbrella without ethnic considerations being a major factor. Yugoslavia's dictator, Marshal Tito, indeed had a cardinal rule that ethnic affairs were not to be brought into the equation. And the country prospered.

As soon as he died, the nationalists were able to use the cause of nationalism to remind people of why they didn't like their neighbors being along with them for the past 40 years. Unscrupulous politicians were able to take advantage of the nationalist feelings and convince people that it made more sense to follow nationalism than to follow their economic self-interest.

There is a reason why Yugoslavia shouldn't still be together. Those folks worked together. They were able to suppress their differences. While you had a national leader that made that his goal, it worked.

Why isn't that their ethnic hatreds aren't important?

It's odd. These are people that have a great deal in common. It's as thought to forget what they have in common they focus on the few things that divide them. It's almost a willful attempt to find out what's different.

Where do matters stand today in the former Yugoslavia?

It's an old, old division between peoples whose heritage is so different, with so much分开but who haven't been able to sustain periods of peace.

I think religion is more important than the ethnic hatred.

I discount all of the religious differences. Tito's business about the Bosnians being Muslims — it was just a cover for those who wanted to take their territory. What's surprising is that Serbia and Croatia have always wanted to control Bosnia-Herzegovina for many, many years. When the Yugoslav state fell apart in 1991, both Serbia and Croatia simply followed the same path. They've been following for a very long time to get their hands on that area. The fact that some of the Bosnians were Muslims, I think, enabled each side to inject a religious element where there shouldn't have been one.

Sarajevo was a wonderful, beautiful city. It was a city of a lot of ethnic groups working together. The tragedy is that the leaders were able to generate enough hatred to tear it all apart.

What has this conflict been so bloody?

There was a lot of grievances. The leaders were able to hit on to cause all the turmoil .... If you put into the mix other issues — economic deprivation, for example. For most people are responsible to the man on horseback who claims that he has the answer.

Look at the United States. A lot of people still display the flag that was the symbol of the Confederacy. If asked if they are American they say yes, of course they are. But if you make some disparaging comment about an ancestor who fought on the Southern side in the Civil War, that gets their dander up. It's that same kind of thing family connections and family grievances that people remember.

These folk talk about World War II as if it were yesterday. I would be at conferences in the 1980s, and the academics would lean over to me and whisper as somebody was giving a paper, “You know, he's really a Croat.” I’d say, “What?”

One of the arguments made is that Tito, in suppressing these ethnic divisions in the long run exacerbated them. In other words, by not dealing with them, they were allowed to fester. He created this ideal that simply divided up these ethnic hatreds. As soon as the ideal disappears, what are you going to do? Who are you now? If Yugoslavia doesn't exist, you're back to being a Serb, you're back to being a Croat.

The problem with nationalism is that it implies an exclusiveness. It immediately identifies someone else as the other. Any appeal to nationalism can...
Watching this videotaped scene on a small TV are Karl Schoenbach, director of Old Dominion's Physical Electronics Research Institute and electrical engineering doctoral student Amr Abou-Ghazaleh. On the same television as the video screen and adjacent to it is an electric apparatus consisting largely of 100 energy-storing, computer-controlled capacitors. This is one of the largest of the Institute's prototypes, capable of releasing up to 20 million watts of power for one millionth of a second.

Don't fret about the shrimp, Schoenbach advises. As far as they and other sea dwellers are concerned, electricity and water can mix without fatal effect. "You don't want to kill these creatures," he says. "We want to stun them, give them a brief shock. And then they recover.... This is a unique system. The technology itself has been known for 20 years. I've adapted it for a biological problem."

Schoenbach's prototype addresses a matter of exceptional concern to ship builders and operators, power companies and water treatment centers: "bio-fouling," or the growth of barnacles and other marine life in contact with water. Traditionally, biofouling has been discouraged or prevented by lacing sealants or paint with powerful chemicals that nevertheless can leach directly into seawater, creating a pollution problem potentially greater than the original predicament.

A Jolt to the System

Schoenbach's environmentally friendly solution is what he calls "pulsed power": the application of very high-energy surges of electricity for extremely short periods of time. The power released is in the millions of watts range, but the duration can be adjusted to as little as one billionth of a second. The flat jolt disrupts cellular function for minutes or hours, preventing the attachment of nuisance marine species like barnacles. More intense pulses can also be used for related purposes, such as purifying water, killing bacteria and other harmful microorganisms.

Pulsed-power technology may have an even larger impact on cancer treatment. In theory, power pulses can be used to selectively target and kill cancer cells by disrupting their basic metabolic function. Surrounding healthy tissue would be unaffected.

In the late 1980s Schoenbach attended a scientific conference in San Diego, where he saw a technique demonstrated that used ultrafast electric pulses to perforate cell membranes. The negative microsecond wavefront of nearly 100 watts was worth of effort. "I came from a field where we can easily create electrical pulses a billionth of a second long," Schoenbach says. "I thought if we want to shock pulses we could, in principle, find new effects. Because of their short duration, the energy these pulses carry is small, even at power levels in the range of millions of watts. You have pure electrical effects on cells, without heating. And everything in the body is related to electrical signaling."

In 1994, in a demonstration project coordinated by the Center for Advanced Ship Repair and Maintenance in Norfolk, Schoenbach and Institute graduate students constructed a pulsing power delivery system which they housed on a dock jutting into the near-by Elizabeth River. Their goal was to prevent attachment and growth of barnacles and other aquatic organisms. For 20 days in November 1995, a test pipe was automatically zapped for microwatts with high-voltage electricity. Subsequent investigations were conducted for 23 days in May 1996 and for 33 days in October that same year. A second, non-pulsed pipe served as a control, a means of comparing results between the two pipes.

During all three runs, hundreds of barnacles, marine worms, jellyfish-like creatures and other water-borne species were identified in the unelectrified pipe. In the first two experiments, when voltage levels were kept high, no organisms were detected. In the third investigation, as electric field density was decreased, the research team detected fewer than a dozen animals in the control pipe through which the electrical pulses were directed.

Killing Cancer?

Schoenbach's work has attracted the attention of utility companies, including several located near or on the Great Lakes. These attract millions of regular dog water intake pipes and are costly to remove. In an experiment in Louisiana, several utilities, the Army Corps of Engineers and a northeastern pulsed-power company are evaluating Old Dominion pulsed-power technology and its effectiveness in curtaining zebra mussel biofouling.

"If the technology works in Louisiana, it could result in a commercial application," Schoenbach points out. "We won't make the devices, but we would provide the blueprints."

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Schoenbach says Institute-derived pulsed-power arrays can be made larger or smaller as needed. He hopes that one day ordinary consumers may be able to use a simple household system that could rid tap water of all biological impurities. In the longer term, pulsed power may be utilized in the struggle against cancer.

"It's not a simple matter of killing or not killing. We can target different parts of the cell," Schoenbach explains. "What it offers is the possibility of killing selected cells -- the cancer -- while keeping healthy cells undisturbed. This is completely new and something I'm very excited about."

"Dowe have in our hands a way to cure cancer?" Schoenbach says. "It's a longshot, a possibility. It will require a lot of work.

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"The energy these pulses carry is small, even at power levels in the range of millions of watts. You have pure electrical effects on cells, without heating."
Families by any Other Name

LINES from a Valentine’s Day card figure prominently in the introduction to one of Katarina Wegar’s latest scholarly articles. But Wegar, an Old Dominion assistant professor of sociology, isn’t studying Cupid. What has caught her attention are key parts of the card’s greeting: “Sis,” the inscription reads, “even if you were adopted, I’d still love you. We all love you, even if your real parents don’t.”

Wegar believes the card writer’s attempt at humor mirrors a widespread assumption about adoption: that it is, and forever will be, a pale imitation of a child’s true birthright. Since the mid-1980s Wegar has studied adoption politics and the institutions that control and administer adoption. In a 1997 book published by Yale University Press titled “Adoption, Identity and Kinship: The Dilemma Over Sealed Birth Records,” Wegar investigated nearly a century’s worth of turf battles, misconceptions, the misapplication of scientific findings and the recent activism of adult adoptees to form a complex picture of the history and politics of American adoption. Believe the myths about adoption, she says, and you’ll conclude — wrongly — that it is invariably best for all parties to prevent the adopted from learning the identities of their biological parents.

“Because adoptees are seen as being in some sense illegitimate, the assumption is that an adoptive family can and should give them a new start and that they don’t have to live with the stigma of a sordid past,” Wegar says. “It’s presumed that secrecy protects the adoptee and protects the adoptive parents and privacy of the new family.”

Although federal statistical tracking of adoptions was halted in 1975, by 1981, at least one university research group determined that at least 1 million children were adopted in the United States in a single year. In the intervening 17 years, it’s likely that figure has increased substantially; by how much, Wegar says no one knows.

In her book, Wegar points out that modern adoption’s legal and cultural precedents are relatively recent, dating back to an 1851 Massachusetts state law designed to protect adopted children. In part, the unrelenting march toward secrecy had much to do with the quintessential American notion that citizens can periodically reinvent themselves as a result of concentrated effort.

“Children must be protected, advocates insisted, so they could begin anew. Shortly after World War I, and beginning in Minnesota, secrecy was codified with a state law that ordered the sealing of birth records. The trend spread by states with most quickly adopting birth-records prohibitions. By the 1940s, the national debate over records confidentiality had essentially ended. Although social worker and adoptee Jean Paton wrote a book in the mid-1950s urging abolishment of these sealed-records systems, the debate was not effectively revisited until the 1970s, when national attention refocused on ethnic origins.”

In truth, Wegar says, surveys show that most adoptive parents aren’t afraid of losing a child to that child’s biological parents, knowing that as adopted sons and daughters mature they’ll be naturally curious about their origins. Moreover, should these children as adults develop severe medical problems that require a tissue or blood match in certain kinds of medical interventions, such as bone marrow and organ transplants, it’s vital to learn their genetic background — and whether they have genetically compatible siblings who could literally make the difference between life and death.

“The assumption that we need anonymity for parents, birth and adoptive, is false,” Wegar says. “It is wrong, however, to assume that all adoptees feel the need to search for or meet their biological kin,” Wegar says. “I tend to agree that adoptees should have access to birth records. But in their attempts to open adoption files and change adoption laws, search activists — by claiming that the blood connection is the most important human connection — have unfortunately reinforced the idea that adoption is a flawed and unworkable family form.”

Among the 50 states, only Alaska, Kansas and Tennessee allow unfettered access to birth records. Absent a match through a national adoption registry, a court order, private detective or national TV talk show appearance, adult adoptees living in the other 47 are on their own in the hunt for lineage.

In making her case for openness, Wegar says that, in part, the enthusiasm for secrecy had to do with the rise of social welfare as a profession, replacing traditional arrangers of adoption, such as social workers, middlemen and gatekeepers. By controlling access, the know professionals, midwives and gatekeepers guaranteed themselves and their institutions a steady clientele and a regular income. For cash-strapped social service agencies, secrecy was profitable; it was a sturdy lever to dislodge any obstacle to funding.

Nevertheless, as later generations grew more curious about their origins. Morever, should these children as adults develop severe medical problems that require a tissue or blood match in certain kinds of medical interventions, such as bone marrow and organ transplants, it’s vital to learn their genetic background — and whether they have genetically compatible siblings who could literally make the difference between life and death.

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Making Secrets

“In their attempts to open adoption files and change adoption laws, search activists — by claiming that the blood connection is the most important human connection — have unfortunately reinforced the idea that adoption is a flawed and unworkable family form.”

BY JAMES SCHULTZ

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Old Dominion University’s Quest 9
Decades ago, when explorers discovered painted figures of horses, bulls and other animals preserved on cave walls near Lascaux, France, they were astonished by the renderings’ sophistication. The cave painters were, after all, primitive peoples of the Paleolithic Age. What prompted them to make art? A hunting guide to the movement of game? An essential part of early religious ceremonies? All three?

• No matter the intent, ancient and modern humans alike seem compelled to describe the world symbolically, whether in images, words, sounds or, in recent times, through the use of mathematical symbols. Scientists who create art are no different. Like their forebears, these scientist-artists are attempting to represent reality in unique, vivid ways.

The following trio of articles describes projects being conducted by Old Dominion researchers who are using computer software and hardware to depict the natural world or the ways cultures have represented it. Whether the purpose is to communicate scientific truth or aesthetic beauty, the intent is the same: to share what has been learned about the world and to foster understanding.

Acts of Love and Care

An adoptee herself, Wegar’s personal experience contradicts the notion that unfettered access to one’s past is corrosive of the present and future. Wegar grew up in a small southwestern Finnish town, an hour’s drive from Helsinki, and knew the identities of both her biological parents. “I needed to know that I belonged to a family that existed before me,” she writes in her book. “I always took access to identifying information for granted...”

• That which is hidden is often thought shameful. While Wegar does not believe secrecy creates stigma, she does think it contributes to the view of adoption as somehow disrespectful. If all sealed adoption records were opened tomorrow, bias would remain — but openness would be an important first step in an ongoing process of legitimizing adoption and helping the adopted to feel as valued as any child living with birth parents.

“Natural, biological kinship is the norm.” Wegar says. “Adoption is seen as second-best — a definite deviation. Adoptive families aren’t seen as real families. Raising a child and growing up as a child can be very difficult under those circumstances.”

Wegar notes that within the past 15 years, some countries in the West, in particular Great Britain, appear to be moving toward greater adoption openness. “The United States has yet to follow that lead. If and when it will, Wegar is reluctant to predict, saying only that ‘it doesn’t look like it will happen soon.”

Adoption prejudice may persist, but Wegar suggests an expanded view of family is also emerging. Ironically, the commonness of divorce in the second half of the century may be helping families redefine, as stepfamilies bringing children of different kin under one roof. No matter the definition, Wegar believes all families should be valued and accepted for what they can and should be places where children are raised, nurtured, accepted and loved.

“ ‘We think too much in biological terms. Kinship is something we do create. It is social as well,’” Wegar argues. “ ‘Families are created through everyday acts of love and care. Adoptive families are as real as any family created by blood.’ ”

Katarina Wegar is assistant professor of sociology at Old Dominion.

Imagery created by 3-D Design (www.3-ddesign.com), courtesy of Shuller, Ferris, Johnson & Lindstrom Architects.
Back in Norfolk, Wheless and Old Dominion colleague Cathy Lascara, a fellow research assistant professor at the Coastal Center, began their search for funding to underwrite the simulation effort. They penned a proposal to the National Science Foundation (NSF), which in 1996 granted $330,000 for the project. Once the largest initial cost was the purchase of an ImmersaDesk, an advanced CAVE system on which the bay simulation would appear. Buying a $1 million-plus CAVE would have broken their bank. Or, as Wheless puts it, “CAVEs are cool. But they’re expensive.”

The science foundation grant came about in part because of Old Dominion’s involvement with the National Computational Science Alliance, a partnership among computational scientists, computer scientists and professionals in education, outreach and training at more than 50 American universities and other research institutions. Led by the National Center for Supercomputing Applications at the University of Illinois Urbana-Champaign, with core funding from the NSF and the state of Illinois, the alliance is building what is known as the National Technology Grid. The Grid will use a high-speed telecommunications network called Internet2 to integrate powerful computer workstations, advanced visualization programs, remote instrumentation and large-scale databases. Grid participants will have at their disposal advanced searching and indexing capabilities, digital libraries, audio and video streaming, even real-time satellite imagery. Once the Grid is operational, researchers using desktop computers will routinely be able to write software and share it with peers at other institutions. On the Grid it will be possible for teams of computational scientists anywhere in the country to simulate global climate change, share next-generation computer chip design, examine the molecular workings of new pharmaceuticals—or monitor changes to the Chesapeake Bay.

### Destroying The Limitations

Such technological progression has spawned at least one new word: “teleimmersion.” For researchers, teleimmersion permits data visualization on a scale and to a degree not previously possible. “Teleimmersion will go beyond images that appear computer generated,” Wheless predicts. “They will be photo-realistic images. In a virtual world, you’ll look at something and it will look real.”

As systems like the Chesapeake Bay simulation mature, teleimmersion will be one aspect of “collaborative visualization,” the ability of Grid-present scientists and policymakers to share and interpret complex information. In the bay’s case, for instance, the gradual and steady urbanization of the surrounding watershed has had harmful ecosystem effects. The VEL’s bay simulation will model the delusional effects of storm and agricultural runoff, the repercussions on marine life and the myriad physical processes forever driving bay circulation, temperature and salinity.

As part of the Computational Science Alliance, Wheless and Lascara are using CAVE-specific software to create their three-dimensional marine simulations. They have modeled St. Johns River, north of Cherry Point, North Carolina, and the Shelikof Straits in southern coastal Alaska. The pair have refined their program to permit multiple users to examine data collaboratively in a common virtual space.

### Summing the Bay

_**Bay On A Grid**_

Wheless says the idea for a computerized Chesapeake Bay simulation came to him in 1993 during a trip to an annual computer graphics conference in Orlando, Florida. There, for the first time, he was exploring in a CAVE, a Computer-Aided Automatic Virtual Environment. Once he put on a pair of liquid-crystal goggles, Wheless says he was stunned by the appearance of even the most basic images projected from the CAVE’s floors and three walls.

“The first time I saw something in the CAVE, I watched fish float by,” Wheless recalls. “It was amazing. They had volume. It was like being on the Star Trek Holodeck. I thought to myself: ‘To look at scientific data in a place like this would be invaluable.’

Wheless and Lascara linked computer scientists and professionals in education, outreach and training at more than 50 American universities and research institutions. Led by the National Center for Supercomputing Applications at the University of Illinois Urbana-Champaign, with core funding from the NSF and the state of Illinois, the alliance is building what is known as the National Technology Grid. The Grid will use a high-speed telecommunications network called Internet2 to integrate powerful computer workstations, advanced visualization programs, remote instrumentation and large-scale databases. Grid participants will have at their disposal advanced searching and indexing capabilities, digital libraries, audio and video streaming, even real-time satellite imagery. Once the Grid is operational, researchers using desktop computers will routinely be able to write software and share it with peers at other institutions. On the Grid it will be possible for teams of computational scientists anywhere in the country to simulate global climate change, share next-generation computer chip design, examine the molecular workings of new pharmaceuticals—or monitor changes to the Chesapeake Bay.

### Diving Through The Bay

Wheless and Lascara’s CAVE software allows marine scientists from Alaska to the Chesapeake to collaborate across space and time. The technology has allowed researchers to analyze patterns of fish movement and explore water temperature and salinity. Data points are dynamically represented in three dimensions, with small, differently colored arrows depicting changeable parameters such as the speed and direction of water and wind. In this place where information appears to have weight and substance, a wayfarer can stop half in and half out of the water; watching events unfold above and below. The Chesapeake Bay is within fingers’ reach, living in microcosm, summed by mathematical formulations and the power of microprocessors.

“Liquid-crystal goggles snug against temples, Glen Wheless and a visitor set out on a journey over shore and bay. No wind blows and there is no sound of engine or smell of fuel. Wheless’ only throttle is held between the thumb and first two fingers of his right hand. Yet Wheless soars and plunges with the abandon of a fearless, winged amphibian, diving easily into deep waters and floating effortlessly at what seems inches above a corrugated coast.

- Most days, Wheless is a research assistant professor at Old Dominion’s Virtual Environments Laboratory (VEL) located in the university’s Center for Coastal Physical Oceanography. This day he is the pilot on a digitized ‘fly-through’ of a computer model of the Chesapeake Bay. On Wheless’ virtual soupspoon, directed with a wand-like, hand-held device, it is possible to explore the deepest bay channels without so much as getting wet. The electronically synchronized goggles provide stereoscopic views of the effects of tides, winds, currents and theebb and flow of marine life.

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- “This is the way to look at data.” Wheless says, “If you don’t like the view, change it. What’s happening here? Over there? You can play around until you find what it is you want.”

### Conclusion

According to Wheless, that latest step may be the most important of all; it destroys the limitations of physical space and time, permitting teams of researchers to partner in real time no matter the location of their workstation. ImmersaDesk or CAVE.

“We’re one of the first groups to study environmental data with the help of a CAVE,” Wheless says. “There will be other people who’ll want to do this soon. It’s nice to see something that started out as an idea turn into something useful.”
T

ew miles off the Virginia coast a super tanker wallows in heavy seas. Earlier that afternoon, during a fierce coastal storm, it collided with a container ship. The second ship survived, limping into the Port of Hampton Roads with a crumpled bow. The oil-carrying Islaathan went as fortunately: crippled, mortally wounded, the tanker is listing severely and pouring much of its cargo directly into the ocean.

The remnants of the storm will dispense some of the hundreds of thousands of gallons of leaking petroleum, but a huge slick is heading directly for shore and Virginia’s tourist beaches. Can the spill be found and contained in time?

One day, says A.D. Kirwan, Jr., Old Dominion professor of oceanography, it will be possible to monitor the extent of such a potential disaster minute by minute with the help of software that he and colleagues have developed for more than five years. Kirwan, professor of computer science and oceanography Chester E. Grosch and doctoral student John H. Holdakham have utilized advances in parallel processing to create “particle-in-cell” software that models changes in temperature, salinity, speed and total height of ocean currents that develop and pass near coastlines. The effects of these oceanic “fronts” can extend for dozens of miles and profoundly affect sediment transport, pollution dispersion and, in deep water, the propagation and properties of sound.

For naval forces operating close to shore, abrupt changes in seawater composition and currents can delay or disrupt operations and troop deployment. The Navy is thus beginning to explore ways of developing “Rapid Environmental Assessments,” or REAs, computer programs able to instantly analyze a wealth of ocean conditions and predict their subsequent development.

According to Kirwan, the predictive potential of the particle-in-cell program attracted the interest of the Office of Naval Research, which has spent roughly half a million dollars underwriting the project over the past five years. “REA has definitely caught the navy’s attention,” he says. “In the days of the Cold War, all the action was in mid-ocean. But now the navy has to consider coastal waters. As you move closer to the coast it is really important to know currents in excruciatingly small detail.”

Kirwan says he, Grosch and doctoral student Holdakham have met their initial goal of developing solid proof-of-concept software that accurately models complex ocean processes. Working in tandem, multiple processors outpace even the fastest serial microchip. Still, significant progress has been made. In the case of the particle-in-cell program, Kirwan, Grosch and Holdakham have utilized advances in parallel processing to create “particle-in-cell” software that models changes in temperature, salinity, speed and total height of ocean currents that develop and pass near coastlines. The effects of these oceanic “fronts” can extend for dozens of miles and profoundly affect the movement of very small or extremely large ocean fronts. In nature, fronts vary dramatically in size: from inches to several miles wide to dozens of miles long and hundreds of feet deep. To accurately mimic real-world conditions, the particle-in-cell program incorporates millions of fluid parcels in each calculation.

“Particle-in-cell computations are made nearly half a world away, at a supercomputer facility located on the Hawaiian island of Maui. It is one of a handful of sites nationwide able to handle the program’s complexity. "You need lots of lots of memory to make this work," Grosch points out. "In the computational science field, this is what we call a ‘scientifically viable parallel computation.’ If you don’t get good performance, you ought to be embarrassed.”

The particle-in-cell program gets its name from the manner in which its designers describe the movement of fluid parcels — "fluid parcels" within the ocean. The parcels are mathematical constructs that encapsulate the composition, structure, movement and speed of sub-chopped volumes of seawater. Accurate fluid parcel descriptions are made possible by direct oceanographic observation, or data culled from the historical record.

Kirwan says he hopes to develop a prototype that could simulate ocean fronts in any coastal region in the world. "My vision is that, in 10 years when the technology is mature, that knowledgeable people on ships would have ready access to this technology to predict the real-time weather," he says. "In the long run, Kirwan predicts, “The real application of REA will be in the civilian sector.”

Future versions of the particle-in-cell software, Kirwan says, should one day be able to link to sensor arrays in the water, atmosphere and in space. The flood of information on water movement and composition could then be funneled over high-speed Internet connections to model running computers. Naval officers and emergency workers alike would thus have another array of formidable tools at their disposal.

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One presentation does stick in your mind. One of your visitors from southeastern Virginia presented you with a computer CD-ROM. You slide it into your notebook PC and take a virtual tour of a three-dimensional model of the site proposed for your company. It’s a parcel within an as-yet undeveloped commerce park, accurately modeled using data from the City’s Geographical Information System and detailed architectural renderings of proposed entrance structures. Using a pull-down menu system and drag-and-drop mouse commands, you’re able to become an instant architect by placing buildings, roads, parking lots and even landscaping to gain an artist for your intended business center. Using the mouse as a steering wheel, you can drive through the commerce park to view your virtual business center from every possible angle and perspective.

With another simple command, you soar skyward to view the entirety of Hampton Roads. You immediately see the location of your business center in relation to shipping ports, airports, major highway systems and other major centers of commerce. With still another click of a button, the availability of water and sewer connections, electrical and communication services, and other necessary utilities is displayed.

Hey, not bad, you tell yourself. This could be it. Maybe dinner won’t be as late as you thought.

Virginia’s First Commercial Simulation Center

Sound futuristic? Not to those of us working at the Virginia Modeling, Analysis and Simulation Center, also known as VMASC. The City of Portsmouth recently commissioned us to develop this cutting-edge interactive visualization tool to give potential business investors a state-of-the-art look at their prospective business sites. The City immediately saw the benefit and visual appeal of this tool to assess potential business investors. In the process, the Virginia Modeling, Analysis and Simulation Center (JTASC), the Joint Training, Analysis and Simulation Center (JTASC), the Joint Warfighting Center (JWFC), and the Armed Forces Staff College.

In addition, Hampton Roads has become this country’s center for the military application of computer simulation technology. The region contains three major military training and education centers: the Joint Training, Analysis and Simulation Center (JTASC), the Joint Warfighting Center (JWFC), and the Armed Forces Staff College.

Although the Center opened in July 1997, in less than a year three projects are already in progress. In addition to the venture with the City of Portsmouth, VMASC is working with the U.S. Army’s Military Transportation Management Command to develop a series of flight simulation packages to plan the movement of troops and equipment to other parts of the world.
VMASC wishes to adapt and apply this exciting new simulation technology in the commercial business sector. Today’s commercial simulations primarily are based on focused process simulations, which are used mainly for diagnostic purposes. Generally, they are constructed for stand-alone applications and are not able to exchange data with other similar simulations. When applied to training, the simulations tend to be limited to a single user on a single computer.

Tomorrow’s simulations will capture the complexity of a given business operation. These simulations will be constructed to standards that will allow several models, running on different hardware platforms, to work in unison. They will also allow multiple users, perhaps separated by great distance, to exchange information and to interact with one another as if they were all part of the same simulation. All this, and they will play on ordinary, networked personal computers.

Because the primary mission of VMASC is economic development, each VMASC project will include both commercial partners: an application partner and a technology partner. An application partner is the endpoint customer, the company for which a prototype simulation tool is being developed. This partner defines the project requirements and then evaluates the final product. A technology partner is any company that participates with VMASC in the development of a prototype simulation tool. This partner brings to the table the tools, expertise, or manpower.

At the project conclusion, the application partner has gained a new management tool to help improve competitive advantage in the marketplace. The technology partner has acquired new expertise, software, or possibly even a new product. Regional economic development occurs because of the additional jobs and investments that the resulting market sector of the technology partner and the competitive advantage gained by the application partner.

VMASC’s mandate is to help commercial businesses utilize the exciting new simulation technology now being developed for the military using our tax dollars. Our goal is nothing less than to make Hampton Roads and Virginia this country’s epicenter for the commercial application of computer simulation technology.

Roland Mielke is VMASC technical director and a professor in Old Dominion’s Department of Electrical and Computer Engineering.

**Down The Simulation Road**

VMASC envisions a future in which desktop simulation tools are as common as word processing, spreadsheet, and database tools are today. These tools will be based on networked, business-enterprise models supported by readily available and accurate databases that can be quickly and easily updated with satellite and map data available over the Internet. These simulations will provide the user with tremendous new capabilities for interactive decision-making and team-centered training and rehearsal.

VMASC has the capability to develop and apply prototype enterprise business models. Enterprise models capture at the macro-level the salient features and processes of a complex business. These models are used to construct computer simulation that assist decision makers better understand the current business climate and to investigate the options available for action.

Point of Crisis Anywhere in the World. One of these simulations, PORTSIM, is designed to predict the movement of military cargo through a seaport. VMASC scientists and engineers are developing the capabilities of PORTSIM by modeling the effect of commercial cargo flow on the handling and processing of military equipment and supplies.

A third project, funded by the Lockheed Martin Corporation, involves the development of new and more efficient methodologies for specifying the behavior of what computer scientists call “objects” computer models of real-world entities. The results of this project should reduce man-hour effort required to develop new computer models. A number of other potential projects await the discussion or proposal stage. VMASC is working with several large manufacturing companies to define simulation tools to capture the product distribution process. These tools will permit decision makers to ask “what if?” questions designed to improve customer service and reduce distribution costs.

We are in discussions with a major operator of theme parks concerning customer-flow simulation as a tool to reduce lines. We are also proposing the development of a utilization simulation to train local government officials for emergency preparedness, and a simulation to assist the Virginia Department of Mental Health to implement an awan and more uniform process for managing publicly funded health care.

**By James Schultz**

Clothed or not, stand in front of a full-length mirror. Stare at yourself. Are you too thin? Too fat? Not tall enough or too tall for comfort? What about your nose, or chin or torso? How does your lower body rate? Do you like what you see? Or are you like millions of Americans—seriously dissatisfied with some body part, maybe even your entire body?

For the past 25 years, Old Dominion professor of psychology Thomas Cash has investigated individuals’ attitudes toward physical appearance. Within the last decade, Cash’s body-image research has caught the eyes and ears of the national media, leading to interviews in top magazines and newspapers, appearance on television news programs and documentaries, and to work as a consultant for corporations and professional associations. He has written background articles, led scores of research programs and counseled hundreds.

The reason he has stayed so busy, Cash says, is that most of us living in the developed world have plenty of opportunity to find fault with our bodies. Despite diversity in body morphology, many women and men feel that they must conform to an unattainable physical ideal. For men, this often translates into a narrow masculinity and, for women, a slender but boyish physique.

In 1985, Cash helped organize a national study on body image in Psychology Today magazine. More than 30,000 subscribers responded; of those, 2,000 were chosen as a representative sample of age and gender distribution. Of these two-thirds of women and one-third of men were dissatisfied with their overall looks. More recent surveys indicate that attitudes have not improved.

“Body dissatisfaction has never been worse,” Cash contends. “I see body-image problems that out-annal all ages, classes and ethnic groups. Younger European American females are the most susceptible. It’s no accident; they’re the ones on the (magazine) covers.”

Discontent with bodily appearance among the American population remains disturbingly high.
Obesity is a national concern. The population as a whole is heavier; physical inactivity and sedentary lifestyles have been on the rise. The confluence of these factors, along with advances in medical technology, has contributed to the increase in overweight and obesity rates. As a result, obesity and related conditions like diabetes, heart disease, and stroke are on the rise. People today are plagued by fears of fatness and thinness that only a few are genetically equipped to indefinitely maintain without undue effort or lasting physical harm.

There are few clear solutions to this problem. Even though beautiful models comprise the minutest fraction of humanity, we nonetheless compare ourselves to their images. Surveys reveal that we all, Cash points out, are embodied in a world that tells us what to think about our body weight. Indeed, the workbook has become part of Cash's current research to evaluate the success of “self-administered” body-image modification. "If you can become aware of a problem then you can change it," Cash says.

We educates people, give them a system and a framework. And then we can teach them specific, active, therapeutic techniques to alter thought patterns that produce certain behaviors. We help people change their body image by changing their mind about their body.

The effective exercise, Cash says, is to change your behavior and to adopt a positive, pro-energetic body image. "The best possible exercise is to do one thing that you want to do and feel good about it," Cash explains. "But you can't make people change the way they think about their bodies."

DoTheRight Thing

Irrational is an individual concern. The population as a whole is heavier; physical inactivity and diet-driven fatness can lead to the ballooning of average weight within the past few decades. Age is also involved, as the 75-plus people lack the body generation has been able to do, for example. It inevitably has gotten fatter. With obesity come predispositions to such maladies as high blood pressure, diabetes, heart disease, and stroke. Despite obesity's risks, Cash believes that there are always some physical countermeasures, including weight reduction and a dedicated exercise program, that should be undertaken only for the right reasons. Before opting for extensive "exterior remodeling," Cash urges concentration on one's interior life: the vexing emotional issues that persist no matter the intensity of other efforts.

The most effective exercise is to change what you look like, but how your body feels and what it's capable of, ""That's the criterion. That way you maintain momentum. The point is to do it to experience. But don't evaluate your experience with an instrument on a weight scale.""

We advocate a body image that humans can replace hair, surgically reshape body contours and smooth wrinkles with lotions and creams. But all means, Cash says, one should avoid oneself of such options when necessary. Because people, Cash explains, ""But you can't change enough to accept most things about your body."

Cash says, and it is hard to avoid images of the physical ideal. Even though beautiful models comprise the minutest fraction of humanity, we nonetheless compare ourselves to their images. Surveys reveal that we all, Cash points out, are embodied in a world that tells us what to think about our body weight. Indeed, the workbook has become part of Cash's current research to evaluate the success of ""self-administered"" body-image modification. "If you can become aware of a problem then you can change it," Cash says.

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Cash says, based on earlier studies, more than half of the people's body images should become "functionally recovered." The most important that representational self-criticism will carry over only that it will become more severe for the sake of the expression. Intuitive people want to learn to see their appearance in a positive manner. "You don't accept everything," Cash explains. "But you can't change enough to accept most things about your body."

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"Begood consumers," Cash advises. "Here are the options: take one and move on. Don't rub something on your head or take a pill so you'll have dating, mating and job opportunities. Don't spend the best years of your life worrying about your appearance."