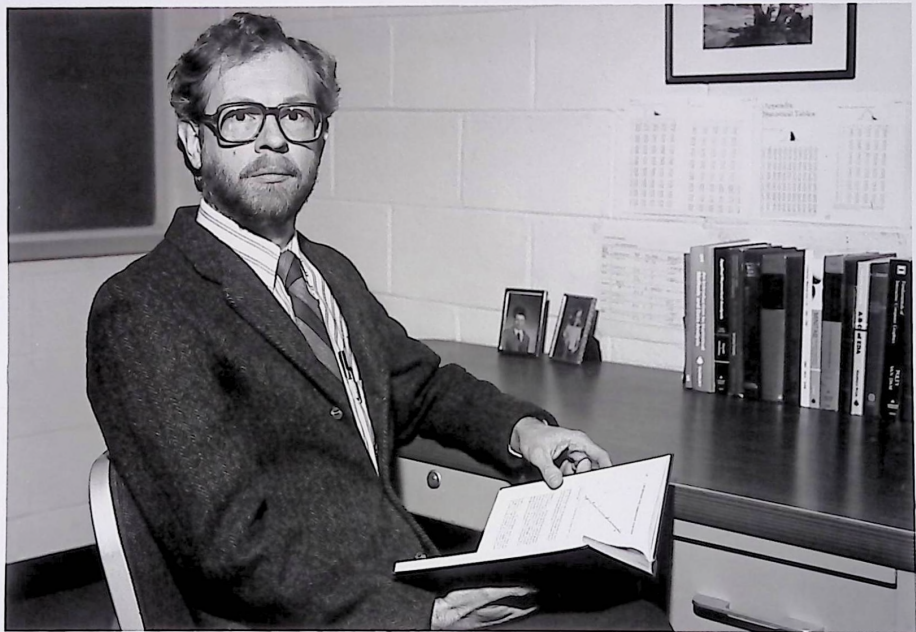
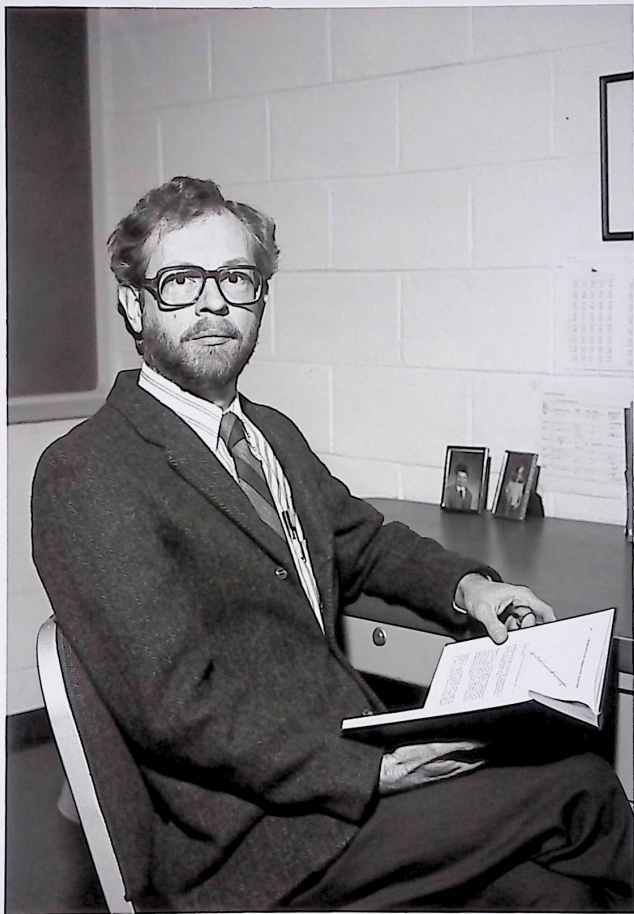










Wilkes University



News

Contact:

Vaughn A. Shinkus
Director, Communications and Marketing
(570) 408-4770 fax: (570) 408-7813
shinkus@wilkes.edu

Specialist from Kodak Research Labs in New York to give Free Lecture at Wilkes University March 29

Wilkes-Barre – Dr. John Hamilton, an applied mathematician at Kodak Research Labs in Rochester, N.Y., will present the lecture "What Does an Industrial Mathematician Do?" in Room 424 of Wilkes University's Stark Learning Center on Thursday, March 29 at 11 a.m. Sponsored by the University's Mathematics and Computer Science Department and the Society for Industrial and Applied Mathematics, the event is free and open to the public.

At Kodak, Hamilton has worked on problems on graphic arts (printing), medical imaging, clinical diagnostic imaging, and electronic digital imaging. Currently, he is developing image processing algorithms for Kodak's digital camera program and hold numerous patents in this and related areas. For more information, contact Sam Merrill at (570) 408-4837.

T.L. 1-15-01

Offers two tried-and-true solutions to presidential election dilemma

I believe each voter in national elections should have the same voice. We need a direct popular vote. But there are problems with a direct popular vote. A close national election would lead to recounts all over the country and the eventual winner might not achieve a majority.

The embarrassment of Florida, however, is likely to lead to a solution of the recount problem in the form of state-of-the-art electronic equipment. If we can count money accurately at ATM machines, we can count votes accurately whether in one state or 50.

The solution to the problem of attaining a majority requires addressing a second issue. Our single-preference system permits the outcome of elections to be reversed by the presence of third-party candidates. Almost certainly, had Nader and Buchanan not been in the race, Gore would have picked up more votes than Bush in Florida and other states and won the election. By limiting voters to only one preference for president, we place in a quandary voters whose first choice has little chance of winning.

There are two promising solutions to this problem.

Under a system known as approval voting — used by a number of national professional associations — each voter can select any number of candidates, in effect, expressing approval or disapproval for each. The candidate with the most votes wins. Thus, Nader or Buchanan supporters could have voted for one of the two main contenders without forgoing their opportunity to send a message in favor of their true first preference.

The vote totals for Gore and Bush — reflecting the full support for each — would have provided a fairer comparison between the two while the totals for Nader and Buchanan — also reflecting their full support — would have sent the intended message about the issues they represent.

A second alternative is an instant runoff, under which voters indicate both their first and second preferences. If no candidate has a majority of first preferences, the candidate with the least first-place preferences is eliminated. The ballots of the voters who preferred this candidate are then credited to the candidate they ranked second. This process is repeated if necessary until one candidate

achieves a majority of the votes remaining and is declared the winner.

In this year's election, we would expect that many Nader supporters would have ranked Nader first and Gore second, so that their votes — after sending their message of support for Nader — would have been transferred to Gore. In the final two-person contest between Gore and Bush, one or the other would have won a majority and achieved the mandate that goes with it.

An actual runoff is now used for the presidencies of France, Russia and a number of other countries and in several U.S. states. The instant runoff — one form of which has been used in Australia since about 1920 — offers the advantage that voters' second choices are recorded immediately and do not have to await a second election.

Either instant runoff or approval voting could be implemented on equipment improved to overcome the other problems with which we are now all too familiar.

Samuel Merrill
Professor of Mathematics
Wilkes University
Wilkes-Barre

Voters in U.S. should be able 'to pick two'

By Samuel Merrill
Special To The Citizens' Voice

CV 1-16-01

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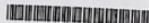
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Dr. Merrill is professor of mathematics at Wilkes University. He is the author of *Making Multicandidate Elections More Democratic* (Princeton University Press, 1988) and co-author of *A Unified Theory of Voting* (Cambridge University Press 1999).



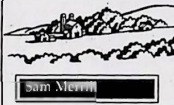
Dr. Merrill



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What's on the Horizon?



This is a monthly column written by members of the North Branch Land Trust, which is headquartered in Trucksville.

Some of the most valuable aspects contributing to the quality of life in the Back Mountain are the undeveloped areas — the areas of woodland, field, and stream corridors that constitute natural areas. These open spaces afford scenic views of unbroken woods or farmland — green and lush in the summer and snow-filled in the winter — that give the area its semi-rural character.

Yet, new houses and developments are eating into these open spaces month by month; cutting away at the very thing that motivates many of the new residents to move to the Back Mountain and older residents who enjoy the area to stay here. In particular, new housing development, dutifully following current zoning regulations, partition each tract

of land entirely into house lots leaving no unbroken open spaces.

Fortunately, there are alternatives. Communities across Pennsylvania realize that they can preserve open spaces and natural resources at the same time that they achieve development goals.

An answer lies in a different point of view about what zoning and subdivision ordinances are intended to accomplish. Currently a township might zone land as A-1 (minimum 2.5 acre lot-size), R-1 (minimum 15,000 sq. ft. or about 1/3 acre lot-size), etc. If, for example, a tract of land is zoned A-1, this means that each house lot must be at least 2.5 acres in size. Typically, a developer chops the entire area of buildable land in a tract into house lots, each of about 2.5 acres. While this plan ensures low-density housing, it leaves no unbroken open spaces.

Alternatively, clustering the houses within the subdivision leaves the remainder of the tract as unbroken open space, which can be used for a system of trails and recreation such as a ball field, etc. To permit this possibility, zoning ordinances need to be more flexible, benefiting both developer and township.

Suppose a developer wishes to cluster a group of homes, leaving large areas of open, undivided

land — a plan not permissible in an A-1 zone because of the 2.5 acre minimum. Rather than rezone such a tract to

R-1, which would in principle permit two or three houses per acre throughout the tract, a development known as a conservation subdivision can be permitted.

For example, in a tract consisting of 40 acres of buildable land (which would support a yield of 16 single-family dwellings at 2.5 acres per lot), the 16 dwellings could be clustered within a conservation subdivision with lots of 1.25 acres each, leaving the remaining 20 acres undeveloped and held in common. In general, *Growing Greener, A Conservation Planning Workbook for Municipal Officials in Pennsylvania* (Natural Lands Trust, 1998) recommends that overall tract density rather than lot-size be the principle that guides development in the various zones.

It is important that the status of the open space conserved in these developments be maintained through a permanent conservation easement. Such an easement might be managed by a land trust or by a homeowners' association. Successful developers of conservation subdivisions have found that most buyers pre-

fer homes in attractive park-like settings and that such homes sell faster at premium prices and appreciate more in value even though the house lots in a conservation subdivision are smaller. For example, developments built around a golf course are attractive whether or not most residents play golf.

Because conservation of undeveloped land is advantageous to the public, townships might consider incentives. They could allow additional dwellings if at least 50 percent of the buildable land is left permanently as open space. This 50 percent left as open space would be in addition to any non-buildable wetlands or steep-slope areas or areas required for streets or utility easements. Although a developer would still have the right to carve up all buildable land into 2.5 acre building lots, an incentive would permit developers and property owners to derive more revenue while at the same time encouraging the placement of houses in compact units. Thus, the residents could find more sense of neighborhood and community as well as jointly use the commonly held land.

Sam Merrill is a professor in the mathematics and computer science department at Wilkes University, and a member of the Kingston Twp. Planning Commission.

Cluster housing makes good use of land

Wilkes University News

Alissa Antosh, Writer/Editor
University Relations Office
Wilkes-Barre, Pennsylvania 18766
Office (570) 408-4770 Fax (570) 408-7813
e-mail: antosh@wilkes.edu

Public is Invited to Attend Lecture on Encryption, the Making and Breaking of Codes, at Wilkes on March 21

Wilkes-Barre -- Dr. Brent Morris, Executive of the Cryptologic Mathematician Program, National Security Agency, will discuss *Classic Cryptanalysis: The Folger Manuscript* at his upcoming lecture on Tuesday, March 21 at 9 a.m. in Room 405 of Wilkes University's Stark Learning Center, South Franklin Street.

Co-sponsored by the Wilkes Department of Mathematics and Computer Science and the Society for Industrial and Applied Mathematics, the lecture will discuss encryption, the making and breaking of codes. The talk is free and open to the public.

Dr. Morris served as the U.S. Representative to the International Standards Organization in the area of computer security. His interests include computer interconnection networks, the mathematics of card shuffling, and recreational mathematics.

For more information, contact Dr. Samuel Merrill, III, professor of Math and Computer Science, at (570) 408-4837.

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031600

They rise early, rain or shine, to keep track of avian population

By KYLIE SHAFFERKOETTER

Post Staff

BACK MOUNTAIN - How many of us could identify a Herring Gull, Sparrow Hawk, Bitted Kingfisher or Pileated Woodpecker as they flew over our heads? Could we distinguish the hoo hoo call of a Screech Owl and Great Horned Owl?

Probably not, but not to worry. Members of the Greater Wyoming

Valley Audubon Society prove that the art of serious bird watching is not dead with its annual Christmas Bird Count.

On Dec. 19 members of the Audubon Society will meet at 5:30 a.m. at the Jersey Shore restaurant in Dallas. Those who shy away from cold, dark mornings can sleep in and meet up with the group at 7:30 a.m. at the PA Game Commission boat lodge at Harveys Lake.

"It's interesting. The people are nice and you get out into the fresh air."

Sandy Goodwin
Beaumont

The national count will celebrate its 100th anniversary next year. The counts provide statistical information concerning which birds are where, if certain populations are on a decline or on the

increase, and different species response to certain conditions. For example, the deadly effect of DDT on hawks was detected through the counts back in the 1950s.

FRONT PAGE

"We send all of our information to the National Audubon Society, which in turn publishes a book of all the counts," explained Ed Johnson, who has been the compiler for the local bird count for 40 years.

American Birds not only records the species found, but the temperature of the day, wind velocity, number of people counting and moving or frozen water.

Back Mountain bird counters

count in a 7 1/2 mile radius of the Huntsville Dam. Among the birds sighted last year were the Northern Harrier, Red-Tailed Hawk, Barred Owl and Downy Woodpecker.

There are approximately 15 members of the group who participate in the count. Five bird counters are from the Back Mountain.

See BIRD COUNT, pg 7

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(continued from page 1)

Ed Johnson of Dallas started the Back Mountain Bird Club in 1958, which became affiliated with the Audubon Society by the early 1960s. Forty years ago, he and nine others ventured out at 4 a.m. into the eight degree morning to find owls. That day, they found 43 species and 1,184 individual birds.

"It was something going on all over the nation and I thought we'd do one for Dallas," explained Johnson, a professor emeritus at Wilkes University, who also taught English at Lake-Lehman.

"The highest bird count in the area was made up of 69 species in 1993. Last year 66 species were found," Johnson says a lot depends on the weather.

Not even the weather keeps the counters from counting. No matter how cold, how rainy or snowy, they are there on the set date.

"It's exciting. You try every year to see how many owls you are getting. Nothing keeps us away. That's part of the game," said Johnson, who describes the count as something to do and by now a habit.

His interest in the winged wonders began in college. "It's a challenge of when and where to look. Every winter is going to be a surprise," said Johnson, 71.

Bird watchers learn to look for details quickly and acquire a keen ability to identify bird calls or singing. For example, the difference between a Greater Scaup and a Lesser Scaup is only a mat-

"It's good that we can reuse it because there is so much of it."

Sarah Jennings
Shaverstown

ter of a greenish head versus a bluish head and the length of a wing stripe. Try seeing that as they whir above at 30 mph.

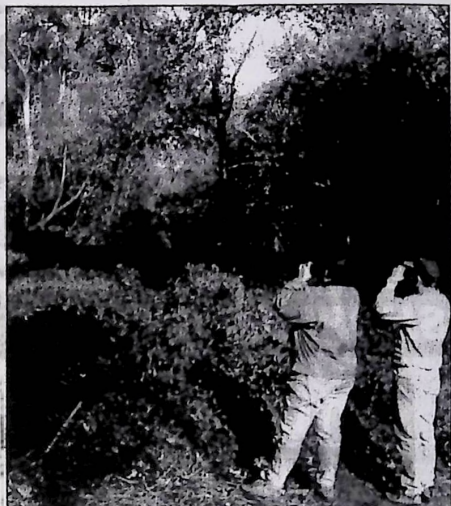
"I usually can tell the different birds. Sound is very important because it alerts you to where to look," said Johnson.

Sam Merrill of Shavertown, a mathematics professor at Wilkes University, has been a count participant for three years. He's one who likes to sleep in just a bit and heads out around 7 a.m.

"It's fun to get out of doors in the invigorating cold," he said. "And it's nice to go out with other people." Merrill said there many unknown little lakes and tiny ponds in the Back Mountain that attract many types of birds.

"It's interesting to keep track of nature," said Merrill, who has been a bird watcher for many years. Much like Johnson, Merrill enjoys the challenge of learning about the 900 different species of birds in North America, with all their unique calls and appearances. He and his wife, Susan, also go birding on their trips across the country.

Sandy Goodwin of Beaumont has been with the Audubon Soci-



Sandy Goodwin, left, and Jim Shoemaker peered into the woods, looking for birds to add to their life lists.

ety for 10 years. Bird counting is always exciting for the Lehman-Jackson sixth grade teacher.

"It's interesting. The people are nice and you get out into the fresh air," said Goodwin. "We have bird counts in the summer and fall also. It's interesting to see the trends (from season to season)."

Merrill said he looks forward to his fourth Back Mountain bird

count. Sandy Goodwin, Jim Holson and Jim Shoemaker are other Back Mountain residents who participate in the count.

Anyone interested in taking part in the count is welcome to meet the group at the places and times listed above.

Wilkes University group safe, relative says

By OSHRAT CARMIEL

Times Leader Staff Writer

A group of 15 Wilkes University students and staff traveling through Kenya was not endangered by the bomb that exploded outside the American Embassy in Nairobi on Friday.

The group, led by anthropology professor James Merryman, was in a game park more than four hours drive from the capital, said Merryman's wife, Nancy, of Bear Creek Township.

Mrs. Merryman said she last heard from her husband and the group Wednesday. Their itinerary showed they were not supposed to be in Nairobi at the time the bombs were detonated, Davis said.

"There was a student who got through to her mother and told her everyone is just fine," Mrs. Merryman said. "They're all just sitting around a camp fire. ... They were very far removed (from where the bombing occurred) and I personally was not worried."

The East African journey, which began for the group on July 29, was planned by James Merryman in conjunction with EF Educational Tours in Boston. The trip included overnight stays in Samburu, Laikipia Plains, a meeting with Kenyan students and a visit to the Masai Mara game reserve.

The group is spending their last days on the reserve before they leave on Sunday, Nancy Merryman said. The trip cost each student \$4,200 and they are scheduled to fly home Sunday from an international airport about 10 miles outside of Nairobi.

EF Educational Tours did not return calls on Friday.

Mrs. Merryman, also a professor of anthropology who has lived and worked in Africa, said she believes that violence was an international, not a local, political statement.

"I feel certain it's not an internal African political uprising or anti-American feelings," she said. The timing and organization of the bombings clearly showed outside involvement.

James Merryman is one of several experts who has helped to guide American foreign policy in the country of Somalia, the northern neighbor of Kenya.

He first traveled to Africa as a Peace Corps volunteer, working on an agricultural project in the north of Kenya. There, he had his first contact with Somali people, who make up a small minority in that country.

A Nebraska native who has lived extensively in Africa, including a three-year stint in Somalia, Merryman came to Wilkes eight years ago.

Staff writer Juan Torres contributed to this report.

T.L. 8-8-98

Could be time to vote for 'several of above'

By SAMUEL MERRILL
For Scripps Howard News Service

Ross Perot's presence in the 1996 election probably does more to create gridlock in politics than it does to solve it.

While Perot may not attract as many voters as he did in 1992, current polls indicate he may draw between 5 percent and 10 percent of the popular vote and is still capable of attracting a sizable share of the vote away from the Democratic and Republican nominees.

That's not enough votes to win the election, but it is possible for third party candidates to bring all candidates below 40 percent of the popular vote in this or subsequent elections. Such an outcome would compromise the popular mandate a president often uses to persuade Congress to pass legislation or to conduct foreign policy.

This widening choice of presidential candidates strongly suggests the need to change our voting system so that two goals can be achieved.

First, the winner in a presidential election should be able to attain majority support and thus be able to govern with a mandate from the people. Second, voters should still be able to express support for third party candidates.

Under the current system, not only is the presidential mandate vulnerable, but also a candidate representing the political center could be squeezed out by candidates on the right and left. Voters supporting a third party face a dilemma: Should they vote for a preferred candidate — such as Perot — who is unlikely to win or switch to a major contender so they can help determine the winner.

Approval voting — a method that is used to elect the officers of a number of professional societies — overcomes many of these shortcomings of the current plurality system. Under approval voting, each voter can vote for one, two, three or any number of candidates. In effect, the voter considers each candidate one-by-one



and casts a vote for those he approves but not for those whom he does not approve. The winner is the one approved by the most voters.

Under approval voting the winner is likely to gain support from a majority or near majority of the voters even in a crowded field and thus establish a wider mandate to govern or — in primary elections — demonstrate the broad support needed to contest the general election.

Approval voting benefits centrist candidates who tend to have a broader appeal while not denying voters the opportunity to express support for more extreme candidates. It also reduces damaging infighting between like-minded candidates since, under approval voting, they need to share support from the same voters.

In recent research conducted by Steven Brams of New York University and myself, we projected the likely outcome had approval

voting been used in the three-cornered 1992 presidential election. Based on polling data from the American National Election Study, which asks voters to score each candidate on a scale from 0 to 100, we projected approval voting totals using three different assumptions. The results consistently indicate that Bill Clinton would have received approvals from about 55 percent, George Bush from about 50 percent, and Ross Perot from about 40 percent.

Thus Clinton would have attained majority support — enhancing his mandate — but his margin over Bush would have been unchanged. Perot would have doubled the 19 percent he received under plurality because some Bush and especially Clinton supporters also approved Perot but opted to cast their vote for one of the main contenders. Under approval voting, Perot's total would thus have more accurately reflected his true support. Yet

his chances of actually winning might have been reduced because voters deciding to cast a vote for Perot would not have had to switch away from Clinton or Bush but could support both.

In light of the high disapproval rate which Perot faced, he would have been hard-pressed to climb past Clinton's 55 percent approval.

The impact of third-party candidates in presidential races seems destined to grow. Independent candidates can siphon votes from the Democratic and Republican candidates. We need to change our voting system so that independent and major-party candidates can share support and so that our president can expect to govern with a mandate from the people.

Samuel Merrill is professor of mathematics and computer science at Wilkes University in Wilkes-Barre, Pa., and author of the book "Making Multi-candidate Elections More Democratic."

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Voting system stifles third party candidates

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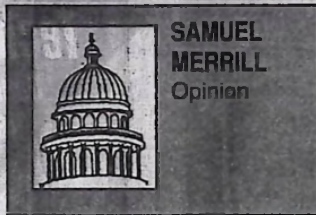
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SUNDAY, NOVEMBER 17, 1996

WILKES-BARRE, PA

GIVING NO QUARTER

Times Leader



Old W-B meters don't always give money's worth

By P. DOUGLAS FILAROSKI

Times Leader Staff Writer

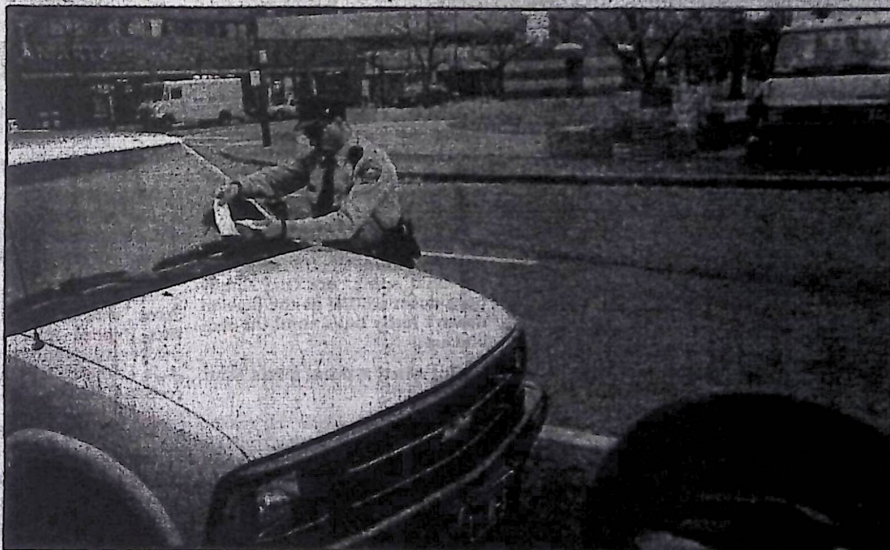
WILKES-BARRE — His gray sedan parked at the curb, Tom Fisher pulls a dime from his pocket, plugs the meter on South Main Street, and heads into the Army & Navy store.

Ten cents buys him 15 minutes on the meter. It shouldn't take more than five to pick up an Air Force belt buckle. But the Hazleton man always puts in more money, just to be safe.

Based on a recent sampling of downtown meters, Fisher has the right approach to avoid a parking ticket in this town.

That's because the dime doesn't always buy the time.

Armed with a fistful of quarters, The Times Leader clocked about 10 percent of the city's 683 parking meters and found about one in seven ran at legal time.



TIMES LEADER PHOTOS/CLARK VAN ORDEN

hour.

In the frosty mornings, and chilly twilight, reporters held stop watches to 60 meters lining 14 city streets.

We found that people who don't pad their parking time, like Fisher, could see that red "expired" flag pop up faster than expected. One of every four meters surveyed ran at least two minutes fast.

"Nothing surprises me," says Chuck Fortinsky, a Wilkes-Barre salesman as he headed for a South Main Street furniture store, after popping two quarters into a meter on Friday.

That's not to say there aren't bargains out there. One meter on West Union Street gave an extra 2 minutes, 10 seconds for a nickel that was supposed to last 7 minutes, 30 seconds.

But rip-offs far outnumbered deals. Two percent gave more than five minutes extra, but 14 percent ran at least five minutes fast.

The facts did surprise other people parking along downtown streets Friday, plugging meters and scurrying back to avoid cycle-riding, ticket-scribbling police who prowl the streets.

Mayor has plan to increase revenue

The meter business is no small change.

Last year, the city collected about \$210,000 in traffic fines, half of which officials attribute to meter violations.

Add \$350,000 pumped into municipal cof-

■ See METERS, Page 18A

No one is immune from violations for an expired meter. A police officer tickets Wilkes-Barre Mayor Tom McGroarty early Thursday on Public Square. The mayor said he inserted two quarters and didn't realize the meter only had a 15-minute maximum. He paid the ticket.



HOW TO CHALLENGE A TICKET

■ The city gives you five weekdays before \$5 fines for meter violations go to \$10. Ticket office workers say timely appeals make better cases. If the meter was jammed or ran fast a month ago, it might not today. That could hurt your case, officials say.

■ The next step is to fill out the form on the back of the ticket. Mail or bring it to the ticket window at the police station on North Washington Street near City Hall. Explain your case. The meter jammed. It ran fast. Whatever. A meter repair person will check it out. If it's true, you're home free.

■ If you want to discuss it, call or visit the ticket window from 9 a.m. to 4:30 p.m., Monday through Friday. The phone number is 826-8108.



Marty Lenahan is the lone employee who maintains and collects from 683 parking meters in the city. The manufacturer says each meter's timing device should be lubricated twice a year.

MORE INSIDE...PAGE 18A

How much money does the city make from meters?

Where to find the 'best deals' on parking meters

60 years ago, a nickel got you an hour

The era of metered parking came to Wilkes-Barre on April 1, 1937, when motorists began dropping coins into the city's 653 new downtown parking meters. The machines gave one hour of parking for 5 cents.

On March 22, 1952, the city began enforcement of its 600 new parking meters, which gave two hours for four nickels. Parking spaces increased from 20 to 22 feet to accommodate the growing size of cars. Fines for overparking rose from \$1 to \$2.50, and meters were in force until 9 p.m. Most of Public Square's meters, which had allowed for nose-in parking, were removed.

On Jan. 1, 1981, the city converted the meters to give 15 minutes for a nickel.

In the spring of 1970 the city installed double-headed meters throughout the downtown. In 1976 many were replaced, and others were added. By this time, meters were in operation only until 6 p.m. daily.

Many downtown spaces that had been metered were gone by this time, having fallen victim to redevelopment with its narrowed streets and large bus zones.

By 1982 the city had meters of various ages and styles, manufactured by two companies. They took nickels, dimes and quarters.

A Times Leader series in 1982 and 1983 showed that large numbers of the city's meters (as well as many in Pittston) were running fast and shortchanging customers. The city conducted its own tests and suspended payment at the offending meters until they could be repaired or replaced.

Source: Times Leader files

Meters

(Continued from Page 1A)

fers from those who dutifully fed the meters.

Subtract the cost of salaries for two ticket-writers, two ticket collectors, one meter repairman, and meter supplies, and it still equals a profit of about \$275,000 this year.

The profit margin might widen if Mayor Tom McGroarty's plan to hire non-police meter readers become reality. The readers would be paid about half the \$33,000 annual salary now paid to each of two officers who hand out tickets.

The mayor wants to equip the readers with hand-held electronic ticket-writers that enable them to write more tickets, and keep better records for collection purposes.

McGroarty acted surprised and amused at the newspaper's findings.

"And we're thinking of adding more," says McGroarty, laughing out loud when told about the fast meters.

The mayor's six-year, \$2.4 million capital budget includes plans for repaving certain downtown streets, cutting back wide sidewalks, and installing meters.

"Now, we're going to have to look into this," McGroarty says, referring to the meter findings.

On the road with the meter man

Marty Lenahan, the city's lone meter repairman, starts his day at 7 each morning, making rounds with a wheel-mounted collection box before most people have begun the drive downtown to work or shop.

For the past seven years, the

66-year-old former newspaper pressman's job involved collecting about half the city's meters on Monday and Thursday, the other half Tuesday and Friday. He does the less-used meters on Wednesdays.

He's lost 18 pounds since he started the job. "Walking's the best thing for you," he says. Despite this, Lenahan says he missed more than two months this summer because of stomach problems. He just returned from Ireland, where he spent two weeks in his parents' homeland.

Lenahan says he performs once-a-year inspections of every meter. City street employees filled in for Lenahan collecting from meters, but not inspecting.

The fast-talking Lenahan's jaw dropped when told about the newspaper's findings.

"That can't be," he says. "What kind of watch did you use?"

About 10 to 15 people dispute the meters' timing every week, Lenahan says. But most are wrong, he says.

Although not scientific, the survey's sample size represents a responsible look at all city meters to within a few percent, said Sam Merrill, a Wilkes University statistician.

Time running out for aging equipment

What's not disputed is that the city's parking meters are old.

Use of meters in downtown Wilkes-Barre dates to the 1930s. The ones on the street go back to the early 1970s, Lenahan says.

Melba Davidson, a sales representative for the Arkansas-based company that makes the current

Steals and deals

Here is a look at some of our findings during a recent random sampling of the city's meters.

■ **Prized Poles:** One meter in front of Murray Apartments on South Main Street jammed with 30 minutes left, never expiring. Another in front of Quad III architects on North Washington jammed with two hours remaining.

■ **Olvet and Taketh Away:** Ironically, the stretch with some of the fastest meters was the same first block of North Washington. That's the area near the police station, where meter repairmen work. Six of eight tested ran fast.

■ **Red Flag:** Parkers often get an extra two to three minutes after the needle drops below zero and the dreaded red "expired" flag pops up. But watch it, turning the handle loosens the flag, and police handing out tickets employ this maneuver to nab meter violators.

nachines, says meters should last about 20 years. "Twenty-five is on the outside of the range," she says.

Davidson, who works for Dunham Industries, says her job involves not only selling parking meters at about \$500 per double unit, but setting up maintenance seminars, like one held recently in Harrisburg.

A meter program isn't as simple as planting the gray-headed poles in the concrete and raking in the coins, she says.

Once-a-year inspections aren't enough, she says. Meters should be lubricated and cleaned twice a year.

And correcting the timing, tweaking a spring with a wrench,



NO SMALL CHANGE

■ Following are the revenues and expenses related to the city's parking meter program. The city has 683 parking meters, mostly in the downtown area.

REVENUES:

Meter money	\$350,000
Fines from meter violations	\$105,000
Total	\$455,000

EXPENSES:

Salaries:

■ Two ticketing police officers (@ \$33,000/yr.)	\$ 66,000
■ Two ticket office workers (@ \$19,800/yr.)	\$ 39,600
■ Meter repair/collection worker (@ \$19,800/yr.)	\$ 19,800
■ Benefits for workers (est.)	\$ 41,800
■ Meter equipment	\$ 12,000
■ Total	\$179,200

PROFIT \$275,800

Source: City of Wilkes-Barre, 1996 budget.

isn't a job for the layman, she says. "You really have to know what you're doing."

To be safe, meter timing devices should be sent back to the company's technicians for adjustment, Davidson says.

Debbie Owens, another sales representative, says there is no reason meters should run fast or slow. "That doesn't sound right."

An extra quarter can save the day

Back on South Main, motorist Tom Fisher asks about the city's system for servicing row after row of parking meters.

"How many they got?" he asks.

"How many people take care of them?"

The retired truck driver, who still works part-time driving a school bus, knows a thing or two about the streets.

"Six hundred-something meters and one man," Fisher says. "That makes it pretty tough."

He reaches back into his pocket and pulls out another quarter.

"There, that ought to do it," he says. "No sense in taking chances."

Times Leader correspondent Christina Eichman contributed to this report.

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A new voting system is needed

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APPROVAL: *New system would give third parties a chance without eroding the winner's mandate.*

By Samuel Merrill

Ross Perot's presence in the 1996 election probably does more to create gridlock in politics than it does to solve it.

While Perot may not attract as many voters as he did in 1992, current polls indicate he may draw between 5 percent and 10 percent of the popular vote and is still capable of attracting a sizable share of the vote away from the Democratic and Republican nominees.

That's not enough votes to win the election, but it is possible for third party candidates to bring all candidates below 40 percent of the popular vote in this or subsequent elections. Such an outcome would compromise the popular mandate a president often uses to persuade Congress to pass legislation or to conduct foreign policy.

This widening choice of presidential candidates strongly suggests the need to change our voting system so that two goals can be achieved.

First, the winner in a presidential election should be able to attain majority support and thus be able to govern with a mandate from the people. Second, voters should still be able to express support for third party candidates.

Under the current system, not only is the presidential mandate vulnerable, but also a candidate representing the political center could be squeezed out by candidates on the right and left. Voters supporting a third party face a dilemma: Should they vote for a preferred candidate — such as Perot — who is

unlikely to win or switch to a major contender so they can help determine the winner.

Approval voting — a method that is used to elect the officers of a number of professional societies — overcomes many of these shortcomings of the current plurality system. Under approval voting, each voter can vote for one, two, three or any number of candidates. In effect, the voter considers each candidate one-by-one and casts a vote for those he approves but not for those whom he does not approve. The winner is the one approved by the most voters.

Under approval voting the winner is likely to gain support from a majority or near majority of the voters even in a crowded field and thus establish a wider

in the three-cornered 1992 presidential election. Based on polling data from the American National Election Study, which asks voters to score each candidate on a scale from 0 to 100, we projected approval voting totals using three different assumptions. The results consistently indicate that Bill Clinton would have received approvals from about 55 percent, George Bush from about 50 percent, and Ross Perot from about 40 percent.

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In recent research conducted by Steven Brams of New York University and myself, we projected the likely outcome had approval voting been used

THE MYTHS AND REALITIES OF FORECASTING PRESIDENTIAL ELECTIONS

By Samuel Merrill, III**

Those polls, news analysis, and opinion pieces attempting to forecast presidential elections may entertain the public but many of the methods used for predicting the outcome are misleading.

One of the chestnuts for predicting elections is the use of bellwether states or counties. A bellwether district is one whose voting pattern has closely resembled that of the nation in a number of previous elections. For example, Ohio has voted with the winner in all but two elections this century.

Bellwether states really don't predict the national outcome any better than non-bellwether states. A 1980 study found that 86 percent of the bellwether states correctly predicted a Reagan win. But wait. In fact, 88 percent of the non-bellwether states also predicted the correct winner. No wonder, since Reagan won most of the states. The results of other studies are similar.

Imagine every four years you flip a coin in each state, assigning one side to the Democrats and the other to the Republicans. After several elections--just by chance--the coins in some states will agree with the winner nearly every time. Bellwether states occur the same way--and are just as useless for prediction.

What about polls? Polls are subject to a lot of criticism, especially by those who don't want to believe the results. The better polls report the statistical sampling error, usually about 3 percentage points for a typical national sample of about 1000 voters. This means that 19 times out of 20 such a poll result should be within 3 percentage points of the national electorate at the time the poll was conducted. Polls for the last month have given Bill Clinton an average margin of about 15 percentage points and poll to poll variation has mostly been within sampling error.

The early November Gallup polls--taken just before the election--for the past 12 elections (1948-92) have had an average error of 2.1 percentage points, a remarkable record and well within the statistical sampling error.

Polls taken earlier in the season fare less well, because voters change their mind. For early September Gallup polls, the average error is 3.4 percentage points; that for June Gallup polls is 7.3 points. The latter by themselves are useless except in landslides.

Simple but scientific methods do lead to surprisingly good predictions when using polls.

For example, to do better early in the season when the campaign is being planned, we need to use more information and use it scientifically. A simple measure of the economy suffices, such as the recent change in the Gross Domestic Product (GDP). Voters tend to support incumbents when the economy is good and vote them out when it is bad.

Using a standard statistical procedure, we relate, say, the early September polls and the change in GDP with the election outcome for a number of presidential elections. Applying the resulting formula to the current year's early September poll and change in GDP, we can forecast the results in the actual election. The method predicts a Clinton margin of about 14 percentage points. The average error of his method in the past is about 1.3 percentage points.

What about the Electoral College? A state-by-state strategy is ineffective unless the election is very close; otherwise it is extremely difficult to win a majority of the Electoral College vote without also winning the popular vote.

Much conventional wisdom about forecasting presidential elections and the effects of the Electoral College cannot withstand critical thinking. Modern national polls together with measures of economic well being, however, can predict election results rather accurately.

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** Dr. Merrill is professor of mathematics and computer Science at Wilkes University in Wilkes-Barre, PA and author of the book, Making Multicandidate Elections More Democratic.

New idea for elections: multiple choice voting

203NW

BY SAMUEL MERRILL
FOR SCRIPPS HOWARD NEWS SERVICE

Ross Perot's presence in the 1996 election probably does more to create gridlock in politics than it does to solve it.

While Perot may not attract as many voters as he did in 1992, current polls indicate he may draw between 5 percent and 10 percent of the popular vote and is still capable of attracting a sizable share of the vote away from the Democratic and Republican nominees.

That's not enough votes to win the election, but it is possible for third party candidates to bring all candidates below 40 percent of the popular vote in this or subsequent elections. Such an outcome would compromise the popular mandate a president often uses to persuade Congress to pass legislation or to conduct foreign policy.

This widening choice of presidential candidates strongly suggests the need to change our voting system so that two goals can be achieved.

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Under the current system, not only is the presidential mandate vulnerable, but also a candidate representing the political center could be squeezed out by candidates on the right and left. Voters supporting a third party face a dilemma: They vote for a preferred candidate — such as Perot — who is unlikely to win or switch to a major contender so they can help determine the winner.

Approval voting — a method that is used to elect the officers of a number of professional societies — overcomes many of these shortcomings of the current plurality system. Under approval voting, each voter can vote for one, two, three or any number of

UNDER APPROVAL

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In recent research conducted by Steven Brams of New York University and myself, we projected the likely outcome had approval voting been used in the three-cornered 1992 presidential election. Based on polling data from the American National Election Study, which asks voters to score each candidate on a scale from 0 to 100, we projected approval voting totals using three different assumptions. The results consistently indicate that Bill Clinton would have received approvals from about 55 percent, George Bush from about 50 percent, and Ross Perot from about

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samuel merrill

Why can't voters choose more than one?

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In light of the high disapproval rate which Perot faced, he would have been hard-pressed to climb past Clinton's 55 percent approval.

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A new election idea: approve of more than one

203NW

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Approval voting gives more choices

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SEPT 22, 1996

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Guest column

Third-party impact growing

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MAKE ELECTIONS MORE DEMOCRATIC

By Samuel Merrill, III**

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While he may not attract as many voters as he did in 1992, Perot is still capable of attracting a sizable share of the vote away from the Democratic and Republican nominees. Political analysts project that Perot may draw between 5-10 percent of the popular vote.

That's not enough votes to win the election but, especially if Perot attracts a larger share, it is possible that all three candidates could get below 40 percent of the popular vote in this year's election. That means the eventual winner does not enjoy a popular mandate by the people which a president often uses to persuade Congress to pass legislation.

This widening choice of presidential candidates strongly suggests the need to change our voting system so the winner in a presidential election can obtain majority support and govern with a mandate from the people.

Approval voting may be the answer since it overcomes many of the shortcomings of the current plurality system. Under the current system, a candidate representing the political center could be squeezed by candidates on the right and left. Voters also face a dilemma: should they vote for their preferred candidate--such as Perot--unlikely to win or switch to a major contender to avoid "wasting" their vote.

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My own research with Steven Brams of New York University and Merrill, projected the likely outcome had approval voting been used in the three-cornered 1992 presidential election.

Based on polling data from the American National Election Study, which asks voters to score each candidate on a scale from 0 to 100, they projected approval voting totals using three different assumptions. The results consistently indicate that Bill Clinton would have received approvals from about 55 percent, George Bush from about 50 percent, and Ross Perot from about 40 percent. Thus Clinton would have attained majority support--enhancing his mandate--but his margin over Bush would have been unchanged.

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The impact of third-party candidates in presidential races seems destined to grow. Independent candidates can siphon votes from the Democratic and Republican candidates. We need to change our voting system to reflect the rise of independent candidates if we want our presidents to govern with a mandate from the people.

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**** Dr. Merrill is professor of mathematics and computer science at Wilkes University, Wilkes-Barre, PA; and author of the book, *Making Multicandidate Elections More Democratic*.**



Do you have a question? Send it in.

More questions and answers:

- Astronomy
- Biology
- Chemistry
- Computers
- Environment
- Geology
- Math
- Medicine
- Physics

This week's questions

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(see pp. 4-5)

- Has there been any progress in developing fairer ways for people to vote?
- Why are scientists sure that the "Martian" meteorite really came from Mars?
- Why is it only recently that antibiotic-resistant bacteria have become the focus of alarm?
- Why do images of astronomical nebulae look like clouds on the earth?
- Why hasn't fusion research so far produced better results?

→ Sam Merrill in the department of mathematics and computer science at Wilkes University in Wilkes-Barre, Penn., provides more details:

"The method of voting in multicandidate elections referred to in the question is, I believe, approval voting. Under this procedure, each voter can vote for one, two, three or any number of candidates. In effect, the voter considers each candidate one by one and casts a vote for those whom she (or he) approves but not for those whom she does not approve. The winner is the one approved by the most voters.

"Approval voting is now used by several national and international professional societies in their electing of officers. These include the Institute of Electrical and Electronics Engineers, the American Statistical Association, the Mathematical Association of America and the Institute for Management Science. Some of the approval-voting elections in these societies have led to winners who would not have won under single-vote plurality (the more common method used in the U.S.) or have enhanced the standing in the voting outcome of candidates who had broad support throughout the profession.

Generally speaking, however, the candidate who has won under approval voting did well among bulk voters (those who voted for only one candidate), as well as among those who voted for more than one candidate. Further details can be found in Steven Brams and Peter Fishburn, 'Approval Voting in Scientific and Engineering Societies,' in *Group Decisions and Negotiations*, Vol. 1, No. 1, pages 41-4; April 1992, and Steven Brams and Jack Nagel, 'Approval Voting in Practice,' in *Public Choice*, Vol. 71, Nos. 1/2, pages 1-17; August 1991.

"Although bills have been introduced in New Hampshire, New York and North Dakota to institute approval voting in public elections, I am not aware of any recent progress on that front.

"In a recent study [Steven J. Brams and Samuel Merrill III, 'Would Ross Perot Have Won the 1992 Presidential Election under Approval Voting?' in *PS: Political Science and Politics*, Vol. 27, No. 1, pages 39-44; March, 1994, we projected the likely outcome had approval voting been used in the

three-cornered 1992 presidential election. Based on polling data from the American National Election Study, which asks voters to score each candidate on a scale from 0 to 100, we projected approval-vote totals using three different assumptions. The results consistently indicate that Bill Clinton would have received approvals from about 55 percent, George Bush from about 50 percent, and Ross Perot from about 40 percent. Hence, Clinton would have attained majority support--enhancing his mandate--but his margin over Bush would have been unchanged.

"Perot would have doubled the 19 percent he received under plurality because some Bush and especially Clinton supporters also approved Perot but opted to cast their vote for one of the main contenders. Under approval voting, Perot's total would therefore have more accurately reflected his true support. His chances of actually winning might have been reduced, because voters deciding to cast a vote for Perot would not have had to switch away from Clinton or Bush but could support both. In light of the high disapproval rate that Perot faced, he would have been hard-pressed to climb past Clinton's 55 percent approval.

"It has been argued that approval voting benefits centrist candidates, who tend to have a broader appeal while not denying voters the opportunity to express support for more extreme candidates, and that it should reduce infighting between like-minded candidates because they need to share support from the same voters. Approval voting could be implemented on existing voting machines, and it could be done without a Constitutional amendment."

ACHIEVING A PRESIDENTIAL MANDATE

By Samuel Merrill, III**

Ross Perot's presence in the 1996 election probably does more to create gridlock in politics than it does to solve it.

While Perot may not attract as many voters as he did in 1992, current polls indicate he may draw between 5 - 10 percent of the popular vote and is still capable of attracting a sizable share of the vote away from the Democratic and Republican nominees.

That's not enough votes to win the election, but it is possible for third party candidates to bring all candidates below 40 percent of the popular vote in this or subsequent elections. Such an outcome would compromise the popular mandate which a president often uses to persuade Congress to pass legislation or to conduct foreign policy.

This widening choice of presidential candidates strongly suggests the need to change our voting system so that two goals can be achieved. First, the winner in a presidential election should be able to attain majority support and thus be able to govern with a mandate from the people. Second, voters should still be able to express support for third party candidates.

Under the current system, not only is the presidential mandate vulnerable, but also a candidate representing the political center could be squeezed out by candidates on the right and left. Voters supporting a third party face a dilemma: Should they vote for a preferred candidate -- such as Perot -- who is

unlikely to win or switch to a major contender so they can help determine the winner.

Approval voting -- a method that is used to elect the officers of a number of professional societies -- overcomes many of these shortcomings of the current plurality system. Under approval voting, each voter can vote for one, two, three, or any number of candidates. In effect, the voter considers each candidate one-by-one and casts a vote for those he or she approves but not for those whom he or she does not approve. The winner is the one approved by the most voters.

Under approval voting the winner is likely to gain support from a majority or near majority of the voters even in a crowded field and thus establish a wider mandate to govern or -- in primary elections -- demonstrate the broad support needed to contest the general election.

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The impact of third-party candidates in presidential races seems destined to grow. Independent candidates can siphon votes from the Democratic and Republican candidates. We need to change our voting system so that independent and major-party candidates can share support and so that our presidents can expect to govern with a mandate from the people.

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Approval method would provide more of a mandate in presidential election

By Samuel Merrill III

THE 1996 PRESIDENTIAL election is potentially the most complicated since 1912, the last time a third-party candidate — Theodore Roosevelt — managed to finish second in both popular and electoral vote.

Even with Colin Powell out of the race, the possibility looms that an independent candidate — perhaps Ross Perot — may be capable of attracting a sizable share of the vote, in addition to the Democratic and Republican nominees.

Although polls this early are notoriously poor predictors of the final outcome, a recent *Newsweek* poll suggests the magnitude of the problem: in each of two possible three-way races — Powell was still a candidate at the time — all candidates got below 40 percent.

Clearly, such an outcome would compromise the mandate of the winner, since most voters would have voted for someone else. A candidate representing the political center could be squeezed by candidates on the right and left. Voters also could face a dilemma: should they vote for a preferred candidate unlikely to win or switch to a major contender to avoid "wasting" their vote.

Under the plurality procedure commonly used in the United States, the candidate with the most votes wins regardless of how far short of the majority. This procedure determines the electoral vote in each state. Its pitfalls would remain even if the Electoral College were abolished.

Plurality has been used so long that

we tend to assume that there are no alternatives. In fact, most other industrialized democracies use other methods.

The runoff, for example, pits the top two vote-getters in a first round of voting against each other in a second ballot. Currently used for election of the president in France and Poland and for non-presidential primaries in most U.S. southern states, this added requirement ensures that the eventual winner has majority support against at least one opponent. Successive elimination of only one candidate at a time selects the majority and minority leaders in Congress. A similar method has elected the Australian lower house for 75 years.

Can the objective of majority support be attained more simply? Such a method is used to elect the officers of a number of professional societies, including the Institute of Electrical and Electronics Engineers and the American Statistical Association. Under this procedure, called approval voting, each voter can vote for one, two, three or any number of candidates. In effect, voters consider each candidate one by one and cast votes for those they approve but not for those whom they don't approve. The winner is the one approved by the most voters.

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Approval voting would be simple to implement on existing voting machines and could be instituted without a constitutional amendment. Despite its simplicity, it would overcome many of the shortcomings of the current plurality system, enhancing the likelihood that the elected president enjoy a wide mandate.

Dr. Samuel Merrill III is professor of mathematics and computer science at Wilkes College in Wilkes-Barre.

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Approval voting makes more meaningful elections

By SAMUEL MERRILL III

The 1992 and the upcoming 1996 presidential campaigns prove independent candidates, in addition to the Democratic and Republican nominees, are capable of attracting a sizable share of the vote.

In three-way races, it's possible that all candidates could get below 40 percent of the popular vote. The widening choice of presidential candidates strongly suggests the need to change our voting system so the objective of majority support can be obtained more simply.



Samuel Merrill III

Clearly, receiving less than 40 percent of the popular vote compromises the mandate of the winner, since most voters would have voted for someone else.

Voters face a dilemma: Should they vote for a preferred candidate unlikely to win or switch to a major contender to avoid "wasting" their vote? A candidate representing the political center could be squeezed by candidates on the right and left.

Under the plurality procedure commonly used in the United States, the candidate with the most votes wins regardless of how far short of a majority. This procedure determines the electoral vote in each state. Its pitfalls would remain even if the electoral college was abolished.

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The runoff, for example, pits the top two vote-getters in a first round of voting against each other in a second ballot. Currently used for election of the president in France and Poland and for non-presidential primaries in most U.S. southern states, this added requirement ensures that the eventual winner has majority support against at least

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one opponent. Successive elimination of only one candidate at a time selects the majority and minority leaders in the United States Congress.

A similar method has elected the Australian Lower House for 75 years.

Approval voting is another method we should consider. It is already used to elect the officers of a number of professional societies, including the Institute of Electrical and Electronics Engineers and the American Statistical Association. Under this procedure, each voter can vote for one, two, three, or any number of candidates. In effect, voters consider each candidate one-by-one and cast votes for those they approve but not for those whom they don't approve.

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In light of the high disapproval rate which Perot faced, he would have been hard-pressed to climb past Clinton's 55 percent approval.

Approval voting would be simple to implement on existing voting machines and could be instituted without a constitutional amendment. Despite its simplicity, it would overcome many of the shortcomings of the current plurality system, enhancing the likelihood that the elected president enjoy a wide mandate.

Samuel Merrill III is professor of mathematics and computer science at Wilkes University, Wilkes-Barre, and author of the book, "Making Multicandidate Elections More Democratic."

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The 1996 election can yield a mandate

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By SAMUEL MERRILL III

The 1996 presidential election is potentially the most complicated since 1912, the last time a third-party candidate — Theodore Roosevelt — managed to finish second in both popular and electoral vote. The possibility looms of one or even two independent candidates — Colin Powell and Ross Perot — each capable of attracting a sizable share of the vote, in addition to the Democratic and Republican nominees.

In such a four-way split, many if not most states could be won with 30-odd percent of the vote or even less.

Although polls this early are notoriously poor predictors of the final outcome, a recent Newsweek poll suggests the magnitude of the problem: In each of two possible three-way races, all candidates got below 40 percent. Clearly, such an outcome would compromise the mandate of the winner, since most voters would have voted for someone else.

A candidate representing the political center could be squeezed by candidates on the right and left. Voters also could face a dilemma: Should they vote for a preferred candidate unlikely to win or switch to a major contender to avoid "wasting" their vote.

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Can the objective of majority support be attained more simply? Such a method is used to elect the officers of a number of professional societies, including the Institute of Electrical and Electronics Engineers and the American Statistical Association. Under this procedure, called approval voting, each voter can vote for one, two, three or any number of candidates. In effect, voters consider each candidate one-by-one and cast votes for those they approve but not for those whom they don't approve. The winner is the one approved by the most voters.

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Approval voting would be simple to implement on existing voting machines and could be instituted without a constitutional amendment. Despite its simplicity, it would overcome many of the shortcomings of the current plurality system, enhancing the likelihood that the elected president enjoy a wide mandate.

Samuel Merrill is professor of mathematics and computer science at Wilkes University in Pennsylvania and author of "Making Multi-candidate Elections More Democratic."

The Scranton Times

SCRANTON, PA

TUESDAY, NOVEMBER 21, 1995

YOUR OPINION

Alternate Ways For Casting Votes

Editor: The possibility looms in every presidential election of independent candidates attracting enough votes to prevent any candidate from winning with majorities.

Clearly, such an outcome would compromise the mandate of the winner, since most voters would have voted for someone else. A candidate representing the political center could be squeezed by candidates on the right and left. Voters also could face a dilemma: should they vote for a preferred candidate unlikely to win or switch to a major contender to avoid "wasting" their vote.

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Approval method would provide more of a mandate in presidential election

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Should we change the way we vote for president?

By SAMUEL MERRILL III
For Scripps Howard News Service

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Ross Perot from about 40 percent. Thus Clinton would have attained majority support — enhancing his mandate — but his margin over Bush would have been unchanged. Perot would have doubled the 19 percent he received under plurality because some Bush and especially Clinton supporters also approved Perot, but opted to cast their vote for one of the main contenders.

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Approval voting would be simple to implement on existing voting machines and could be instituted without a constitutional amendment. Despite its simplicity, it would overcome many of the shortcomings of the current plurality system, enhancing the likelihood that the elected president enjoys a wide mandate.

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Samuel Merrill is professor of mathematics and computer science at Wilkes University in Pennsylvania and author of "Making Multi-Candidate Elections More Democratic."

HOW THE 1996 ELECTION CAN YIELD A PRESIDENTIAL MANDATE

by Samuel Merrill, III **

The 1996 presidential election is potentially the most complicated since 1912, the last time a third-party candidate--Theodore Roosevelt--managed to finish second in both popular and electoral vote.

The possibility looms of one or even two independent candidates--Colin Powell and Ross Perot--each capable of attracting a sizable share of the vote, in addition to the Democratic and Republican nominees.

In such a four-way split, many if not most states could be won with thirty-odd percent of the vote or even less.

Although polls this early are notoriously poor predictors of the final outcome, a recent Newsweek poll suggests the magnitude of the problem: in each of two possible three-way races, all candidates got below 40 percent.

Clearly, such an outcome would compromise the mandate of the winner, since most voters would have voted for someone else. A candidate representing the political center could be squeezed by candidates on the right and left. Voters also could face a dilemma: should they vote for a preferred candidate unlikely to win or switch to a major contender to avoid "wasting" their vote.

Under the plurality procedure commonly used in the United States, the candidate with the most votes wins regardless of how far short of a majority. This procedure determines the electoral vote in each state. Its pitfalls would remain even if the Electoral College were abolished.

Plurality has been used so long that we tend to assume that there are no alternatives. In fact, most other industrialized democracies use other methods.

The runoff, for example, pits the top two vote-getters in a first round of voting against each other in a second ballot. Currently used for election of the president in France and Poland and for non-presidential primaries in most U.S. southern states,

this added requirement ensures that the eventual winner has majority support against at least one opponent. Successive elimination of only one candidate at a time selects the majority and minority Leaders in the U.S. Congress. A similar method has elected the Australian Lower House for 75 years.

Can the objective of majority support be attained more simply? Such a method is used to elect the officers of a number of professional societies, including the Institute of Electrical and Electronics Engineers and the American Statistical Association. Under this procedure, called *approval voting*, each voter can vote for one, two, three, or any number of candidates. In effect, voters consider each candidate one-by-one and cast votes for those they approve but not for those whom they don't approve. The winner is the one approved by the most voters.

Under approval voting the winner is likely to gain support from a majority or near majority of the voters even in a crowded field and thus establish a wider mandate to govern or--in primary elections--demonstrate the broad support needed to contest the general election.

Approval voting benefits centrist candidates who tend to have a broader appeal while not denying voters the opportunity to express support for more extreme candidates. It also reduces damaging infighting between like-minded candidates since, under approval voting, they need to share support from the same voters.

In a recent study conducted by Steven Brams of New York University and myself, we projected the likely outcome had approval voting been used in the three-cornered 1992 presidential election. Based on polling data from the American National Election Study which asks voters to score each candidate on a scale from 0 to 100, we projected approval voting totals using three different assumptions. The results consistently indicate that Bill Clinton would have received approvals from about 55 percent, George Bush from about 50 percent, and Ross Perot from about 40 percent. Thus Clinton would have attained majority

support--enhancing his mandate--but his margin over Bush would have been unchanged.

Perot would have doubled the 19 percent he received under plurality because some Bush and especially Clinton supporters also approved Perot but opted to cast their vote for one of the main contenders. Under approval voting, Perot's total would thus have more accurately reflected his true support. Yet his chances of actually winning might have been reduced because voters deciding to cast a vote for Perot would not have had to switch away from Clinton or Bush but could support both. In light of the high disapproval rate which Perot faced, he would have been hard-pressed to climb past Clinton's 55 percent approval.

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DICK JONES COMMUNICATIONS
P.O. Box 497
Dalton, PA 18414
(717) 563-1150
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A Paradox Of Majority Politics

By Kathy Sawyer
Washington Post Staff Writer

The mere presence of Colin L. Powell and Ross Perot, prowling the perimeters of the 1996 presidential sweepstakes, has altered the strategic calculations of the Democratic president and his Republican challengers.

But specialists in the mathematical theory of elections point to a deeper truth: When the number of major candidates rises above two—no matter who they are—the chances increase that the strongest candidate will not win. Some say the cherished principle of "one person, one vote" is an anachronism.

Under the current system, a presidential election with more than two major candidates seems rigged against a majority decision, according to theorists. "It is primarily for this reason that many people believe the two-party system is essential to the stability of democracy in the U.S., even though that system is neither mandated nor recognized by the Constitution," declared Lynn Arthur Steen of St. Olaf College in Northfield, Minn., in a 1980 *Scientific American* essay.



Final Tally

To many, the democratic election of a president embodies high-minded public choices on issues and character. But a few analysts deliberately set aside the mix of passion, personality, and other complexities to focus on the presidential election as a mathematical game. A simple change in the number of candidates, they argue, will alter the nature of the campaign itself—the strategic moves and counter-moves of the candidates—as well as the final vote tally.

While the impact of this principle is most dramatic at the state and local levels—in the elections of some 500,000 officials in about 80,000 government entities in the United States—analysts also see its influence at the national level. "We're probably

cutting out strong centrist presidential candidates because of the voting system," says New York University's Steven J. Brams.

If there should be four major candidates in the 1996 race, for instance, Republicans could be emboldened to choose an extreme right candidate, "pick up 30 to 35 percent of the vote—and win," Brams said. A political scientist with a mathematics background who specializes in game theory, Brams is among those advocating a change in the voting system.



Options

The existing process is based on the principles of "one person, one vote," and

"the candidate with the most votes (a plurality) wins" even if he or she does not have a majority. When the number of contenders exceeds two, the vote gets divided into more fractions, reducing the chances of anyone's winning a majority. Bill Clinton won with 43 percent in 1992.

There are several alternative voting systems, each with its own strengths and weaknesses. Economist Kenneth J. Arrow won a Nobel Prize in part for his 1951 proof that there is no "perfect" democratic voting system for multicandidate elections.

But experts agree on one thing: That the winner-take-all system used to elect American presidents is the least satisfactory. "There is no right answer on this issue," said Robert Richie of the Washington-based Center for Voting and Democracy. "But there probably is a wrong answer, which is the plurality system."

This is because it is the most likely of all the systems to produce a paradox—that is, an inherently contradictory outcome—such as:

- The victory of the least popular candidate.
- The possibility that voting for the candidate a person likes best increases the probability that the candidate he least prefers will win.
- The possibility that an extremely conservative (or liberal) candidate—

SCIENCE

MATHEMATICS



Majority rule is fundamental in a democracy, yet experts in mathematical election theory say Americans elect their presidents in a way that, under certain conditions, eliminates the strongest contenders.

Under an alternative system, the vote could register the true support for presumed long-shot candidates such as Jesse L. Jackson, George C. Wallace or Ross Perot.

In the 1992 election, approval voting would not have changed the outcome but might have changed the tone and likely would have doubled Perot's 19 percent share of the vote, according to an analysis by

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candidates into races, reduce sharp differentiation of choices and help to undermine the two-party system. Riche advocates a system called preference voting, used in Australia and Ireland, in which voters rank their multiple choices.

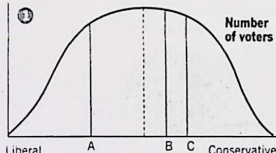
The issue of alternative voting systems has come to attention in the Supreme Court's ruling against the use of race in drawing district lines, and in 1993 when President Clinton withdrew the nomination of Lani Guinier to head the Justice Department's Civil Rights Division. Guinier had provoked controversy by favoring an approach called cumulative voting (which enables voters to give several votes to a single candidate) in order to strengthen the power of minority candidates in city councils, legislatures and other multiple-winner situations.

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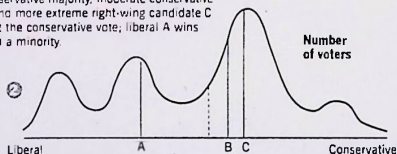
Three-way contest among a liberal, a moderate and a conservative candidate

Two graphs show how the plurality system may work against candidates with broadest appeal. Horizontal lines show hypothetical shapes of public opinion along a spectrum from liberal to conservative. Dotted vertical line on each graph indicates the median (the point at which half the voters lie to the left and half to the right). Vertical lines show where candidates A, B and C fall along the ideological spectrum.

1. Moderate candidate B splits the support of voters on the right with more conservative candidate C, while liberal candidate A, with a minority of supporters but no rival nearby, can win. Against A or C alone, B would win.



2. With public attitudes skewed toward a conservative majority, moderate conservative B and more extreme right-wing candidate C split the conservative vote; liberal A wins with a minority.



SOURCE: The Presidential Election Game by Steven J. Brams

presumably with the narrowest support—would help defeat the more moderate conservative (or liberal).

In national races, such paradoxical phenomena are most apparent in the primary phase, where (unless the party has an incumbent or "their apparent" running) there are never as

few as two contenders for a party nomination. Voters express frustration that radical minorities so often seem to dominate party nominations. (The cases of Barry M. Goldwater in 1964 and George S. McGovern in 1972 are most commonly cited.) The current system "is in jeopardy perni-

ciously in depriving the electorate of its rightful public choice," Brams wrote in "The Presidential Election Game."

To broaden the appeal of the victorious and reduce the paradox potential, Brams and others have long advocated a voting system known as "approval voting." In a twist on the old joke about voting early and often, it would replace the "one person, one vote" rule with "one candidate, one vote." That is, each voter could cast a vote for each candidate he considers acceptable but no more than one vote for any candidate. The candidate "approved of" by the most voters would win.

Brams says this would give voters more flexible options and the freedom to express true preferences (vote for a single favorite or vote for all acceptable candidates without fear of "wasting" a vote on a sure loser). Instead of the candidate with the largest minority, the candidate with the greatest overall support would win. For example, Candidate X might be liked by the largest minority of voters (say 25 percent), but the system should also register the fact that he is disliked by 70 percent—and so would be approved by a total of only 30 percent. At the same time, candidate Y might be the first choice of only 24 percent, but approved of by 51 percent.

The plurality system "tortures voters interested in supporting a third-party candidate," Riche said. It encourages them to vote for someone other than their first choice in order to avoid wasting their one vote, a practice that Streen said "can lead to a state of serious confusion where . . . the public will be effectively camouflaged." Such a process "rarely gives a legitimate mandate to the victor," he added.

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Features

Would Ross Perot Have Won the 1992 Presidential Election Under Approval Voting?*

Steven J. Brams, *New York University*
Samuel Merrill III, *Wilkes University*

The answer to the question we pose in the title is by no means obvious. That it might be affirmative is suggested by the facts that Ross Perot:

- ran ahead of the major-party presidential candidates in several presidential preference polls at the height of his popularity in June 1992; and
- on election day in November received a higher proportion of the popular vote (19.0%) than any third-party candidate since Theodore Roosevelt in 1912 (27.4%), who came in second to Woodrow Wilson that year.

More significant than Perot's relatively large percentage, however, is that he appealed to many Republicans because of his conservative economic policies, especially with respect to reducing the budget deficit, and to many Democrats because of his liberal social views on issues like abortion.

It is precisely this kind of wide-ranging appeal that favors candidates under *approval voting* (AV), whereby voters can vote for as many candidates as they like or consider acceptable in a multicandidate election. (In a three-candidate race like the 1992 presidential election, this means voting either for one's top or one's top two choices.) Yet despite extensive research on AV (Brams and Fishburn 1983), comparisons of it that have been made with other voting systems (Nurmi 1987; Merrill 1986), and empirical studies of its actual use (reviewed in Brams and Fishburn 1992), it is no easy task to establish

how candidates would fare under AV in a specific election.

In this essay, we attempt to determine AV's likely effects in the 1992 presidential election, based on three different projections of voting returns. In the 1992 race, both Bill Clinton and George Bush came out far ahead of Perot in the popular-vote count with 43.2% and 37.7%, respectively (we shall consider the possible effects of the Electoral College later). Nevertheless, it is conceivable that Perot might have been acceptable to a large enough number of supporters of each of the major-party candidates to have won or placed second under AV. The likelihood of such an outcome increases to the extent that:

- (1) Clinton and Bush voters would shun also approving of the other major-party candidate at the same time that they would approve of Perot; and
- (2) Clinton and Bush voters who favored Perot, yet voted strategically for one of the major-party candidates out of fear of "wasting" their votes, would switch to voting for Perot—either exclusively or in combination with one of the major-party candidates—if he appeared to be a potential winner under AV.

In fact, as we shall show, Perot would have received a big boost under AV, but his popular vote would have still fallen short of that of Clinton and Bush, who would have gained by lesser amounts. The only conceivable way Perot could have won is if there would have been a new equilibrium under AV

that would *greatly* have favored him. But, for reasons we discuss next, this would probably never have been the case.

A New Equilibrium Under AV?

The effects of factors (1) and (2) that would help Perot under AV, while possible to estimate from the survey data we shall analyze later, are subject to a major qualification. They presume that the 1992 campaign can be held constant in making projections, including voter turnout, when in fact a campaign under AV might alter the survey data in such a way as to invalidate projections.

Indeed, there is good reason to believe that the presidential campaign would have changed substantially had AV been in place (see Myerson and Weber 1993, for the effect of the choice of voting system on voting equilibria in the presence of polls that alter the perceptions by voters of candidate viability). Whether these changes would have had a major impact on the outcome, or whether they would have "canceled each other out," is something about which we can offer only measured speculation, based on how the campaign might have unfolded under AV.

Perot, we believe, might not have temporarily dropped out on July 16, only to re-enter the race on October 1, had the election been conducted under AV. Even if Perot's popularity had slipped under AV, as it did under the present system before he dropped

out (Arterton 1993, 62), this drop might not have been so sharp, inducing him to stay in the race, despite some slippage, under AV.

The major-party candidates, too, might have significantly altered their campaigns under AV. George Bush and his supporters, for example, might not have made the blatant appeal they did to right-wing Republicans by stressing "family values" at the Republican national convention in mid-August. Anticipating that, under AV, such strident rhetoric could cost him the approval of many conservative ("Reagan") Democrats, he might have moderated his harsh attack, despite the fact that such negative campaigning had been highly successful against Michael Dukakis in 1988.

Bill Clinton, it would seem, would have had less reason to change his overweening focus on the economy during the campaign. Possibly he would have tried harder to distinguish himself from Perot, whom he hardly criticized, under the assumption that Perot would have been a serious contender under AV and, consequently, someone that Clinton would have needed actively to campaign against, in addition to Bush.

More generally, all the candidates, while trying to be expansive in their appeals in order to try to pick up second-place approval votes from other candidates' supporters, would probably also have attempted to persuade their own supporters to cast "bullet" (single) approval votes for themselves. But, as we shall argue, this strategy probably would have failed, especially for Clinton and to a less extent for Bush, had they tried to stem the flow of second-place approval votes to Perot.

The principal reason is that a campaign does not start from a blank slate. Bush's image was well established from four years of being president; Clinton was well known from his strenuous campaign for the Democratic party nomination; and Perot was getting to be better known (some would say "picked on") in the early summer of 1992. Hence, different cam-

paign strategies would probably not have been able to alter, in a fundamental way, the appeal of these candidates to voters.

This is not to say that AV would have had no effect on the election. Assume, for example, that Bush had appealed less to right-wing Republicans and thereby kept more Reagan Democrats. Surely Clinton and Perot would have countered with strategies to hold these voters, as well as to try to pick up approval from some conservative Republicans. Perot, for example, might have argued more specifically about how his strong business credentials would help save the economy from its parlous state—even if he might raise the gasoline or other taxes, which are usually anathema to conservatives—making him deserving of their approval if not their heartfelt support.

Although there is no reason to believe that these new strategies and counterstrategies would come out a wash, there is even less reason to believe that the candidates—in developing such strategies as best responses against each other (i.e., creating an equilibrium) under AV—would have greatly altered the political landscape. With the exception of Perot, the candidates were reasonably well-known quantities and therefore could not substantially alter their positions. Perot, as he became better known, was increasingly perceived to be authoritarian and conspiratorial (his enemies would say paranoic), "negatives" that would have given Clinton and Bush effective counterstrategies to mute his appeal under AV.

Assuming the candidates had shifted their strategies in roughly the manner that we suggest might have occurred under AV, the new equilibrium almost certainly would not have produced a drastic transformation in their political support. Although there was a foundation of approval on which Perot could have built a much broader base of support under AV, he, like Clinton and Bush, had a past to defend. By mid-July (when he dropped out), he was having increasing difficulty defending it.

Even if Perot had stayed in the

race, our projections suggest that his AV percentage would not have climbed above the low 40s. (It may have if voter turnout had increased significantly under AV, but there is no indication that such an increase would have affected the relative standings of the candidates.) This total, however, would not have been sufficient to surpass Bush's AV total in the high 40s and Clinton's in the mid-50s.

Projected Popular-Vote Returns Under AV

Because each of the candidates would have shifted his campaign strategy, at least to some degree, in a new equilibrium under AV, any projections from survey data collected in the 1992 election must be hedged with uncertainty. This uncertainty is compounded by the electoral college, under which a plurality of *approval* votes, we assume, would determine the winner in every state except Maine and Nebraska, which currently are the only two states that do not use a winner-take-all rule (their electoral votes are awarded on the basis of who wins each congressional district as well as the state overall).

But it is likely that the national AV winner, like almost all previous winners under the present single-vote (SV) system, would be the electoral-vote winners. Consequently, we will confine our attention only to AV projections, though we recognize that the AV winner, like two SV winners in the nineteenth century, may not be the winner under the electoral college.

Our AV projections are based on data collected in the 1992 American National Election Study (NES) conducted by the Center for Political Studies at the University of Michigan (Miller et al. 1993). We restrict respondents to the set of 1,658 who reported voting for one of the three main candidates in the post-election survey—Clinton, Bush, or Perot—which eliminates both reported nonvoters (about ¼ of the sample) and those who reported voting for other than the three main candidates (only seven respondents).¹ We have made three

rent AV projections, based on the following assignment rules. Assignment rules (1) and (3) were first used by Kiewiet (1979) in assigning approval votes in the 1968 three-way presidential contest among Richard Nixon, Hubert Humphrey, and George Wallace (see also Brams and Fishburn 1978, 1983), in which Wallace was the Perot (i.e., third-party candidate) of rule (3).

(1) *Sincere AV*. Let $u(X)$ be the "feeling thermometer" score for candidate X , which may range between 0 and 100 degrees and may be thought of as a measure of the utility that the voter derives from X 's election. (Respondents are instructed that ratings between 0 and 50 degrees mean that "you don't feel favorable toward the person and don't care too much for that person," whereas ratings between 50 and 100 degrees mean that "you feel favorable and warm toward that person.") Assume $u(A) \geq u(B) \geq u(C)$. This rule assigns an approval vote to the candidate for whom the voter reports that he or she voted. In addition, it always assigns an approval vote to A but not to C ; it assigns an approval vote to B if one of the following is true:

- (i) $u(B) > 50 \geq u(C)$, or
- (ii) $u(B) > [u(A) + u(C)]/2$ and $u(C) > 50$.

Thus, B receives an approval vote if it is rated above 50 degrees and C is not, or it is rated above the average rating of A and C , given the rating of C exceeds 50 degrees.²

(2) *Ever AV*. After designating the candidate they voted for in the election (say, A), voters were asked, "Was there ever a time when you thought you were going to vote for B or C ?" This rule assigns an approval vote to A and one to B or C if such a candidate is specified ($\frac{1}{2}$ a vote to each if both are specified, which were only 7% of all respondents reporting switches).

(3) *Strategic AV*. Perot's approval vote is based on "sincere AV," so it duplicates that in (1) above. All voters are assumed to vote for ex-

TABLE 1
SV Totals and AV Projections (Based on 1992 NES Survey)

Candidate	SV	Sincere AV	Ever AV	Strategic AV
Clinton	47.8%	61.9%	59.1%	57.4%
Bush	34.0%	47.8%	46.7%	42.4%
Perot	18.2%	39.7%	43.2%	39.7%

actly one of Clinton or Bush, according to the following rules:

- (i) if the voter reports voting for one or the other, that candidate receives a vote;
- (ii) if the voter reports voting for Perot, the major-party candidate with the higher thermometer score—whatever it is—also receives a vote (if there is a tie, both receive $\frac{1}{2}$ a vote each).³

Rule (2) is the most behavioral of the assignment rules. It awards a second approval vote—if it does so at all—not on the basis of the present feelings of the voter but rather because he or she, at least some time in the past, reported intending to vote for a candidate different from the candidate that he or she voted for on election day. The reasons for a voter's switching might vary from a true preference reversal (e.g., based on a judgment that Perot's erratic behavior made him temperamentally unfit to be president) to strategic (e.g., based on a perception that Perot, according to the polls, could not win). Rule (3) is "strategic" in the sense that it implicitly assumes that every voter, whether he or she likes one of the major-party candidates or not, will vote for one as "protection" against the possibility that the third-party candidate cannot win.⁴

We shall analyze later the prevalence of two different kinds of insincere voting, one of which we call "strategic" and the other of which we call "protest." Suffice it to note here that Perot suffered the

most from switches during the campaign: of the 870 switches, 434 (50%) were desertions from Perot, 233 (27%) from Bush, and 203 (23%) from Clinton.

The AV projections of the three rules are shown in Table 1 along with the SV totals of the NES survey. Whereas Perot's vote in the survey (18.2%) is close to his actual popular vote (19.0%), Clinton's survey vote (47.8%) is inflated above his actual vote (43.2%), and Bush's survey vote (34.0%) is deflated below his actual vote (37.7%).

Such an inflation of the winner's share in post-election surveys is a well-known phenomenon. More realistic AV projections can be obtained by adjusting for this inflation, beginning with subtracting 4.6 percentage points from Clinton's SV total and adding 3.7 and 0.8 points to Bush's and Perot's SV totals, respectively, as shown in Table 2.

We make exactly the same downward and upward adjustments in the AV projections, because a winner-induced inflation is not to be expected among "second-place" approval votes [i.e., those votes assigned according to rules (1), (2), or (3) to a candidate other than that for whom the voter reported voting]. In fact, respondents who falsely reported voting for Clinton could not have given him second-place approval votes; only his first-place approval votes, based on false reporting, must be adjusted downward in the projections. Analogously, upward projections in

TABLE 2
Adjusted SV Totals and AV Projections

Candidate	SV	Sincere AV	Ever AV	Strategic AV
Clinton	43.2%	57.3%	54.5%	52.8%
Bush	37.7%	51.5%	50.4%	46.1%
Perot	19.0%	40.5%	44.0%	40.5%

first-place approval votes are made for Bush and Perot in Table 2.

Note that differences in the AV projections for Clinton and Bush fall within a very narrow range: Clinton leads Bush by 5.8%, 4.1%, and 6.7% according to assignment rules (1), (2), and (3), or an average of 5.5%. Coincidentally, 5.5% is exactly Clinton's actual SV margin over Bush in the election, so it seems that AV not only would not have affected the election outcome, but it also would have had practically no impact on Clinton's absolute margin of victory (this consistency is often not the case, as documented in the sources cited in the introduction to this article).

The quantitative impact of AV is very different for Perot, who would have more than doubled his 19.0% SV vote to adjusted AV totals of 40.5%, 44.0%, and 40.5%, according to assignment rules (1), (2), and (3). These give Perot an average 41.7% AV projection, compared to Bush's average of 49.3% and Clinton's average of 54.9%. Although the candidates maintain their SV relative standings under AV, Perot's average AV increase over SV (119%) far outstrips both Bush's (31%) and Clinton's (27%) average increases.

Sources of Approval

To understand the basis of Perot's remarkable improvement under AV, we next analyze whether Perot would have benefited more from the approval of Clinton or Bush voters, based on assignment rules (1) and (2). We do not include rule (3), because the sources of Perot's approval are the same as those given by rule (1). For Clinton and Bush as well, we indicate how much of their approval would have come from the supporters of the other two candidates (see Table 3).

Both the sincere-AV and the ever-AV assignment rules indicate that Perot would have received considerably more approval votes from Clinton voters than from Bush voters. This extra approval—100% more from Clinton than from Bush voters under the sincere-AV rule

TABLE 3
Source of Approval Votes

AVs of	Voted for Clinton	Voted for Bush	Voted for Perot	Total AVs
<i>Sincere-AV Assignment Rule</i>				
Clinton	793	116	117	1,026
Bush	127	564	102	793
Perot	238	119	301	658
<i>Ever-AV Assignment Rule</i>				
Clinton	793	68.5	118	979.5
Bush	90	564	121	775
Perot	255	160.5	301	716.5

(238 versus 119 votes), 59% more under the ever-AV rule (255 versus 160.5 votes)—is disproportionate to the greater number of Clinton voters in the electorate, indicating that Clinton voters were definitely more favorably disposed to Perot than were Bush voters.

How did Perot voters feel about Clinton and Bush? Under the sincere-AV rule, Perot is somewhat more helpful to Clinton than Bush (contributing 117 approval votes to Clinton and 102 to Bush), whereas under the ever-AV rule Perot is slightly more helpful to Bush than Clinton (contributing 121 approval votes to Bush and 118 to Clinton). Taken together, it is probably fair to say that the major-party candidates are viewed with about equal approval by Perot voters. This conclusion is supported by the finding that if Perot were not in the race, his vote would have divided evenly between Clinton and Bush (38% to each), with the rest choosing minor candidates or abstaining (Pomper 1993, 142).

Perot voters would contribute a relatively small proportion of approval to the major-party candidates (between 11% and 16% under the two rules), whereas Bush and Clinton would contribute much more to Perot's approval (their joint contribution is 54% under the sincere-AV rule and 58% under the ever-AV rule). These latter contributions clearly show why Perot would have more than doubled his 19% SV total, according to either rule, under AV.

Finally, the figures in Table 3 enable us to say something about how much approval the major-party candidates would have given to

each other. About one in five Bush voters, and about one in six Clinton voters, would have approved of the other major-party candidate, according to the sincere-AV rule, but fewer according to the ever-AV rule. Not only was there not much shared approval between the major-party candidates, but for strategic reasons there probably would be even less if Clinton and Bush were viewed as the only serious competitors. Of course, this is the strategic assumption of rule (3), which presumes that no major-party voter would approve of the other major-party candidate.

To summarize, Clinton voters help Perot much more than do Bush voters. Perot voters, on the other hand, help each major-party candidate by about the same amount, but this isn't much, quantitatively speaking, compared to the extra support that the major-party voters give Perot. Although Bush voters are somewhat more approving of Clinton than are Clinton voters of Bush, there is not much shared approval between the major-party voters.

Condorcet and Borda Winners

The thermometer-scale scores in the 1992 NES study were also used to determine the probable Condorcet and Borda winners. As in the AV analysis, such projections are subject, it must be remembered, to altered campaign strategies and voter perceptions about candidate viability had other voting systems been in use.

Thermometer scores were used

specify first-choice preferences, because they appear more likely to represent sincere appraisal than reported votes, which might be strategic. In determining preferences for Condorcet comparisons, respondents rating two or more candidates the same were apportioned equally between the respective candidates. Respondents failing to rate both candidates in a pair were not counted for that pair. Such omissions may slightly advantage Perot, because more respondents failed to rate him (29) than Clinton (14) or Bush (9), and it would seem that a voter would prefer a rated candidate over one not rated.

Clinton is easily the Condorcet winner, beating Bush 953.5 to 687.5 and Perot 1038.5 to 585.5. Bush beats Perot in a relatively close race, 865.5 to 761.5, reflecting the disproportionate preference of Clinton voters for Perot over Bush (although adjustment for post-election effects would widen Bush's lead somewhat). These preference profiles also indicate that under a plurality-with-runoff or single-transferable-vote system, Perot would have been eliminated followed by a win for Clinton over Bush. These latter two procedures, however, would not have revealed Perot's strong claim for second place.

To resolve ties in determining the Borda count, the adjusted Borda method (Black 1958) was used in which a respondent's score for a focal candidate is the number of candidates rated strictly lower than the focal candidate minus the number rated strictly higher. In order that the scoring agree with the usual Borda count for a strict preference ordering, the resulting values are subjected to a linear transformation so that, for example, a strict preference ordering yields the Borda scores 2, 1, and 0 but an ordering in which the highest two candidates are tied gives the scores 1.5, 1.5, and 0. This method assigns the (intermediate) score of 1 to any candidate not rated, which, as above, may slightly inflate Perot's total score. Borda totals for the three candidates are: Clinton, 2,017.5; Bush, 1,577.0; and Perot, 1,379.5. The closeness of the race

between Bush and Perot for second place again reflects the preference of Clinton voters for Perot over Bush.

Insincere Voting

We define *insincere voting* as voting for a candidate to whom one gives a lower thermometer-scale rating than to a candidate one does not vote for. By this measure, 43 (4.9%) of the 870 respondents who gave Clinton their highest rating, and 42 (6.5%) of the 644 respondents who gave Bush their highest rating, were insincere. By contrast, 55 (13.9%) of the 396 respondents who gave Perot their highest rating were insincere.⁵

We distinguish two motivations for insincere voting based on respondents' reported votes: strategic voting and protest voting. The results indicate that Perot suffered much more from *strategic voting*—that is, desertions of those who rated him the top candidate—than the major-party candidates. This is in line with the usual collapse of third-party candidacies (e.g., George Wallace in 1968 and John Anderson in 1980), in which early supporters vote strategically for their second choices when the third-party candidate is perceived no longer to be a serious contender.

In fact, Perot's case is not typical in this regard, because after he re-entered the presidential race on October 1, his popularity, after an initial dip, rose steadily until election day, November 3 (Pomper 1993, 145). Undoubtedly, Perot was helped by his massive spending on television advertising (chiefly, half-hour "infomercials") and strong performances in the presidential debates on TV.⁶ But he seems to have suffered, nevertheless, from strategic voting, as defined here.⁷

Looked at from another angle, the same data suggest, however, that Perot benefited from what we call *protest voting*—that is, insincere voting designed to "send a message." Forty-eight (15.9%) of Perot's 301 votes came from respondents who did not give him the highest thermometer-scale rating. By contrast, only 39 (4.9%) of

Clinton's 793 votes and 42 (7.4%) of Bush's 564 votes came from similar respondents. This behavior, we believe, reflects a willingness on the part of some voters to vote against their preferences in order to express what Pomper (1993, 142) calls a "generalized protest," not directed at any specific program. In particular, it seems that about one in six Perot voters voted for him, despite their apparent preference for one of the major-party candidates, to protest the latter choices.

There may, however, be more mundane explanations for the latter phenomenon, because similar numbers (but not proportions) of Bush and Clinton voters voted contrary to their preferences. Such "misvoting" may simply indicate the high but not perfect correlation between reported voting behavior (we suggested earlier that there was probably some winner-induced inflation that favored Clinton) and an attitudinal measure like the thermometer-scale ratings.

To conclude, there was probably mild strategic voting that hurt Perot to some degree. But it would not have been significant enough to have affected the election outcome had AV been used and the insincere voters had also voted sincerely for the candidate they rated top on the thermometer scale.

Normatively Speaking . . .

The fact that Perot would have at least doubled his vote total, gaining significant ground on both Clinton and Bush under AV, indicates that AV would have given a very different cast to the 1992 presidential election, even if the outcome would not have changed. Desirably, we think, AV would have led to a less negative campaign, especially on the part of Bush. It is probable that he, as well as the other candidates, would have seen an electoral advantage in trying to garner second-place approval from opponents' supporters, leading to a toning down of some of the most offensive rhetoric of the campaign.

It is likely that voter turnout, the highest since 1968 at about 56% of the voting-age population ("Voting

Registration and Turnout in the 1992 General Election," 1993), would have been still higher under AV. Nonvoters who considered two of the candidates acceptable but could not settle on which one to vote for under SV, or who intensely disliked one candidate but could not decide which one of the others to support, would have had a greater incentive to vote under AV.

Finally, the strongest candidate overall (Clinton) not only would have won but also would have had his victory validated by the popular-vote count, receiving majority approval under AV. But just as important, an AV election would have elevated Ross Perot to his rightful place—a close third—making the race more competitive and thereby increasing voter turnout still more.

Notes

*Steven J. Brams gratefully acknowledges the support of the C. V. Starr Center for Applied Economics. The authors thank Danny Kleinman and Richard D. Potthoff for valuable comments on an earlier version of this paper.

1. We have used the post-election rather than pre-election survey because of the ambiguity of the relevant questions in the earlier survey, which was conducted, in part, during the time when Perot had taken himself out of the race. The question asking for the candidate for whom the respondent intends to vote listed Bush and Clinton, but required that Perot be volunteered by the respondent. Respondents were asked if Perot was ever their first choice for president, but no comparable questions were asked about Clinton or Bush.

2. The following assignments are made if there are ties: if $u(A) = u(B) > u(C)$, both A and B receive an approval vote; if $u(A) > u(B) = u(C)$, only A receives an approval vote; and if $u(A) = u(B) = u(C)$, only the candidate reported voted for receives an approval vote. For respondents who fail to provide thermometer scores for all three candidates, approval votes in addition to the reported vote are assigned only to a candidate rated strictly higher than another rated candidate.

3. Three respondents (0.2%), who did not provide thermometer scores for both Clinton and Bush, could not be assigned a vote for either.

4. Unlike for Perot, rule (3) gives different sources of approval for Clinton and Bush than does rule (1). More specifically, because rule (3) assumes that neither Clinton nor Bush voters would approve of the other, the extra approval of these candidates can come only from Perot voters, who are assumed always to support the major-party

candidate with the higher thermometer rating. Although we think this rule is more realistic for third-party candidates—like George Wallace in 1968—who have little chance of winning under AV because of their ideological extremeness and the consequent "need" for strategic voting, it is useful to include rule (3) in races with more centrist candidates like Perot. Among other things, it tends to provide a lower bound on the likely AV support of the major-party candidates. In 1992, for example, while rule (3) surely attributes too much approval to Clinton and Bush from Perot voters—who are assumed to vote for one or the other major-party candidate regardless of his thermometer rating—this inflation is more than balanced by the deflation caused by attributing no approval to the major-party candidates from each other.

5. These percentages are more than doubled (to 14.4% for Clinton, 19.1% for Bush, and 36.4% for Perot) if we include all respondents who did not vote for a candidate to whom, nevertheless, they gave their highest rating. Under this broader definition of insincerity, which includes respondents who either failed to rate the candidate for whom they voted or gave more than one candidate their highest rating, our conclusion does not change—Perot voters remain decidedly more insincere than Clinton or Bush voters. Note that because the total number of highest-rating responses (1,882) includes ties, it exceeds the total number of voters in the survey (1,658).

6. Perot was perceived to have "won" the first debate October 11, Clinton the second on October 15, and Perot and Clinton the third (ending in a tie) on October 19. Bush came in last on all except the second debate, in which he came in second (Francovic 1993, 120).

7. Black and Black (1993) report that enough voters might have switched to Perot—if they thought he had a chance to win—to put him in the lead. This observation is, however, based on the responses to a single question in an exit poll, which in isolation are hard to interpret, as is pointed out in a rebuttal by Hugick (1993).

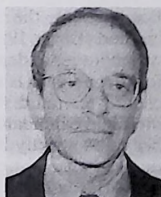
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About the Authors

Steven J. Brams is professor of politics at New York University. His primary interest is in applications of game theory and social choice theory to voting, elections, and international relations. He is the author or coauthor of eleven books, the most recent of which is *Theory of Moves* (Cambridge University Press, 1994).

Samuel Merrill III is professor of mathematics and computer science at Wilkes University. His research involves mathematical and statistical modeling in the social sciences, especially social choice and voting behavior. He is the author of *Making Multicandidate Elections More Democratic* (Princeton University Press, 1988).



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I am sending the following information in response to a request sent to the Public Relations Dept. at this University. As indicated in the enclosed Cover Sheet for Presentation, I will be giving a talk at the AAAS Annual Meeting. An Abstract is also enclosed. Copies of the paper will be sent shortly to Joan Wrather, AAAS Newsroom Director. Could you send information concerning the presentation to the following papers. Thank you.

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*File
Sam Merrill*

Sincerely,

Samuel Merrill, III
Professor of Mathematics and
Computer Science

AAAS Annual Meeting

WASHINGTON, DC

14-19 February 1991

COVER SHEET FOR PRESENTATION

AUTHOR: Samuel Merrill, III

AFFILIATION: Wilkes University

CO-AUTHOR: _____

AFFILIATION: _____

TITLE OF PRESENTATION: _____

Multicandidate Voting Systems

TYPE OF DOCUMENT: (1) ☒ PAPER (2) _____ ABSTRACT (3) _____ OTHER

TIME AND DATE OF PRESENTATION: Mon 18 AM

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SYMPOSIUM TITLE: Voting: Mathematical Foundations and Political Reality

ARRANGER: Alan D. Taylor

NOTE TO CORRESPONDENTS: *Release time is the time of presentation.*

AAAS Annual Meeting
February 14-19, 1991

Samuel Merrill, III
Department of Mathematics and Computer Science
Wilkes University

Multicandidate Voting Systems

Abstract

This talk evaluates--from a mathematical prospective--voting procedures designed to select a single winner from a field of three or more candidates. There is no lack of alternative procedures used in public elections and private organizations: single-vote-plurality, runoff, the Borda count, approval voting, the Hare system. These voting procedures can differ strikingly in the election outcomes they produce, the opportunities for manipulation they create, and the nature of the candidates--centrist or extremist--whom they advantage. A number of researchers have used a variety of methodologies in recent decades to assess these implications, including deduction from theoretical models of voting behavior, computer simulation, and reconstructions of historical voting from election and polling data. Of the voting procedures surveyed here, single-vote-plurality appears most often at odds with the majoritarian principle of Condorcet and with the criterion of maximizing social utility. More reliable and probably less vulnerable to manipulation in practice are approval voting and the Hare and runoff methods.

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The American Association for the Advancement of Science (AAAS) will hold its 157th national meeting in Washington, D.C., 14-19 February 1991. As in the past, we are expecting several hundred media representatives from major newspapers, magazines, wire services, professional journals, and radio and television stations across the country to take part in this annual event. We hope you can assist us in providing them with the necessary materials to more accurately and effectively cover the meeting.

The person/s from your institution whose name/s you will find listed on the attached sheet will be participating in the meeting. We have requested all speakers to provide us with copies of their texts or a detailed summary for the use of reporters at the meeting.

In addition, if you would like to prepare news releases on any of those papers from your institution, we would be happy to make them available to reporters at the meeting in Washington. We would appreciate receiving 200 copies, printed on your letterhead, and timed for release at the time of presentation. Any such releases should be sent to my attention -- Office of Communications, AAAS, 1333 H Street, N.W., Washington, D.C. 20005 -- to arrive no later than 25 January 1991, or delivered to the AAAS Newsroom Headquarters, Calvert Room, First Level, Sheraton Washington Hotel, during the meeting. We would like to know in advance if you are planning to prepare such releases.

Thank you very much for your assistance. If you have not already done so, we urge you to inform your constituents about the AAAS meeting and the participation of the people from your institution. Please let me know if we can help in any way.

Mark / Jane

File Sam Merrill faculty file

For Presidential Preference Poll

State Democrats to Use Merrill's Plan

By FRED NEY
Staff Writer, Sunday Independent

Upstaged by Maine Democrats who decided to hold their presidential straw poll yesterday, the Pennsylvania Democrat delegation chose to defer its straw poll until December 17, hopeful that by then the presidential candidates and the nation's media will be willing to focus their undivided attention on the Keystone state.

That poll will be of interest not only to the state's Democratic leadership and the nation in general but also to Dr. Samuel Merrill, a Wilkes College professor of mathematics and computer science, who helped develop and advance the "approval method" of candidate selection which will be used to choose the state's presidential straw poll winner.

Edward Mezvinsky, chairman of the Pennsylvania Democratic Party, said Friday he is "enthusiastic" about the approval voting system developed by Merrill and his colleagues who are "concerned about the health of Democracy and the soundness of the selection process."

Under approval voting, which Merrill believes can and should be applied to all Primary Elections, voters are allowed to cast a ballot for any or all of the candidates and are not limited to voting for just one.

Merrill, in a published article on the topic, maintains that under approval voting the winner is the candidate who meets the approval of the most voters or, put another way, meets the disapproval of the least. Approval voting tends to select a candidate who holds a more moderate position and who may enjoy wider support. Further, approval voting tends to lead to the selection of a candidate who can, if elected, serve with a wider mandate. And, approval voting would be simple to implement on existing voting machines, Merrill believes.

In a letter to Mezvinsky applauding his decision to utilize approval voting in the state's presidential straw poll, Merrill and a dozen of his colleagues from Carnegie Mellon University, Temple University, the University of Pennsylvania and other institutions of higher learning, wrote:

"Until your decision, no one had taken the vital step of introducing approval voting directly into the political process. We believe that non-binding straw votes such as yours is the ideal occasion to try out this important innovation.

"If this and other tests prove successful, approval voting could spread rapidly to actual primary elections in which case it could dramatically improve the effectiveness of American democracy. We are proud that Pennsylvania will be the first to introduce this promising reform and we commend you and the Pennsylvania Democratic Party for your pioneering vision."

Merrill contends that approval voting will eliminate primary winners who actually receive less than 50% of the vote. He cites Gov. Richard Thornburgh as an example. He won the Republican Primary in 1978 with 33% of the vote. And just this year, Harold Washington won the Chicago Primary with 36%, followed by Jane Byrne with 34% and 30% for Richard Daley.

That approval voting is becoming a popular concept can be seen in New Hampshire, Vermont and New York where bills have been introduced to implement approval voting in presidential primaries.

The presidential straw poll, scheduled to take place yesterday in Camp Hill, was to have followed on the

heels of the Pennsylvania Democratic State Committee convention, which attracted about 400 Democratic party officials from around the Commonwealth.

Concerned about the early primaries in other states which historically attract the lion's share of publicity and tend to give other states, often with small populations, a disproportionate degree of influence in the selection of presidential candidates, Mezvinsky's Pennsylvania straw poll was intended to put the state back in the limelight.

With 195 delegates to the National Democratic convention, Pennsylvania is the fourth largest state in the union, representatively speaking.

"We deserve to be heard and listened to when it comes to picking presidential candidates," Mezvinsky observed.

Ohio Sen. and former Astronaut John Glenn and former Vice President Walter Mondale are perceived to be the two front-runners in the presidential sweepstakes. Glenn, from all appearances, seemed to be picking up steam, especially in the northeast.

But Mondale is not to be counted out just yet. A few days ago, he received an endorsement from the national teachers union and just yesterday, an endorsement from the AFL-CIO. Those substantial labor endorsements may make the big difference for Mondale in Pennsylvania, traditionally a heavily labor and union oriented state.

These endorsements are perceived to have played a major role in his winning the Maine straw poll yesterday.

Mondale will benefit directly from Pennsylvania's decision to defer its presidential straw poll until December because it will give him the extra time he appears to need in the Keystone state to build support and offset Glenn's charismatic appeal.

About Merrill . . .

Dr. Samuel Merrill 3d, 44, 11 Shaver Ave., Shavertown, is a mathematics and computer science instructor at Wilkes College.

His firm belief that approval voting for selection of candidates in primary elections as a means of vastly enhancing the Democratic process is reflected in numerous scholarly articles he has authored on the topic.

Educated at Tulane and Yale Universities, he has held teaching positions at Yale, the University of Rochester and Wilkes College.

Author of "Approval Voting: A Best Buy Method for Multi-Candidate Elections," he has also authored works on "Citizen Voting Power Under the Electoral College . . ." "Empirical Estimates for the Likelihood of a Divided Verdict in a Presidential Election" and "A Unified Framework for One-Stage Multi-Candidate Elections Via Linear Programming."



DR. SAMUEL MERRILL

Prof to give talk on elections

WILKES-BARRE — "Elections, Polls and Primary" will be the topic of Samuel Merrill III, professor and chairman of mathematics and computer science at Wilkes College, on Thursday at 7:30 p.m. in the Darte Center for the Performing Arts.

The lecture, which is open to the public free of charge, is part of the college's Faculty Seminar Series.

Merrill will address the relationship of the electoral college to the popular vote and the polls' margin of error in predicting the outcome of the election.

He'll also speak on voting records for individual states and primary elections, about which he recently published a book.

The book, entitled "Making Multicandidate Elections More Democratic," evaluates voting procedures for elections with three or more candidates.

"When more than two candidates run under

the present system, no one, not even the winner, may get the majority. This is all too clear in presidential primaries in which 30 percent or less is often enough to win," said Merrill. "Furthermore, a voter may resort to voting for a second choice if a favorite has little chance to win."

Merrill suggests that "approval voting," in which people can vote for more than one candidate in multicandidate elections, may be the reliable procedure for overcoming these defects.

"Under approval voting, a voter may vote for one, two, three — or any number of candidates, that he or she approves. Thus the voter states an opinion, favorable or unfavorable, about each candidate, rather than giving his or her first choice," Merrill said.

"Under the present system, the candidate with the most total votes wins, but under approval voting, the winner is the candidate who meets the approval of the most voters, or put another way, meets the disapproval of the least."

His latest book is one of more than 20 publications produced by the Shavertown resident, and is based largely on his research at Wilkes on the comparison of voting systems using mathematical models and computer simulation.



Samuel Merrill

FLS
10/30/82 95

Faculty Resume Information Sheet

Full Name Merrill Samuel III
 Last First M.I.
 School or College and Department Arts and Sciences Dept. of Mathematics and Computer Science
 Age as of September 1, 1988, Date of Birth 48 - 10/27/39
 Academic Rank Professor
 Full-Time ☒ Part-Time ☐
 Non-Wilkes College Teaching, If Part-Time _____

Earned Degrees	Name of Institution	Location	Area, Field or Major	Degree Received	Date Conferred
	Yale	New Haven, CT	Math.	Ph.D.	1965
	Penn State	State Coll, PA	Statistics	M.S.	1980
	Yale	New Haven, CT	Math.	M.A.	1963
	Tulane	New Orleans, LA	Math.	B.A.	1961

Teaching Experience Incl. Wilkes	Name of Institution	Location	Subjects/Fields Taught	Full or Part-Time Rank	Dates of Service From-To
	Wilkes College	W-B, PA	Math., Stat., C.S.	FT Prof.	'73-to date
	Univ. of Rochester	Rochester, NY	Math.	FT Asst. Prof.	'65-'73

Non-Teaching Experience

Full-Time	Firm or Organization or Self-Employed	Duties	Title	Dates of Service From - To
	Yale Medical School	Statistical	Visiting	'86 - '87
		Consultant	Professor	(sabbatical)
Part-Time	Penn. State	Statistical	Student	'79 - '80
		Consulting		

List Major Consulting Activities

Statistical (Yale Medical School; Penn State)

Bibliographic Citation of Principal Publications - Last Five Years

See attached sheet.

Membership in Professional and Scientific Societies

Organization Name	Local, State, Regional, National	Offices Held
Math. Assoc. America	National	
Amer. Statistical Assoc.	National	Member, Elections Comm.
Public Choice Society	National	

Teaching at Wilkes 1988-89 (including teaching overloads)

	Course Title	Hrs. of Lecture per Week	Hrs. of Recitation per Week	Contact Hrs. of Laboratory per Week	# of Day Sections; Enrollment	# of Evening or Weekend Sections/ Enrollment
Fall '88	MA 351A. Prob. & Stat. I	3			8	
Total of	CS 321A. Simul. Data	3			7	
Students	Analysis					
Taught						
15						
Spring '89						
Anticipated						
Total of	MA 150 Ele. Statis.	3				
Students	MA 352 Prob. &	3				
Projected	Math. Statis.					

Other Duties Performed for Base Salary, 1988-89 (Full-Time Faculty)

Duty/Activity	Hours per Week	# of Advisees: 10
Advising	3	
Research/Scholarship	5	
Committee Work	5	
Department Chairperson	25	

Other Duties for Extra Compensation, 1988-89 (Full-Time Faculty)

Duty/Activity	Hours per Week

esc

9-26-88

SAMUEL MERRILL, III

RESEARCH PUBLICATIONS: 1984-88

1. A comparison of efficiency of multicandidate electoral systems, Amer. J. Political Science 28 (1984), 23-48.
2. A statistical model for Condorcet efficiency using simulation under spatial model assumptions, Public Choice 47 (1985), 389-403.
3. Response to Rubow, Management Science 31 (1985), 375-376 (with S. J. Brams).
4. Binding versus final-offer arbitration: A combination is best, Management Science 32 (1986), 1346-1355 (with S.J. Brams).
5. The effect of approval balloting on strategic voting under alternative decision rules, American Political Science Review 81 (1987), 511-524 (with J. Nagel).
6. The responsiveness of approval voting: Comments on Saari and Van Newenhizen, Public Choice (forthcoming; with S.J. Brams and P.C. Fishburn).
7. Final-offer arbitration with a bonus, submitted for publication (with S.J. Brams).

BOOK

1. Making Multicandidate Elections More Democratic. Princeton: Princeton University Press (1988).



WILKES COLLEGE OFFICE OF PUBLIC RELATIONS

FACULTY-STAFF INFORMATION SHEET

1980-81

PROMOTED TO PROFESSOR
MAY, 1981.NAME Samuel Merrill, III POSITION Assoc. Prof. of
Math/Comp. Sci.Date of Birth 10/27/39 Place of Birth New Orleans, La.Address 11 Shaver Ave., Shavertown Home Phone 696-3753Marital Status married To Whom Susan L. Merrill When 1969Children and Dates of Birth Andrew - 10/22/71Amy - 5/11/74Date Joined Wilkes 1973 Other Positions Held at Wilkes (Include Dates)— May 1981 - Promoted to Professor of Math and Computer Science.

Previous Employment (Institutions, Titles & Dates)

Instructor - Univ. of Rochester - 1965-67Assistant Prof - Univ. of Rochester - 1967-1973

COLLEGE INFORMATION

Colleges Attended	Dates	Degree	Major
<u>Yale Univ.</u>	<u>1961-65</u>	<u>Ph.D.</u>	<u>Math.</u>
<u>"</u>	<u>"</u>	<u>M.A.</u>	<u>Math.</u>
<u>Penn State Univ.</u>	<u>1979-80</u>	<u>M.S. (expected Nov. 1980)</u>	<u>Statistics</u>
<u>Tulane Univ.</u>	<u>1957-61</u>	<u>B.A.</u>	<u>Math.</u>
High School Attended	<u>Bogalusa (La.) High Sch.</u>		
Location	<u>—</u>	Years	<u>1953-57</u>

FACULTY-STAFF INFORMATION SHEET
(Page 2)

Military Information (Optional)

Dates of Service _____ Branch _____

Rank on Discharge _____

List all Honors, Decorations, etc. _____

Please list extra-curricular activities; professional memberships; honors or awards received; varsity athletics; business and social fraternities; scholastic Honors; etc. (Use reverse side if necessary.) _____

Member American Math Society, Mathematical
Association of America, American Statistical Assoc.,
Public Choice Society.

Please list research and teaching interests. (Use reverse side if necessary.)

Teaching: Statistics, general mathematics, application
of computing. Research: Statistics, Math, Application
in Political Science.
Hometown Newspaper or Professional Publications to which you would like releases sent: _____

Please add any additional information about yourself that would help us in keeping our files up-to-date.

Please Return To:

PUBLIC RELATIONS OFFICE
WECKESSER HALL

NEXT OF KIN NOTIFICATION

NAME Samuel Merrill, III

DEPARTMENT Mathematics

Please list below the name and address of that person
you wish the Administration to contact in the event of your death.

Name Susan Merrill

Address 11 Shaver Ave.

Phone No. 696-3753

If above person is not available, contact instead:

Name _____

Address _____

Phone No. _____

June 1978

Department Mathematics
Appointed 9/1/73

FACULTY PERSONNEL DATA

NAME Samuel Merrill, III Date of Birth 10/27/39

I. RECORD AT WILKES:

	<u>Date of appointment or Promotion</u>	<u>Date of Severance</u>
Instructor		
Assistant Professor		
Associate Professor	<u>9/1/73</u>	
Professor	<u>6/1/81</u>	
Other		

Other activities and responsibilities while at Wilkes:

II. EDUCATION:

	<u>Degree</u>	<u>Institution</u>	<u>Date</u>
Bachelor's Degree	<u>B. A.</u>	<u>Tulane University</u>	<u>1961</u>
Master's Degree	<u>M. A.</u>	<u>Yale University</u>	<u>1963</u>
Doctor's Degree	<u>Ph.D.</u>	<u>Yale University</u>	<u>1965</u>
Other Degrees			

II. STUDIES AND PUBLICATIONS:

<u>Title</u>	<u>Publisher or Publication</u>	<u>Date</u>
<u>See attached sheet.</u>		

SAMUEL MERRILL, III

Publications

1. Analytic embedding and mean square approximation, Proc. Amer. Math. Soc. 18 (1967), 836-842.
2. Maximality of certain algebras $H^\infty(dm)$, Math. Zeitschrift, 106 (1968), 261-266.
3. Characterization of certain invariant subspaces of H^p and L^p spaces derived from logmodular algebras, Pacific J. Math. 30 (1969), 463-474 (with N. Lal).
4. Isometries of H^p spaces of the torus, Proc. Amer. Math. Soc. 30 (1972), 465-471 (with N. Lal).
5. Gleason parts and a problem in prediction theory, accepted for publication, Math. Zeitschrift (about 8 pages), 129 (1972), 321-329.
6. Continuous transitions from convex to quasi-convex and log-convex functions, in preparation (with G. S. Mudholkar).
7. A Probability model for a Voter's Power during 1936-72 under the Electoral College System, submitted for publication.

IV. EXPERIENCE Before Coming to Wilkes:

<u>Teaching: - School or College</u>	<u>Position Held</u>	<u>Date</u>
Associate in Teaching - Yale		1964-65
Instructor in Mathematics - University of Rochester		1965-67
Asst. Prof. of Mathematics - Univ. of Rochester		1967-73

Business Government

Mathematician - U. S. Naval Ordnance Test Station,	<u>Summers of</u>
China Lake, California	1960, 1962

<u>Military: - Service</u>	<u>Rank</u>	<u>Year</u>

V. PROFESSIONAL AFFILIATIONS (Indicate offices held):

Phi Beta Kappa, Secretary, University of Rochester chapter 1969-70.

American Mathematical Society, Mathematics Association of

America, AAUP

VI. NON-PROFESSIONAL AFFILIATIONS:

715 CV- 4/28/83

File
D.S. Merrill

To: Jane Mangarella

From: Samuel Merrill

Date: April 20, 1983

Enclosed is the article for the Commentary section of the Citizens Voice which you suggested.

In addition to having a number of published research articles on the analysis of electoral systems, I am now working as a content developer on a telecourse concerning the application of mathematics. This telecourse is being produced by the Consortium for Mathematics Applications Project (COMAP) in Lexington, MA, under a grant from the Public Broadcasting System funded in turn by the Carnegie Foundation and the Annenberg School of Communications. In addition to politics, the telecourse will depict the role of mathematics in the study of biological growth, computing, statistics, urban planning, and other topics. It is intended for use as an entry-level course for college students and in continuing education programs.

The material for the enclosed article is taken in part from my talk at Bucknell and from the script for a videotape which I prepared with Dean Friedman for use by COMAP.

Thanks for your help. Let me know if you need more information.

Approval Voting: A 'Best Buy' Method for Primary Elections

Dr. Samuel Merrill

Department of Mathematics and Computer Science

Wilkes College - Wilkes-Barre, PA

April 20, 1983

Each time the Presidential primary season approaches, at least one of our national parties offers a large selection of candidates. If a party is to succeed in the general election, the primary and convention process must select from the wide range of available candidates a single nominee who has broad support within his or her party.

Yet Senator Barry Goldwater in 1964 and Senator George McGovern in 1972 each won nomination because of a fervent but narrow constituency and each met a predictable disaster at the polls. In fact, the typical winner of a multicandidate primary receives only a minority--often a small minority--of the total primary votes cast. This is an inevitable result of current election rules in all the primary states, which permit each voter to express a preference for only one of the candidates.

Had Democratic voters been able to express approval for several of the primary contenders in 1972, moderate candidates such as Hubert Humphrey and Edmund Muskie would have fared much better.

In fact this idea is at once simple to implement as a formal system of voting, yet remarkable in that it can overcome many of the shortcomings of the

present voting system. The procedure is called approval voting. Under approval voting, a voter may vote for one, two, three--or any number of candidates, that is for as many as he or she approves. Thus the voter states an opinion, favorable or unfavorable, about each candidate, rather than giving only his or her first choice. As under the present system, the candidate with the most total votes wins. But under approval voting, the winner is the candidate who meets the approval of the most voters, or put another way, meets the disapproval of the least.

The basic concept of approval voting is presently used in multi-vacancy elections, such as for city council or school board. If there are, say, three positions to be filled, the voter is normally instructed to vote for "not more than three." But there is no logical reason why the number of candidates voted for needs to be keyed to the number of positions to be filled. In any event, to implement approval voting, no change would be needed in the construction of voting machines.

What effect might approval voting have had on the outcome of historical elections? For our first example, consider the 1972 Democratic Presidential primaries. At that time the highly-respected Survey Research Center conducted a poll based on a national sample in which voters were asked to rate each of the candidates on a scale from 0 to 100. On this basis, likely approval votes can be estimated. Although George McGovern had the greatest support under the present system, with George Wallace tied for second, Muskie would almost certainly have won under approval voting and Humphrey would have finished well ahead of Wallace.

A more recent example of the probable effect of approval voting comes from the 1980 Republican Presidential primary in New Hampshire. This primary is particularly important because it is the first in the nation. Approval vote estimates can be based on the answer to a question posed by ABC News in an election day exit poll: "Which candidates in this election do you consider acceptable?" Howard Baker more than tripled his total under approval voting and came in second (ahead of George Bush), although he had finished a poor third (behind Reagan and Bush) under the present system. With such a showing under approval voting he might have stayed in the race much longer, rather than dropping out, as he did, within a few days.

In both primary situations illustrated, approval voting tended to select a candidate who held a more moderate position and may have enjoyed wider support. Bills have been introduced into the legislatures of three states (NH, VT, and NY) to implement approval voting in presidential primaries.

Recently a growing number of political scientists and mathematicians have sought to meld aspects of their disciplines to address this fundamental question of democracy: How should the winner be chosen in an election involving more than two candidates? The political objectives are diverse: e.g., the winner should emerge with a wide mandate; s(he) should be preferred to each other candidate by a majority; and loopholes whereby voters can advance their own interests by voting other than for their true preferences should be avoided.

Unfortunately, the present system (called plurality voting), the one most commonly used in this country, is singularly deficient in meeting these

criteria. Many alternatives have been proposed-- such as permitting voters to rank the candidates or employing a successive elimination or, as we have seen, approval voting. Considerable new insight concerning the advisability of using these systems can be obtained through a mathematical approach.

Primary elections for governors and mayors present the same problem. In a large field, the winner of the primary often receives far less than 50 percent of the vote. In 1978, Richard Thornburgh won the Republican primary for governor of Pennsylvania with 33 percent of the vote; in 1977 Edward Koch led the first Democratic primary for Mayor of New York City with only 20 percent of the vote (followed by Mario Cuomo, Abraham Beame, and Bella Abzug who each received between 17 and 19 %). A few weeks ago Harold Washington won the Chicago Democratic primary with 36 % (to 34 % for Jane Byrne and 30 % for Richard Daley).

Fortunately, New York City has a runoff between the top two candidates (Chicago does not). But a runoff is more expensive and time consuming than approval voting. It would be impractical for state by state Presidential primaries in a campaign season already too long.

More fundamentally, a runoff may overlook a compromise candidate who stands third (or fourth) on the first ballot. Perhaps Koch and Washington were the strongest candidates in their respective contests, but even use of a runoff is not convincing evidence when more than two candidates receive about equal votes.

A close three-way race without runoff such as the recent Democratic

primary in Chicago leads to a winner with no strong mandate even from his own party. This circumstance in Chicago permitted other factors to produce a bitter and divisive campaign. Regardless of who was elected, drawing the polarized camps back together will be difficult.

In contrast, approval voting tends to lead to the selection of a candidate who enjoys approval by a large proportion of the electorate and who can, if elected, serve with a wider mandate. It benefits centrist candidates, without denying voters the opportunity to express their support for more extremist candidates. It lessens the tendency for primary candidates with similar platforms to attack each other, since, under approval voting, they can share support from the same voters.

Voting in a way that does not reflect one's true preferences is discouraged under approval voting. In contrast, under the present system, a voter may feel forced to desert a favorite who has little chance of winning to avoid wasting his vote. A common misconception, under approval voting, is that a voter could increase his impact by voting for more candidates. That this is not true can be seen by noting that if I vote for all the candidates, I simply add one vote to the tally for every candidate, but have no effect on their relative standings. Hence such a vote has no effect on the choice of the winner. In fact, it can be shown mathematically that to have the greatest impact, I should on the average vote for about half the candidates, because I thereby make the most possible distinctions between candidates approved and not approved. It would still be appropriate to bullet vote for a single candidate if I prefer one candidate strongly to the others. Or I might vote for all but one, if there is one candidate whom I strongly disapprove relative

to the others.

Approval voting would have many advantages for primaries for single-winner executive offices. For general elections, the situation is more debatable. It has been argued that the present plurality system, by forcing voters to desert parties unlikely to win, helps preserve a two-party system in inter-party contests. Approval voting might well be inappropriate even for primaries involving multi-member bodies such as legislatures and city councils where minority representation and a variety of viewpoints is desirable.

Approval voting is not the only alternative voting system that has been proposed for multicandidate elections. About 200 years ago, a Frenchman, Jean-Charles de Borda, proposed a system now used to determine rankings of collegiate football teams by AP and UPI sportswriters. Each sportswriter ranks his choice of the top 20 teams, assigning 20 points to his first choice, 19 to his second, down to 1 point for his 20th choice. The sums of these points over all sportswriters provide the collective rankings with which most readers of the sports page are familiar.

If Borda's system were used in public elections, with voters assigning ranks to the candidates, an enormous loophole would be opened for manipulation of the results. For example, were the system used in our Presidential election, in which there are typically several minor parties in addition to the two major ones, Democrats, say, could increase their impact by rating the Democrat first and the Republican last, even if they thought all the minor parties candidates incompetent. Republicans could, of course, do the reverse. Such manipulation could easily overturn the outcome and if most voters used

this technique one of the minor party candidates would likely tally enough intermediate ranks to win! Unfortunately, the Borda system cannot be recommended for public elections.

A third system, proposed by the Englishman, Thomas Hare, is used to elect the Australian House of Representatives. As with the Borda system, each voter ranks the candidates. The candidate with the fewest first place votes is eliminated, and the second place votes of his supporters transferred to add to the first place totals of the remaining candidates. This process is repeated until one candidate has a majority and is declared the winner. (Without computers, it takes days to count the vote.)

The Hare system is similar to our plurality system with runoff (low candidates are eliminated in both methods) and shares its faults. The worst is truly bizarre: a candidate can lose an election by gaining support, or what is just as bad, win an election by losing support since the outcome depends on the sequence of elimination of candidates.

Many other ideas for voting systems have been proposed. One of the best is that of the Marquis de Condorcet, namely that a candidate should be elected if he could beat each of the others in two-way contests. A remedy when there is no such candidate was proposed by none other than Lewis Carroll (of Alice and Wonderland fame), but the system is complicated.

Both intuition and theoretical studies reveal that there is no perfect multicandidate voting system. Approval voting would be simple to implement on existing voting machines. It is currently being considered in several states

for use in the 1984 Presidential primaries. It would overcome many of the shortcomings of the present system of plurality voting. Yet, despite its simplicity, it would be almost as effective in determining the strongest candidate as a number of more complicated alternatives and less vulnerable to manipulation. In this sense it seems to be the 'best buy' method for Presidential primaries.

TO ALL FACULTY:

Please fill out the following form and return to Jane Manganello so we may update your file and do appropriate publicity. Thank you.

NAME: Samuel Merrill, III

DEPARTMENT: Mathematics/Computer Science

RESEARCH: Mathematical and Statistical modeling in Political Science, Management Science, and Geology

1985 - WHO'S WHO in--The East

PUBLICATIONS: See attached list.

AWARDS: National Science Foundation Grants each year, 1966-72, at the University of Rochester.

OTHER: Organizer and Chairperson of Special Session: "Mathematics of Voting and Bargaining," held at the meeting of the American Mathematical Society, March 16-17, 1982.

Invited lecturer at the 1982 A.A.A.S. National Meeting (Symposium on Comparison of Voting Systems), 1984 A.A.A.S. National Meeting (Symposium on the Bargaining Question Revisited), Philadelphia Section of the Mathematical Association of America, Stevens Inst. of Technology, Villanova and Susquehanna Universities, University of Connecticut, Gettysburg and Kings' Colleges.

SAMUEL MERRILL, III

Resume

Ph.D.	Yale University	1965	Mathematics
M.S.	Pennsylvania State Univ.	1980	Statistics
M.A.	Yale University	1963	Mathematics
B.A.	Tulane University	1961	Mathematics

Professor of Mathematics and Computer Science: Wilkes College,
1981-to present.

Associate Professor of Mathematics and Computer Science: Wilkes
College: 1973-81 (on sabbatical at Pennsylvania State
University 1979-80).

Assistant Professor of Mathematics: University of Rochester, 1967-73.

Instructor in Mathematics: University of Rochester, 1965-67.

Current Research: Mathematical and statistical models in Political Science
(voting systems, voting power), Management Science (arbitration), and
Geology (paleobathymetry).

NSF Research Grants, each year 1966-72, University of Rochester.

Statistical Consulting: Statistical Consulting Service (Pennsylvania State
University, 1979-80); City of Wilkes-Barre (1981).

Computer Experience: FORTRAN, SAS, BMDP, MINITAB, SPSS, and SLAM.

Organizer and Chairman of Special Session: "Mathematics of Voting and
Bargaining," held at the meeting of the American Mathematical Society,
March 16-17, 1982.

Invited lecturer at the 1982 A.A.A.S. National Meeting (Symposium on
Comparison of Voting Systems), 1984 A.A.A.S. National Meeting (Symposium
on Solving the Bargaining Question), Philadelphia Section of the
Mathematical Association of America, Villanova and Susquehanna
Universities, Univ. of Connecticut, Gettysburg and King's Colleges.

Referee for J. Amer. Stat. Assn., S.I.A.M. J. Applied Math., Amer.
Political. Sci. Rev., Theory and Decision, J. Econ. Theory, Intern. J.
Game Theory, Operations Research, and Math. Magazine.

Participant in a number of conferences sponsored by NSF.

Instructor in an Energy Conservation Workshop for secondary school teachers
held at Wilkes College, 1978, sponsored by U.S. D.O.E.

Member of American Statistical Association, Mathematical Association of
America, and Public Choice Society.

Born: October 27, 1939, New Orleans, LA
Married, two children.

SAMUEL MERRILL, III

PUBLICATIONS

1. Analytic embedding and mean square approximation, Proc. Amer. Math. Soc. 18 (1967), 836-842.
2. Maximality of certain algebras $H^\infty(dm)$, Math. Zeitschrift 106 (1968), 261-266.
3. Characterization of certain invariant subspaces of H_p and L_p spaces derived from logmodular algebras, Pacific J. Math. 30 (1969), 463-474 (with N. Lal).
4. Isometries of H_p spaces of the torus, Proc. Amer. Math. Soc. 30 (1972), 465-471 (with N. Lal).
5. Gleason parts and a problem in prediction theory, Math. Zeitschrift 129 (1972), 321-329.
6. Citizen voting power under the Electoral College: A stochastic model based on state voting patterns, S.I.A.M. J. on Applied Math. 34 (1978), 376-390.
7. Empirical estimates for the likelihood of a divided verdict in a Presidential election, Public Choice 33, #2 (1978), 127-133.
8. Approval voting: A 'best buy' method for multi-candidate elections, Math. Magazine 52, #2 (1979), 98-102.
9. For 'approval voting,' Op-Ed page, The New York Times, July 20, 1979.
10. Decision analysis for multicandidate voting systems, module completed (1980) on assignment for Undergraduate Mathematics Applications Project (UMAP), Education Development Center, Newton, Mass.
11. Strategic decisions under one-stage multi-candidate voting systems, Public Choice 36, #1 (1981), 115-134.
12. Strategic decisions for multicandidate voting systems under uncertainty and under risk, in M. Holler, ed., Power, Voting, and Voting Power, pp. 179-187. Wurzburg: Physica-Verlag.
13. Foraminiferal paleobathymetry of the Hokuroku district during the time of Kuroko ore genesis, Presented at the Annual Meeting of the Society of Mining Geologists of Japan, Tokyo, January 29-30, 1981 (with A. Guber and J. Date).
14. Approximations to the Banzhaf index of voting power, Math. Monthly 89 (1982), 108-110.
15. A statistical model for foraminiferal paleobathymetry, with application to the middle Miocene of the Hokuroku district, Japan, J. of Math. Geology 14 (1982), 607-627 (with A. Guber).

16. Equilibrium strategies for final-offer arbitration: There is no median convergence, *Management Science* 29 (1983), 927-941 (with S. Brams).
17. Paleo-oceanographic and biostratigraphic significance of the foraminifera from the Hokuroku district, Japan, *J. Economic Geology: Monograph # 5* (1983), 55-70 (with A. Guber).
18. A comparison of efficiency of multicandidate electoral systems, *Amer. J. Political Science* 28 (1984), 23-48.
19. A statistical model for Condorcet efficiency using simulation under spatial model assumptions, *Public Choice* (1985), (about 15 pages, in press).
20. Response to Rabow, *Management Science* 31 (1985), (with S. J. Brams; one page, in press).

WORK IN PROGRESS

21. Binding versus final-offer arbitration: A combination is best, (with S. J. Brams; under review).
22. Evaluating the desirability of approval balloting under alternative decision rules (with J. Nagel; in progress).

SAMUEL MERRILL, III

Resume

Office: Dept. of Math. & Comp. Sci.
Wilkes College
Wilkes-Barre, PA 18766
(717) 824-4651, Ext. 378

Home: 11 Shaver Avenue
Shavertown, PA 18708
(717) 696-3753

PERSONAL:

Born: October 27, 1939, New Orleans, LA
Married, two children.

EDUCATION:

Ph.D.	Yale University	1965	Mathematics
M.S.	Pennsylvania State Univ.	1980	Statistics
M.A.	Yale University	1963	Mathematics
B.A.	Tulane University	1961	Mathematics

PROFESSIONAL EMPLOYMENT:

Wilkes College, Department of Mathematics and Computer Science:
1973-to present. Currently Professor.
Pennsylvania State University, Statistical Consulting Service (part-time):
sabbatical, 1979-80.
University of Rochester, Department of Mathematics: 1965-73.

OBJECTIVES FOR SABBATICAL YEAR 1986-87:

My professional experience to date has been academic teaching and research. I would value the opportunity to work as a statistical analyst and consultant--preferably as part of a team--with more direct contact with practical problems. My training and research experience give me skills in mathematical and statistical modeling and data analysis in a variety of fields from political science to clinical trials. Two decades of teaching have developed my skills in communication and interpersonal relationships.

CURRENT RESEARCH:

Mathematical and statistical modeling:
Political Science (voting systems and voting power)
Management Science (arbitration)
Geology (paleobathymetry)
Clinical trials (breast cancer)

18 research publications; 2 in preparation. See attached list.

PROFESSIONAL ACTIVITIES:

Invited Lectures: 1982 A.A.A.S. National Meeting (Symposium on Comparison of Voting Systems); 1984 A.A.A.S. National Meeting (Symposium on Solving the Bargaining Question); 1985 national Meeting of the American Political Science Association; Philadelphia Section of the Mathematical Association of America; Villanova, Bucknell, and Susquehanna Universities; University of Connecticut; Gettysburg and King's Colleges.

Organizer and Chairperson of Special Session: "Mathematics of Voting and Bargaining," held at the meeting of the American Mathematical Society, March 16-17, 1982.

Referee: J. Amer. Statistical Assn., S.I.A.M. J. Applied Math., Amer. Political Science Review, Amer. J. Political Science, Theory and Decision, J. Economic Theory, Intern. J. Game Theory, Operations Research, and Math. Magazine.

Content Developer: VisUMAP telecourse, under production by Consortium for Mathematics and Its Applications (COMAP), Lexington, MA.

Statistical Consulting: Statistical Consulting Service (Pennsylvania State University, 1979-80); City of Wilkes-Barre (1981); informal consulting for Wilkes College faculty.

Computer Experience: FORTRAN, SAS, BMDP, MINITAB, SPSS, and SLAM.

Member: American Statistical Association, Mathematical Association of America, and Public Choice Society.

TEACHING EXPERIENCE:

Probability and Statistics; Statistical Methodology and Consulting; Numerical Analysis; Operations Research; Computer Simulation; Fortran; normal range of undergraduate mathematics, both pure and applied; graduate mathematics in the field of analysis.

ADMINISTRATIVE EXPERIENCE:

Chairperson of two faculty committees, including the Wilkes College Tenure and Promotion Committee. Coordinator of two community organizations.

12. Approximations to the Banzhaf Index of voting power, Math. Monthly 89 (1982), 108-110.

13. A statistical model for fecundational paleoecology, with application to the middle Miocene of the Hakurika district, Japan, J. of Math. Geology 14 (1982), 607-627 (with A. Gabor).

14. Equilibrium strategies for final-offer arbitrations: There is no median convergence, Management Science 29 (1983), 927-941 (with S. J. Brann).

SAMUEL MERRILL, III

RESEARCH PUBLICATIONS

1. Analytic embedding and mean square approximation, Proc. Amer. Math. Soc. 18 (1967), 836-842.
2. Maximality of certain algebras $H^\infty(dm)$, Math. Zeitschrift 106 (1968), 261-266.
3. Characterization of certain invariant subspaces of H^P and L^P spaces derived from logmodular algebras, Pacific J. Math. 30 (1969), 463-474 (with N. Lal).
4. Isometries of H^P spaces of the torus, Proc. Amer. Math. Soc. 30 (1972), 465-471 (with N. Lal).
5. Gleason parts and a problem in prediction theory, Math. Zeitschrift 129 (1972), 321-329.
6. Citizen voting power under the Electoral College: A stochastic model based on state voting patterns, S.I.A.M. J. on Applied Math. 34 (1978), 376-390.
7. Empirical estimates for the likelihood of a divided verdict in a Presidential election, Public Choice 33, #2 (1978), 127-133.
8. Approval voting: A 'best buy' method for multi-candidate elections, Math. Magazine 52, #2 (1979), 98-102.
9. Strategic decisions under one-stage multi-candidate voting systems, Public Choice 36, #1 (1981), 115-134.
10. Strategic decisions for multicandidate voting systems under uncertainty and under risk, in M. Holler, ed., Power, Voting, and Voting Power, pp. 179-187. Wurzburg: Physica-Verlag.
11. Foraminiferal paleobathymetry of the Hokuroku district during the time of Kuroko ore genesis, Presented at the Annual Meeting of the Society of Mining Geologists of Japan, Tokyo, January 29-30, 1981 (with A. Guber and J. Date).
12. Approximations to the Banzhaf index of voting power, Math. Monthly 89 (1982), 108-110.
13. A statistical model for foraminiferal paleobathymetry, with application to the middle Miocene of the Hokuroku district, Japan, J. of Math. Geology 14 (1982), 607-627 (with A. Guber).
14. Equilibrium strategies for final-offer arbitration: There is no median convergence, Management Science 29 (1983), 927-941 (with S. J. Brams).

15. Paleo-oceanographic and biostratigraphic significance of the foraminifera from the Hokuroku district, Japan, J. Economic Geology: Monograph # 5 (1983), 55-70 (with A. Guber).
16. A comparison of efficiency of multicandidate electoral systems, Amer. J. Political Science 28 (1984), 23-48.
17. A statistical model for Condorcet efficiency using simulation under spatial model assumptions, Public Choice (1985), (in press).
18. Response to Rabow, Management Science 31 (1985), 375-376 (with S. J. Brams).
19. Binding versus final-offer arbitration: A combination is best. Presented at the National Meeting of the Amer. Assoc. for the Advancement of Science, New York, May 24-29, 1984 (with S.J. Brams).
20. The effect of approval balloting on strategic voting under alternative decision rules. Presented at the 1985 Annual Meeting of the Amer. Pol. Sci. Assoc., New Orleans, August 29-September 1, 1985 (with J. Nagel).

EXPOSITORY PUBLICATIONS

1. 'For approval voting,' Op-Ed page, The New York Times, July 20, 1979.
2. Decision analysis for multicandidate voting systems, module completed (1980) on assignment for Undergraduate Mathematics Applications Project (UMAP), Education Development Center, Newton, Mass.

CURRENT RESEARCH:

Mathematical and statistical modeling:
 Political Science (voting systems and voting power)
 Management Science (logistics)
 Geology (paleogeography)
 Clinical trials (breast cancer)

18 research publications, 2 in preparation. See attached list.



Wilkes College

Wilkes-Barre, Pennsylvania 18766

Melissa

To: Jane Mangarella

From: Sam^{Sam} Merrill

Date: June 26, 1986

Here are some notes about my sabbatical for possible use in newspaper articles, as we discussed on the phone.

Dr. Samuel Merrill, Professor of Mathematics and Computer Science at Wilkes College, will be a Visiting Professor at the Yale University School of Medicine during his sabbatical from Wilkes, 1986-87. Dr. Merrill will be in the Division of Biostatistics in the Department of Epidemiology and Public Health.

His work will involve statistical consulting for clinical trials, epidemiological studies and other research conducted by the Yale Medical School. He will work with Dr. Robert Makuch, formerly Head of the Biostatistics and Data Management Section at the National Cancer Institute, who will be in charge of statistical consulting at the Yale Medical School.

Enclosed is a copy of my vita, in case more information is needed.

MEMORANDUM

TO: Sam Merrill, Department of Mathematics/Computer Science
FROM: Robert J. Neuman, Acting Vice President for Academic Affairs
RE: Report of Sabbatical Year 1986-87
DATE: September 14, 1987

Thank you for your report on your sabbatical year 1986-87. I am impressed with the quality of work you have done and grateful for the recognition you have brought to Wilkes with your publications and presentation. Congratulations on your forthcoming book to be published by Princeton University Press, Making Multicandidate Elections More Democratic. You make all of us very proud, Sam.

esc

cc: Christopher W. Breiseth, President
Jane Manganella, Director, Public Relations ✓
James Rodechko, Dean, College of Arts and Sciences
Richard Sours, Chairperson, Department of Mathematics/Computer Science
George Waldner, Vice President for Academic Affairs

*File
Samuel Merrill*

Wilkes College

News

OFFICE OF PUBLIC RELATIONS • WILKES-BARRE, PENNSYLVANIA 18766
TELEPHONE: (717) 822-8413



contact: Ken Swisher
Assistant Director
Public Relations

WILKES PROFESSOR WRITES BOOK ABOUT VOTING

WILKES-BARRE--Dr. Samuel Merrill, Professor of Mathematics and Computer Science at Wilkes College, has written a book entitled "Making Multicandidate Elections More Democratic," which is scheduled for publication in May by Princeton University Press. The book is based largely on his research at Wilkes on the comparison of voting systems using mathematical modeling and computer simulation.

"The book evaluates voting procedures for elections with three or more candidates. When more than two candidates run under the present system, no one, not even the winner, may get the majority. This is all too clear in the current presidential primaries in which 30 percent or less is often enough to win," said Merrill. "Furthermore, a voter may resort to voting for a second choice if a favorite has little chance to win. Approval voting emerges from the analysis in the book as, perhaps, the most reliable procedure for overcoming these defects. Although simple to implement, it usually gives a majority mandate to the

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1ST AD/WILKES PROFESSOR WRITES BOOK ON VOTING

strongest candidate while avoiding loopholes for manipulation."

Two research papers by Dr. Merrill have appeared recently: "Binding versus Final-Offer Arbitration: A Combination is Best," published in "Management Science" and co-authored by professor Steven Braums of New York University; and "The Effect of Approval Balloting on Strategic Voting under Alternative Decision Rules," which appeared in the "American Political Science Review," and was co-authored with Professor Jack Nagel of the University of Pennsylvania.

Merrill holds a B.A. in Mathematics from Tulane University, an M.A. in Mathematics from Yale University, an M.S. in Statistics from Pennsylvania State University, and a Ph.D. in Mathematics from Yale. The Shavertown resident has published a number of research articles on the analysis of electoral systems, and has also taught at Yale and the University of Rochester.

Wilkes prof suggests 'approval voting'

"Elections, Polls and Primary" will be the topic of Dr. Samuel Merrill, III, professor and chairman of mathematics and computer science at Wilkes College, on Nov. 3 at 7:30 p.m. in the Darte Center for the Performing Arts, South and South River Streets.

The lecture, which is open to the public free of charge, is part of the college's Faculty Seminar Series.

Merrill will address the relationship of the electoral college to the popular vote and the polls' margin of error in predicting the outcome of the election.

He will peak on voting records for individual states and primary elections, about which he recently published a book. The book, *Making Multicandidate Elections More Democratic*, evaluates voting pro-

cedure for elections with three or more candidates.

"When more than two candidates run under the present system, no one, not even the winner,

may get the majority. This is all too clear in presidential primaries in which 30 percent or less is often enough to win," said Merrill.

"Furthermore, a voter may resort to voting for a second choice if a favorite has little chance to win."

Merrill suggests that "approval voting," in which people can vote for more than one candidate in multi-candidate elections, may be the most reliable procedure for overcoming these defects.

"Under approval voting, a voter may vote for one, two, three — or any number of candidates, that he or she approves. Thus the voter states an opinion, favorable or un-

favorable, about each candidate, rather than giving his or her first choice. Under the present system, the candidate with the most total votes wins, but under approval voting, the winner is the candidate who meets the approval of the most voters, or put another way, meets the disapproval of the least," said Merrill.

The book is one of more than 20 publications produced by the Shavertown resident, and is based largely on his research at Wilkes on the comparison of voting systems using mathematical modeling and computer simulation.

He holds a B.A. in mathematics from Tulane University, an M.A. in mathematics from Yale University, an M.S. in statistics from Pennsylvania State University, and a Ph.D. in mathematics from Yale.

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Wilkes College

News

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TELEPHONE: (717) 822-8413



contact: Ken Swisher
Assistant Director
Public Relations

WILKES PROFESSOR TO GIVE LECTURE ON PRESIDENTIAL ELECTIONS

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1ST AD/WILKES PROFESSOR TO GIVE LECTURE ON ELECTIONS

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Merrill to teach at Yale

Dr. Samuel Merrill, Professor of Mathematics and Computer Science at Wilkes College, will serve as a Visiting Professor at the Yale University School of Medicine during a sabbatical from Wilkes College for 1986-87. Merrill will teach in the Division of Biostatistics of the Department of Epidemiology and Public Health.

Dr. Merrill's work at Yale will involve statistical consulting for clinical trials, epidemiological studies and other research conducted by the Yale Medical School.

He will work with Dr. Robert Makuch, formerly Head of the Biostatistics and Data Management Section at the National Cancer Institute.

Dr. Merrill holds a BA in Mathematics from Tulane University, an MA in Mathematics from Yale University, and MS in Statistics from Pennsylvania State University, and a PhD in Mathematics from Yale. His current research involves mathematical and statistical modeling for Political Science, Management Science, Geology and clinical trials.

Dr. Merrill has served on the Wilkes faculty since 1973. He will return to teaching at Wilkes in the fall of 1987.



Dr. Samuel Merrill

WILKES COLLEGE

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CV 8/28/86

Sunday Independent

WILKES BARRE, PA.

S-51,530

Sam Merrill to Serve As Visiting Prof at Yale

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Wilkes College

News

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TELEPHONE: (717) 822-8413



contact: Melissa Meyers
Assitant Director
Public Relations

WILKES COLLEGE PROFESSOR WILL TEACH AT YALE UNIVERSITY FOR 1986-87

WILKES-BARRE--Dr. Samuel Merrill, Professor of Mathematics and Computer Science at Wilkes College, will serve as a Visiting Professor at the Yale University School of Medicine during a sabbatical from Wilkes for 1986-87. Merrill will teach in the Division of Biostatistics of the Department of Epidemiology and Public Health.

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Wilkes College

News

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TELEPHONE: (717) 822-8413

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Dr. Merrill



Jane Mangarella
Assistant Director

EXCLUSIVE TO THE SUNDAY INDEPENDENT

WILKES COLLEGE PROFESSOR TO LECTURE AT BUCKNELL UNIVERSITY ON
MARCH 15

WILKES-BARRE--Dr. Samuel Merrill, Professor of Mathematics and Computer Science at Wilkes College will be the featured speaker at the 50th Anniversary Faculty Coloquium at Bucknell University on March 15.

Merrill will discuss his research into voting systems for multicandidate elections. According to the Wilkes scientist, "An increasing volume of research has been carried out recently, by political scientists and mathematicians at several institutions, including Wilkes, on an alternative method of voting, which is at once, simple to implement and understand, yet remarkable in its capacity to overcome the shortcomings of the present voting system."

Dr. Merrill, who holds a Ph.D from Yale University, has been a member of the Wilkes Facutly since 1973.

Further information about the Coloquium may be obtained by calling Dr. Owen Faut, Chemistry Department at Wilkes, 824-4651, extension 426.

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Citizens' Voice 3/1

Merrill 43 **Lecture** 427

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12. In Your Town 3/11

College news

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Merrill will discuss his research into voting systems for multi-candidate elections. He holds a Ph.D. from Yale University and has been a member of Wilkes faculty since 1973.

54 9/18/88 2/5

Wilkes Professor Publishes Book on Voting

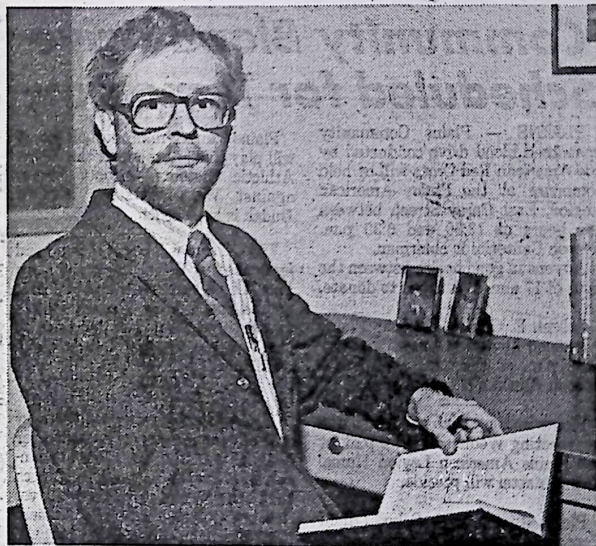
Dr. Samuel Merrill, professor of mathematics and computer science at Wilkes College, recently published his book "Making Multicandidate Elections More Democratic," by Princeton University Press. The book is based largely on his research at Wilkes on the comparison of voting systems using mathematical modeling and computer simulation.

"The book evaluates voting procedures for elections with three or more candidates. When more than two candidates run under the present system, no one, not even the winner, may get the majority of votes. This is all too clear in the presidential primaries in which 30 percent or less is often enough to win," said Merrill. "Furthermore, a voter may resort to voting for a second choice if a favorite has little chance to win. Approval voting emerges from the analysis in the book as, perhaps, the most reliable procedure for overcoming these defects. Although simple to implement, it usually gives a majority mandate to the strongest can-

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DR. SAMUEL MERRILL

For Presidential Preference Poll

State Democrats to Use Merrill's Plan

By FRED NEY
Staff Writer, Sunday Independent

Upstaged by Maine Democrats who decided to hold their presidential straw poll yesterday, the Pennsylvania Democrat delegation chose to defer its straw poll until December 17, hopeful that by then the presidential candidates and the nation's media will be willing to focus their undivided attention on the Keystone state.

That poll will be of interest not only to the state's Democratic leadership and the nation in general but also to Dr. Samuel Merrill, a Wilkes College professor of mathematics and computer science, who helped develop and advance the "approval method" of candidate selection which will be used to choose the state's presidential straw poll winner.

Edward Mezvinsky, chairman of the Pennsylvania Democratic Party, said Friday he is "enthusiastic" about the approval voting system developed by Merrill and his colleagues who are "concerned about the health of Democracy and the soundness of the selection process."

Under approval voting, which Merrill believes can and should be applied to all Primary Elections, voters are allowed to cast a ballot for any or all of the candidates and are not limited to voting for just one.

Merrill, in a published article on the topic, maintains that under approval voting the winner is the candidate who meets the approval of the most voters or, put another way, meets the disapproval of the least. Approval voting tends to select a candidate who holds a more moderate position and who may enjoy wider support. Further, approval voting tends to lead to the selection of a candidate who can, if elected, serve with a wider mandate. And, approval voting would be simple to implement on existing voting machines, Merrill believes.

In a letter to Mezvinsky applauding his decision to utilize approval voting in the state's presidential straw poll, Merrill and a dozen of his colleagues from Carnegie Mellon University, Temple University, the University of Pennsylvania and other institutions of higher learning, wrote:

"Until your decision, no one had taken the vital step of introducing approval voting directly into the political process. We believe that non-binding straw votes such as yours is the ideal occasion to try out this important innovation."

"If this and other tests prove successful, approval voting could spread rapidly to actual primary elections in which case it could dramatically improve the effectiveness of American democracy. We are proud that Pennsylvania will be the first to introduce this promising reform and we commend you and the Pennsylvania Democratic Party for your pioneering vision."

Merrill contends that approval voting will eliminate primary winners who actually receive less than 50% of the vote. He cites Gov. Richard Thornburgh as an example. He won the Republican Primary in 1978 with 33% of the vote. And just this year, Harold Washington won the Chicago Primary with 36%, followed by Jane Byrne with 34% and 30% for Richard Daley.

That approval voting is becoming a popular concept can be seen in New Hampshire, Vermont and New York where bills have been introduced to implement approval voting in presidential primaries.

The presidential straw poll, scheduled to take place yesterday in Camp Hill, was to have followed on the

heels of the Pennsylvania Democratic State Committee convention, which attracted about 400 Democratic party officials from around the Commonwealth.

Concerned about the early primaries in other states which historically attract the lion's share of publicity and tend to give other states, often with small populations, a disproportionate degree of influence in the selection of presidential candidates, Mezvinsky's Pennsylvania straw poll was intended to put the state back in the limelight.

With 195 delegates to the National Democratic convention, Pennsylvania is the fourth largest state in the union, representatively speaking.

"We deserve to be heard and listened to when it comes to picking presidential candidates," Mezvinsky observed.

Ohio Sen. and former Astronaut John Glenn and former Vice President Walter Mondale are perceived to be the two front-runners in the presidential sweepstakes. Glenn, from all appearances, seemed to be picking up steam, especially in the northeast.

But Mondale is not to be counted out just yet. A few days ago, he received an endorsement from the national teachers union and just yesterday, an endorsement from the AFL-CIO. Those substantial labor endorsements may make the big difference for Mondale in Pennsylvania, traditionally a heavily labor and union oriented state.

These endorsements are perceived to have played a major role in his winning the Maine straw poll yesterday.

Mondale will benefit directly from Pennsylvania's decision to defer its presidential straw poll until December because it will give him the extra time he appears to need in the Keystone state to build support and offset Glenn's charismatic appeal.

About Merrill . . .

Dr. Samuel Merrill 3d, 44, 11 Shaver Ave., Shavertown, is a mathematics and computer science instructor at Wilkes College.

His firm belief that approval voting for selection of candidates in primary elections as a means of vastly enhancing the Democratic process is reflected in numerous scholarly articles he has authored on the topic.

Educated at Tulane and Yale Universities, he has held teaching positions at Yale, the University of Rochester and Wilkes College.

Author of "Approval Voting: A Best Buy Method for Multi-Candidate Elections," he has also authored works on "Citizen Voting Power Under the Electoral College . . ."; "Empirical Estimates for the Likelihood of a Divided Verdict in a Presidential Election" and "A Unified Framework for One-Stage Multi-Candidate Elections Via Linear Programming."



DR. SAMUEL MERRILL

Approval Voting: 'Best Buy' Primary Elections Method

By DR. SAMUEL MERRILL

Special to the Citizens' Voice

Each time the Presidential primary season approaches, at least one of our national parties offers a large selection of candidates. If a party is to succeed in the general election, the primary and convention process must select from the wide range of available candidates a single nominee who has broad support within his or her party.

Yet Senator Barry Goldwater in 1964 and Senator George McGovern in 1972 each won nomination because of a fervent but narrow constituency and each met a predictable disaster at the polls. In fact, the typical winner of a multicandidate primary receives only a minority — often a small minority — of the total primary votes cast. This is an inevitable result of current election rules in all the primary states, which permit each voter to express a preference for only one of the candidates.

Had Democratic voters been able to express approval for several of the primary contenders in 1972, moderate candidates such as Hubert Humphrey and Edmund Muskie would have fared much better.

In fact this idea is at once simple to implement as a formal system of voting, yet remarkable in that it can overcome many of the shortcomings of the present voting system. The procedure is called approval voting. Under approval voting, a voter may vote for one, two, three — or any number of candidates, that is for as many as he or she approves. Thus the voter states an opinion, favorable or unfavorable, about each candidate, rather than giving only his or her first choice. As under the present system, the candidate with the most total votes wins. But under approval voting, the winner is the candidate who meets the approval of the most voters, or put another way, meets the disapproval of the least.

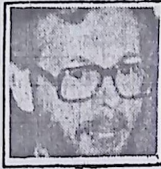
The basic concept of approval voting is presently used in multi-vacancy elections, such as for city council or school board. If there are, say, three positions to be filled, the voter is normally instructed to vote for "not more than three." But there is no logical reason why the number of candidates voted for needs to be keyed to the number of positions to be filled. In any event, to implement approval voting, no change would be needed in the construction of voting machines.

What effect might approval voting have had on the outcome of historical elections? For our first example, consider the 1972 Democratic Presidential primaries. At that time the highly-respected Survey Research Center conducted a poll based on a national sample in which voters were asked to rate each of the candidates on a scale from 0 to 100. On this basis, likely approval votes can be estimated. Although George McGovern had the greatest support under the present system, with George Wallace tied for second, Muskie would almost certainly have won under approval voting and Humphrey would have finished well ahead of Wallace.

A more recent example of the probable effect of approval voting comes from the 1980 Republican Presidential primary in New Hampshire. This primary is particularly important because it is the first in the nation. Approval vote estimates can be based on the answer to a question posed by ABC News in an election day exit poll: "Which candidates in this election do you consider acceptable?" Howard Baker more than tripled his total under approval voting and came in second (ahead of George Bush), although he had finished a poor third (behind Reagan and Bush) under the present system. With such a showing under approval voting he might have stayed in the race much longer, rather than dropping out, as he did, within a few days.

In both primary situations illustrated, approval voting tended to select a candidate who held a more moderate position and may have enjoyed wider support. Bills have been introduced into the legislatures of three states (NH, VT, and NY) to implement approval voting in presidential primaries.

Recently a growing number of political scientists and mathematicians have sought to meld aspects of their disciplines to address this fundamental question of democracy: How should the winner be chosen in an election involving more than two candidates? The political objectives are diverse: e.g., the winner should emerge with a wide mandate; s(he) should be preferred to each other candidate by a majority; and loopholes whereby



Merrill



Under approval voting, the winner is the candidate who meets the approval of the most voters, or put another way, meets the disapproval of the least.



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Approval voting tends to lead to the selection of a candidate who can, if elected, serve with a wider mandate.



Approval voting would be simple to implement on existing voting machines.

voters can advance their own interests by voting other than for their true preferences should be avoided.

Unfortunately, the present system (called plurality voting), the one most commonly used in this country, is singularly deficient in meeting these criteria. Many alternatives have been proposed — such as permitting voters to rank the candidates or employing a successive elimination or, as we have seen, approval voting. Considerable new insight concerning the advisability of using these systems can be obtained through a mathematical approach.

Primary elections for governors and mayors present the same problem. In a large field, the winner of the primary often receives far less than 50 percent of the vote. In 1978, Richard Thornburgh won the Republican primary for governor of Pennsylvania with 33 percent of the vote; in 1977 Edward Koch led the first Democratic primary for Mayor of New York City with only 20 percent of the vote (followed by Mario Cuomo, Abraham Beame, and Bella Abzug who each received between 17 and 19%). A few weeks ago Harold Washington won the Chicago Democratic primary with 36% (to 34% for Jane Byrne and 30% for Richard Daley).

Fortunately, New York City has a runoff between the top two candidates (Chicago does not). But a runoff is more expensive and time consuming than approval voting. It would be impractical for state by state Presidential primaries in a campaign season already too long.

More fundamentally, a runoff may overlook a compromise candidate who stands third (or fourth) on the first ballot. Perhaps Koch and Washington were the strongest candidates in their respective contests, but even use of a runoff is not convincing evidence when more than two candidates receive about equal votes.

A close three-way race without runoff such as the recent Democratic primary in Chicago leads to a winner with no strong mandate even from his own party. This circumstance in Chicago permitted other factors to produce a bitter and divisive campaign. Regardless of who was elected, drawing the polarized camps back together will be difficult.

In contrast, approval voting tends to lead the selection of a candidate who enjoys approval by a large proportion of the electorate and who can, if elected, serve with a wider mandate. It benefits centrist candidates, without denying voters the opportunity to express their support for more extremist candidates. It lessens the tendency for primary candidates with similar platforms to attack each other, since, under approval voting, they can share support from the same voters.

Voting in a way that does not reflect one's true preference is discouraged under approval voting. In contrast, under the present system, a voter may feel forced to desert a favorite who has little chance of winning to avoid wasting his vote. A common misconception, under approval voting, is that a voter could increase his impact by voting for more candidates. That this is not true can be

seen by noting that if I vote for all the candidates, I simply add one vote to the tally for every candidate, but have no effect on their relative standings. Hence such a vote has no effect on the choice of the winner. In fact, it can be shown mathematically that to have the greatest impact, I should on the average vote for about half the candidates, because I thereby make the most possible distinctions between candidates approved and not approved. It would still be appropriate to bullet vote for a single candidate if I prefer one candidate strongly to the others. Or I might vote for all but one, if there is one candidate whom I strongly disapprove relative to the others.

Approval voting would have many advantages for primaries for single-winner executive offices. For general elections, the situation is more debatable. It has been argued that the present plurality system, for forcing voters to desert parties unlikely to win, helps preserve a two-party system in inter-party contests. Approval voting might well be inappropriate even for primaries involving multi-member bodies such as legislatures and city councils where minority representation and a variety of viewpoints is desirable.

Approval voting is not the only alternative voting system that has been proposed for multicandidate elections. About 200 years ago, a Frenchman, Jean-Charles de Borda, proposed a system now used to determine rankings of collegiate football teams by AP and UPI sportswriters. Each sportswriter ranks his choice of the top 20 teams, assigning 20 points to his first choice, 19 to his second, down to 1 point for his 20th choice. The sums of these points over all sportswriters provide the collective rankings with which most readers of the sports page are familiar.

If Borda's system were used in public elections, with voters assigning ranks to the candidates, an enormous loophole would be opened for manipulation of the results. For example, were the system in our Presidential election, in which there are typically several minor parties in addition to the major ones, Democrats, say, could increase their impact by rating the Democrat first and the Republican last, even if they thought all the minor parties candidates incompetent. Republicans could, of course, do the reverse. Such manipulation could easily overturn the outcome and if most voters used this technique one of the minor party candidates would likely tally enough intermediate ranks to win! Unfortunately, the Borda system cannot be recommended for public elections.

A third system, proposed by the Englishman, Thomas Hare, is used to elect the Australian House of Representatives. As with the Borda system, each voter ranks the candidates. The candidate with fewest first place votes is eliminated, and the second place votes of his supporters transferred to add to the first place totals of the remaining candidates. This process is repeated until one candidate has a majority and is declared the winner. (Without computers, it takes days to count the vote.)

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Many other ideas for voting systems have been proposed. One of the best is that of the Marquis de Condorcet, namely that a candidate should be elected if he could beat each of the others in two-way contests. A remedy when there is no such candidate was proposed by none other than Lewis Carroll (of Alice and Wonderland fame), but the system is complicated.

Both intuition and theoretical studies reveal that there is no perfect multicandidate voting system. Approval voting should be simple to implement on existing voting machines. It is currently being considered in several states for use in the 1984 Presidential primaries. It would overcome many of the shortcomings of the present system of plurality voting. Yet, despite its simplicity, it would be almost as effective in determining the strongest candidate as a number of more complicated alternatives and less vulnerable to manipulation. In this sense it seems to be the 'best buy' method for Presidential primaries.

(Dr. Samuel Merrill teaches in the department of mathematics and computer science at Wilkes College. He is currently developing a telecourse, under a grant from the Public Broadcasting System, depicting the role of mathematics in the study of biological growth, computing, statistics, urban planning and other topics.)

State Democratic Officials Favor Mondale in Poll

HARRISBURG (AP) — Pennsylvania Democratic Party officials have overwhelmingly named former Vice President Walter Mondale as their favorite presidential candidate in a non-binding approval poll.

Mondale was named on 148, or 73 percent, of the 202 ballots cast in the poll Saturday of state committee members and elected officials.

Ohio Sen. John Glenn, who has picked up endorsements from a number of key Democrats here, was on 91 ballots, or 45 percent.

South Carolina Sen. Ernest "Fritz" Hollings, who is not well-known in the state, was third with 42 votes, or 21 percent.

The poll used the approval method, which allowed each voter to pick one or more candidates.

Most of the 83 people who picked one candidate voted for Mondale. Glenn picked up most of the remaining single-candidate ballots.

The Rev. Jesse Jackson, the civil rights activist from Chicago, had 33 votes, or 16 percent; Sens. Alan Cranston of California and Gary Hart of Colorado each had 30 votes or 15 percent; and former Florida Gov. Reubin Askew and former Sen. George McGo-

vern each had 12 votes, or 6 percent.

Sen. Edward Kennedy of Massachusetts, who is not an announced candidate for the party's presidential nomination, received two votes.

While the poll may not be an accurate measure of the candidates' standing in the state, it was free of the hype that marked straw votes in other states, said party chairman Edward Mezvinsky.

"It may be a more sincere view of where these people are ..." he said.

Mezvinsky, who had arranged the poll, said it was the first time the approval method had been used on such a scale anywhere in the country.

Samuel Merrill, a professor of mathematics at Wilkes College in Wilkes-Barre who helped count the ballots, said 59 percent of the participants voted for more than one candidate.

Of the 433 eligible to vote, 234 were present at the meeting and 202 submitted ballots.

Jack Nagle, an associate professor of political science at the University of Pennsylvania who managed the poll, said its outcome seemed to indicate that many party officials already had

made personal commitments to particular candidates.

Mondale, a frequent visitor to Pennsylvania, is popular with the state's party members. He picked up a number of endorsements recently, but his organization has not been as evident as Glenn's.

Nagle said the approval voting method tests broad-based support rather than the narrow, hard-core support that shows up in "vote-for-one" balloting.

Mezvinsky said there is deep concern about flaws in the present presidential nomination process and that the poll here was an "historic step to consider a way to change."

"It's more meaningful and less divisive," he said. "I like the idea."

Mezvinsky originally scheduled a presidential straw vote for Oct. 1. But key party officials, including Philadelphia party chairman Joseph Smith, opposed the idea.

As for Hollings' strong showing, Mezvinsky said an appearance here by the senator's wife, Rita, just before the voting appeared to be a factor.

Mrs. Hollings herself received two write-in votes.

Hollings' deputy national field director, John Phillips, said the third place finish was "very, very positive."

Merrill to teach at Yale

Dr. Samuel Merrill, Professor of Mathematics and Computer Science at Wilkes College, will serve as a Visiting Professor at the Yale University School of Medicine during a sabbatical from Wilkes College for 1986-87. Merrill will teach in the Division of Biostatistics of the Department of Epidemiology and Public Health.

Dr. Merrill's work at Yale will involve statistical consulting for clinical trials, epidemiological studies and other research conducted by the Yale Medical School. He will work with Dr. Robert Makuch, formerly Head of the Biostatistics and Data Management Section at the National Cancer Institute.

Dr. Merrill holds a BA in Mathematics from Tulane University, an MA in Mathematics from Yale University, and MS in Statistics from Pennsylvania State University, and a PhD in Mathematics from Yale. His current research involves mathematical and statistical modeling for Political Science, Management Science, Geology and clinical trials.

Dr. Merrill has served on the Wilkes faculty since 1973. He will return to teaching at Wilkes in the fall of 1987.



Dr. Samuel Merrill

Star Wars system subject of lecture

Sam Merrill, coordinator of the Wyoming Valley Peace Committee, will present the topic "Star Wars: A Maginot Line in Space?" on Thursday, Oct. 17 at noon in the second floor meeting room of the Osterhout Free Library, 71 S. Franklin St., Wilkes-Barre.

"Star Wars" is a proposal to develop a system of orbiting laser battle stations to shoot down incoming nuclear missiles. This plan - the most expensive military venture ever proposed - is now under consideration by Congress.

Merrill will address the questions of: will it work, will it protect people or missile silos, how might the Soviets react, will it hinder arms control, and will it make Americans more secure?

Dr. Merrill is a professor of mathematics and computer science at Wilkes College.

The lecture is co-sponsored by College Misericordia and



Sam Merrill

the Osterhout Free Library. It is open to the public free of charge. Guests are welcome to bring a lunch. No reservations are necessary.

College news

WILKES COLLEGE

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First Test:

State Dems To Put Approval On Voting

HARRISBURG (UPI) — Next month's Democratic State Committee presidential straw vote deserves national attention because of its pioneering use of "approval voting," three professors say.

The Dec. 17 straw poll will mark the first use of approval voting in the political process, University of Pennsylvania professor Jack Nagel said Thursday at a news conference at Democratic State Committee headquarters.

In approval voting, ballots are cast not only for voters' first choices but also for all other candidates they support, without ranking them.

Approval balloting has been used in polls by ABC News and George Gallup and several states are considering the method for primary and general elections, he added.

Nominees who win under approval voting will have broader support than has often been the case, when candidates win with less than a majority of the votes, he said.

"That's why it's important and that's why it's a good thing," he said.

The system is likely to change the outcome of multicandidate elections where, for example, two liberals draw votes from each other while a conservative candidate wins with a slight edge.

Nagel said it would avoid a deep split in the party among camps of opposing candidates and allow party leaders to gauge whether support for particular candidates was waxing or waning during the course of the campaign.

Professor John Kellett of Gettysburg College predicted it also would allow dark horse candidates to tell whether their support was building and prevent their early withdrawal from the contest.

Its use will solve dilemmas for people torn between voting for a new presidential contender like Jesse Jackson or casting their ballots for candidates with a better chance of winning, Nagel said.

But Wilkes College professor Samuel Merrill cautioned that their support of approval voting does not hinge on hopes it will boost anyone's candidacy. He said it is unlikely to affect the relative standing of the candidates in the Democratic State Committee's straw poll next month.

Approval Voting Is a 'Best Buy' At Ballot Box

*File
Dr. R. Merrill*

Editor's Note: The following article was written by Dr. Samuel Merrill III, a member of the Wilkes College Mathematics and Computer Science faculty. Dr. Merrill holds a Ph.D. from Yale and has been a member of the Wilkes College faculty since 1973.

By Dr. Samuel Merrill III

It frequently happens in elections with more than two candidates, such as primaries, that the winning candidate receives only a minority—often a small minority—of the total votes. This is an inevitable result of current election rules in the United States, which permit each voter to express a preference for only one of the candidates.

For example, Richard Thornburgh won the 1978 gubernatorial primary in Pennsylvania with 33% of the vote in a field of seven candidates. At the same time, the winner of the Democratic primary for Lt. Governor received 29% in a field of 14. Henry Jackson "won" the 1976 Democratic presidential primary in Massachusetts with only 22% and Edward Koch led the New York mayoralty first primary with a mere 20%.

Some of these primary winners (notably Governor Thornburgh and Mayor Koch) were later able to demonstrate wide support. But often as not, such minority victories are almost meaningless, yet many saddle a political party with a nominee who leads it to disaster the following November. Probably the best known examples of this phenomenon are Barry Goldwater in 1964 and George McGovern in 1972.

Very recently an increasing volume of research has been carried out by political scientists and mathematicians at several institutions including Wilkes College on an alternative method of voting, which is at once simple to implement and understand, yet remarkable in its capacity to overcome many of the shortcomings of the present

runoff for United States House Democratic Majority leader in 1976, could have defeated any of his opponents in a two-man race.

Following a categorical ballot by a runoff only compounds the problem of strategic voting. For example, in a three-candidate race, supporters of a candidate expected to lead the first ballot may well shift some of their first ballot votes to their last choice if they expect him to be the less dangerous opponent in the runoff. Some observers believe that precisely this happened in the House Majority Leader race mentioned above.

The probable outcome, had approval voting been used in some Presidential primaries, has been studied by this writer and others by analyzing polling data taken by the national Survey Research Center shortly after the 1972 Democratic primaries.

In the poll a sample of voters were asked to give "thermometer" ratings of each candidate on a scale of 0 to 100. These ratings were used to determine that strategy which would maximize the voter's influence on the outcome. Analysis, assuming voters use these optimal strategies, indicates that the distribution

system, called approval voting, each voter may vote for more than one candidate, but cast no more than one vote for any single candidate. In effect he votes for as many candidates as he approves. The candidate receiving the most votes wins.

From the recent research, there emerge several major advantages of approval voting over the simple plurality system currently used:

(1) approval voting tends to lead to the selection of a candidate who enjoys approval by a large proportion of the electorate—often a majority—and who can, if elected, serve with a wider mandate.

(2) approval voting benefits centrist candidates, without denying voters the opportunity to express their support for more extremist candidates.

(3) approval voting mitigates the tendency for primary candidates with similar platforms to attack each other, since under approval voting they can share support from the same voters.

(4) approval voting discourages strategic voting, i.e., voting in a way that does not reflect one's true preferences. In contrast, under simple plurality voting, a voter must often resort to such a strategy when he deems his first choice has little chance to win. The dilemma he faces involves a decision between his assessment of candidate quality on the one hand and his judgment of the electoral strength of the candidates on the other. It is like comparing apples and oranges.

Approval voting stands up well when compared with a number of more complicated schemes. An election followed by a runoff between the top two contestants is more expensive and may overlook a compromise candidate who stands third on the first ballot. As a case in point, most observers believe that Congressman Richard Bolling, a centrist candidate who failed to make the

didates would be almost the same under approval voting as under a variety of more complicated systems, including the Borda count (a of which is used in Australia) and the Hare elimination scheme (used in Ireland).

But the results were quite different under the simple plurality system. All of the alternative systems show Humphrey with the greatest strength at the time of the poll, whereas the simple plurality winner of the poll is McGovern.

It is interesting to note that a slight variation of the Borda count, which is based on summing ranks or points, is used by AP and UPI to achieve composite rankings of the top 20 collegiate football teams in the country.

As we have seen, approval voting is well suited to primary elections, such as presidential or gubernatorial primaries, where there are many candidates from which it is desired to choose a single nominee who has broad support within his party. Such a system could be easily introduced in presidential primaries in one or two states on an experimental basis.

In fact, Morley Winograd of a Democratic National Party commission on presidential primaries, has proposed that it be considered for use in Michigan in 1980.

Approval voting would be simple to implement on existing voting machines. It is akin to the present provision for voting for "not more than three" when there are three vacancies on a school board or city council, but this procedure need not be limited to multiple-vacancy races.

We have seen that approval voting overcomes many of the shortcomings of categorical voting, yet fares well in comparison with more complicated alternatives. It is in this sense that we argue that it is a "best buy" method for multi-candidate elections, such as presidential and gubernatorial primaries.

Approval Voting: 'Best Buy' Primary Elections Method

By DR. SAMUEL MERRILL
Special to the Citizens' Voice

Each time the Presidential primary season approaches, at least one of our national parties offers a large selection of candidates. If a party is to succeed in the general election, the primary and convention process must select from the wide range of available candidates a single nominee who has broad support within his or her party.

Yet Senator Barry Goldwater in 1964 and Senator George McGovern in 1972 each won nomination because of a fervent but narrow constituency and each met a predictable disaster at the polls. In fact, the typical winner of a multicandidate primary receives only a minority — often a small minority — of the total primary votes cast. This is an inevitable result of current election rules in all the primary states, which permit each voter to express a preference for only one of the candidates.

Had Democratic voters been able to express approval for several of the primary contenders in 1972, moderate candidates such as Hubert Humphrey and Edmund Muskie would have fared much better.

In fact this idea is at once simple to implement as a formal system of voting, yet remarkable in that it can overcome many of the shortcomings of the present voting system. The procedure is called approval voting. Under approval voting, a voter may vote for one, two, three — or any number of candidates, that is for as many as he or she approves. Thus the voter states an opinion, favorable or unfavorable, about each candidate, rather than giving only his or her first choice. As under the present system, the candidate with the most total votes wins. But under approval voting, the winner is the candidate who meets the approval of the most voters, or put another way, meets the disapproval of the least.

The basic concept of approval voting is presently used in multi-vacancy elections, such as for city council or school board. If there are, say, three positions to be filled, the voter is normally instructed to vote for "not more than three." But there is no logical reason why the number of candidates voted for needs to be keyed to the number of positions to be filled. In any event, to implement approval voting, no change would be needed in the construction of voting machines.

What effect might approval voting have had on the outcome of historical elections? For our first example, consider the 1972 Democratic Presidential primaries. At that time the highly-respected Survey Research Center conducted a poll based on a national sample in which voters were asked to rate each of the candidates on a scale from 0 to 100. On this basis, likely approval votes can be estimated. Although George McGovern had the greatest support under the present system, with George Wallace tied for second, Muskie would almost certainly have won under approval voting and Humphrey would have finished well ahead of Wallace.

A more recent example of the probable effect of approval voting comes from the 1980 Republican Presidential primary in New Hampshire. This primary is particularly important because it is the first in the nation. Approval vote estimates can be based on the answer to a question posed by ABC News in an election day exit poll: "Which candidates in this election do you consider acceptable?" Howard Baker more than tripled his total under approval voting and came in second (ahead of George Bush), although he had finished a poor third (behind Reagan and Bush) under the present system. With such a showing under approval voting he might have stayed in the race much longer, rather than dropping out, as he did, within a few days.

In both primary situations illustrated, approval voting tended to select a candidate who held a more moderate position and may have enjoyed wider support. Bills have been introduced into the legislatures of three states (NH, VT, and NY) to implement approval voting in presidential primaries.

Recently a growing number of political scientists and mathematicians have sought to meld aspects of their disciplines to address this fundamental question of democracy: How should the winner be chosen in an election involving more than two candidates? The political objectives are diverse: e.g., the winner should emerge with a wide mandate; s/he should be preferred to each other candidate by a majority; and loopholes whereby



Merrill

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Approval voting would be simple to implement on existing voting machines.

voters can advance their own interests by voting other than for their true preferences should be avoided.

Unfortunately, the present system (called plurality voting), the one most commonly used in this country, is singularly deficient in meeting these criteria. Many alternatives have been proposed — such as permitting voters to rank the candidates or employing a successive elimination or, as we have seen, approval voting. Considerable new insight concerning the advisability of using these systems can be obtained through a mathematical approach.

Primary elections for governors and mayors present the same problem. In a large field, the winner of the primary often receives far less than 50 percent of the vote. In 1978, Richard Thornburgh won the Republican primary for governor of Pennsylvania with 33 percent of the vote; in 1977 Edward Koch led the first Democratic primary for Mayor of New York City with only 20 percent of the vote (followed by Mario Cuomo, Abraham Beame, and Bella Abzug who each received between 17 and 19%). A few weeks ago Harold Washington won the Chicago Democratic primary with 36% (to 34% for Jane Byrne and 30% for Richard Daley).

Fortunately, New York City has a runoff between the top two candidates (Chicago does not). But a runoff is more expensive and time consuming than approval voting. It would be impractical for state by state Presidential primaries in a campaign season already too long.

More fundamentally, a runoff may overlook a compromise candidate who stands third (or fourth) on the first ballot. Perhaps Koch and Washington were the strongest candidates in their respective contests, but even use of a runoff is not convincing evidence when more than two candidates receive about equal votes.

A close three-way race without runoff such as the recent Democratic primary in Chicago leads to a winner with no strong mandate even from his own party. This circumstance in Chicago permitted other factors to produce a bitter and divisive campaign. Regardless of who was elected, drawing the polarized camps back together will be difficult.

In contrast, approval voting tends to lead the selection of a candidate who enjoys approval by a large proportion of the electorate and who can, if elected, serve with a wider mandate. It benefits centrist candidates, without denying voters the opportunity to express their support for more extremist candidates. It lessens the tendency for primary candidates with similar platforms to attack each other, since, under approval voting, they can share support from the same voters.

Voting in a way that does not reflect one's true preference is discouraged under approval voting. In contrast, under the present system, a voter may feel forced to desert a favorite who has little chance of winning to avoid wasting his vote. A common misconception, under approval voting, is that a voter could increase his impact by voting for more candidates. That this is not true can be

seen by noting that if I vote for all the candidates, I simply add one vote to the tally for every candidate, but have no effect on their relative standings. Hence such a vote has no effect on the choice of the winner. In fact, it can be shown mathematically that to have the greatest impact, I should on the average vote for about half the candidates, because I thereby make the most possible distinctions between candidates approved and not approved. It would still be appropriate to bullet vote for a single candidate if I prefer one candidate strongly to the others. Or I might vote for all but one, if there is one candidate whom I strongly disapprove relative to the others.

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HOW THE 1996 ELECTION CAN YIELD A PRESIDENTIAL MANDATE

by Samuel Merrill, III **

The 1992 and the upcoming 1996 presidential campaigns prove independent candidates are capable of attracting a sizable share of the vote, in addition to the Democratic and Republican nominees.

In three-way races, it's possible that all candidates could get below 40 percent of the popular vote. The widening choice of presidential candidates strongly suggests the need to change our voting system so the objective of majority support can be obtained more simply.

Clearly, receiving less than 40 percent of the popular vote compromises the mandate of the winner, since most voters would have voted for someone else.

Voters face a dilemma: should they vote for a preferred candidate unlikely to win or switch to a major contender to avoid "wasting" their vote. A candidate representing the political center could be squeezed by candidates on the right and left.

Under the plurality procedure commonly used in the United States, the candidate with the most votes wins regardless of how far short of a majority. This procedure determines the electoral vote in each state. Its pitfalls would remain even if the Electoral College were abolished.

Plurality has been used so long that we tend to assume that there are no alternatives. In fact, most other industrialized democracies use other methods.

The runoff, for example, pits the top two vote-getters in a first round of voting against each other in a second ballot. Currently used for election of the president in France and Poland and for non-presidential primaries in most U.S. southern states, this added requirement ensures that the eventual winner has majority support against at least one opponent. Successive elimination of only one candidate at a time selects the majority and minority leaders in the U.S. Congress. A similar method has

elected the Australian Lower House for 75 years.

Approval voting is another method we should consider. It's already used to elect the officers of a number of professional societies, including the Institute of Electrical and Electronics Engineers and the American Statistical Association. Under this procedure, each voter can vote for one, two, three, or any number of candidates. In effect, voters consider each candidate one-by-one and cast votes for those they approve but not for those whom they don't approve. The winner is the one approved by the most voters.

Under approval voting the winner is likely to gain support from a majority or near majority of the voters even in a crowded field and thus establish a wider mandate to govern or--in primary elections--demonstrate the broad support needed to contest the general election.

Approval voting benefits centrist candidates who tend to have a broader appeal while not denying voters the opportunity to express support for more extreme candidates. It also reduces damaging infighting between like-minded candidates since, under approval voting, they need to share support from the same voters.

In a recent study conducted by Steven Brams of New York University and myself, we projected the likely outcome had approval voting been used in the three-cornered 1992 presidential election. Based on polling data from the American National Election Study which asks voters to score each candidate on a scale from 0 to 100, we projected approval voting totals using three different assumptions. The results consistently indicate that Bill Clinton would have received approvals from about 55 percent, George Bush from about 50 percent, and Ross Perot from about 40 percent. Thus Clinton would have attained majority support---enhancing his mandate---but his margin over Bush would have been unchanged.

Perot would have doubled the 19 percent he received under plurality because some Bush and especially Clinton supporters also approved Perot but opted to cast their vote for one of the

main contenders. Under approval voting, Perot's total would thus have more accurately reflected his true support. Yet his chances of actually winning might have been reduced because voters deciding to cast a vote for Perot would not have had to switch away from Clinton or Bush but could support both. In light of the high disapproval rate which Perot faced, he would have been hard-pressed to climb past Clinton's 55 percent approval.

Approval voting would be simple to implement on existing voting machines and could be instituted without a constitutional amendment. Despite its simplicity, it would overcome many of the shortcomings of the current plurality system, enhancing the likelihood that the elected president enjoy a wide mandate.

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** Samuel Merrill, III is professor of mathematics and computer science at Wilkes University, Wilkes-Barre, PA; and author of the book, *Making Multicandidate Elections More Democratic*.

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DICK JONES COMMUNICATIONS
P.O. Box 497
Dalton, PA 18414
(717) 563-1150
FAX: (717) 563-2806
Internet: 71700.3343@compuserve.com

FAX TRANSMISSION

TO: Mark Davis, PR Office
FROM: Steve Infanti
DATE: November 9, 1995
=====

This fax is 4 page(s) including this cover sheet.

Here's an updated copy of Merrill's op-ed which reflects the changes in the Powell candidacy. The old version went out on Scripps-Howard last week. I thought you might want to deliver this version to the Scranton and Wilkes-Barre newspapers

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by Samuel Merrill, III **

The 1992 and the upcoming 1996 presidential campaigns prove independent candidates are capable of attracting a sizable share of the vote, in addition to the Democratic and Republican nominees.

In three-way races, it's possible that all candidates could get below 40 percent of the popular vote. The widening choice of presidential candidates strongly suggests the need to change our voting system so the objective of majority support can be obtained more simply.

Clearly, receiving less than 40 percent of the popular vote compromises the mandate of the winner, since most voters would have voted for someone else.

Voters face a dilemma: should they vote for a preferred candidate unlikely to win or switch to a major contender to avoid "wasting" their vote. A candidate representing the political center could be squeezed by candidates on the right and left.

Under the plurality procedure commonly used in the United States, the candidate with the most votes wins regardless of how far short of a majority. This procedure determines the electoral vote in each state. Its pitfalls would remain even if the Electoral College were abolished.

Plurality has been used so long that we tend to assume that there are no alternatives. In fact, most other industrialized democracies use other methods.

The runoff, for example, pits the top two vote-getters in a first round of voting against each other in a second ballot. Currently used for election of the president in France and Poland and for non-presidential primaries in most U.S. southern states, this added requirement ensures that the eventual winner has majority support against at least one opponent. Successive elimination of only one candidate at a time selects the majority and minority leaders in the U.S. Congress. A similar method has

elected the Australian Lower House for 75 years.

Approval voting is another method we should consider. It's already used to elect the officers of a number of professional societies, including the Institute of Electrical and Electronics Engineers and the American Statistical Association. Under this procedure, each voter can vote for one, two, three, or any number of candidates. In effect, voters consider each candidate one-by-one and cast votes for those they approve but not for those whom they don't approve. The winner is the one approved by the most voters.

Under approval voting the winner is likely to gain support from a majority or near majority of the voters even in a crowded field and thus establish a wider mandate to govern or--in primary elections--demonstrate the broad support needed to contest the general election.

Approval voting benefits centrist candidates who tend to have a broader appeal while not denying voters the opportunity to express support for more extreme candidates. It also reduces damaging infighting between like-minded candidates since, under approval voting, they need to share support from the same voters.

In a recent study conducted by Steven Brams of New York University and myself, we projected the likely outcome had approval voting been used in the three-cornered 1992 presidential election. Based on polling data from the American National Election Study which asks voters to score each candidate on a scale from 0 to 100, we projected approval voting totals using three different assumptions. The results consistently indicate that Bill Clinton would have received approvals from about 55 percent, George Bush from about 50 percent, and Ross Perot from about 40 percent. Thus Clinton would have attained majority support--enhancing his mandate--but his margin over Bush would have been unchanged.

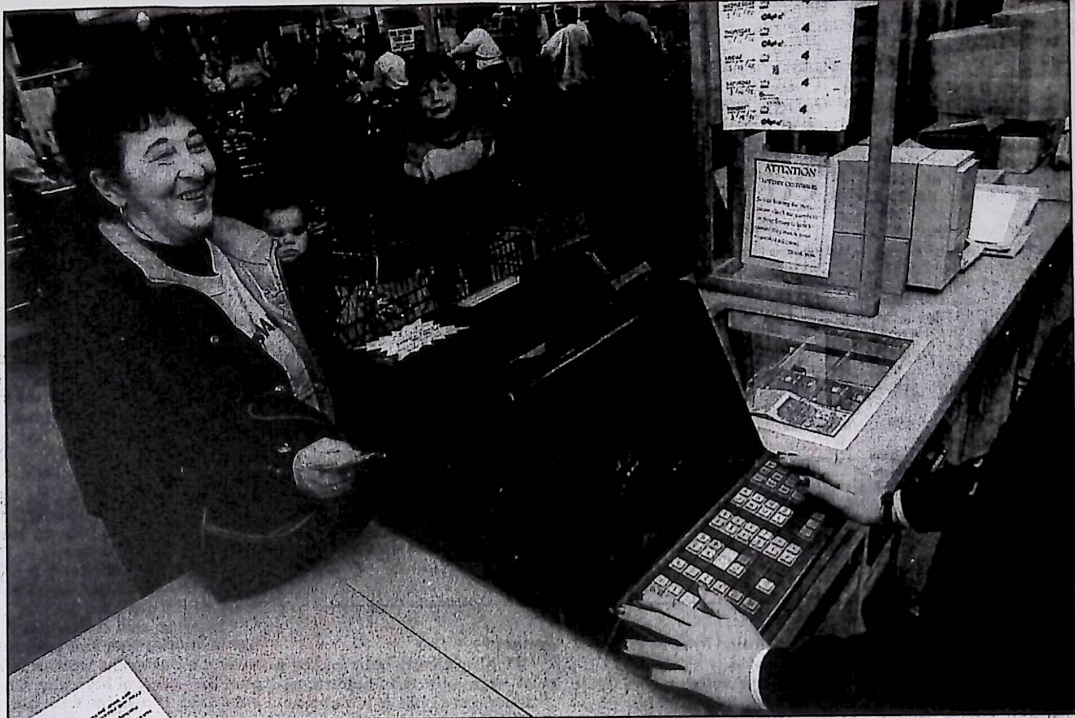
Perot would have doubled the 19 percent he received under plurality because some Bush and especially Clinton supporters also approved Perot but opted to cast their vote for one of the

main contenders. Under approval voting, Perot's total would thus have more accurately reflected his true support. Yet his chances of actually winning might have been reduced because voters deciding to cast a vote for Perot would not have had to switch away from Clinton or Bush but could support both. In light of the high disapproval rate which Perot faced, he would have been hard-pressed to climb past Clinton's 55 percent approval.

Approval voting would be simple to implement on existing voting machines and could be instituted without a constitutional amendment. Despite its simplicity, it would overcome many of the shortcomings of the current plurality system, enhancing the likelihood that the elected president enjoy a wide mandate.

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** Samuel Merrill, III is professor of mathematics and computer science at Wilkes University, Wilkes-Barre, PA; and author of the book, *Making Multicandidate Elections More Democratic*.



Arlene Spak of Bear Creek Township buys tickets at Wegmans in Wilkes-Barre Township for Saturday's \$40 million Keystone Jackpot.

Just the ticket?

'Lottery-winning' software stirs debate as \$40 million jackpot looms Saturday

By JENNIFER L. HENN
Times Leader Staff Writer

You tried birth dates, anniversaries and old football numbers, but as long as you can remember they never made you rich. Yet you don't give up.

Like many Pennsylvanians, you are chasing a \$40 million lottery dream with astronomical odds — 36.5 million to one. Someone has to win. Why can't it be you, and can you improve your chances?

Well, maybe, if you have \$79.95, a computer and faith in Gail Howard, "lottery expert."

Howard, of White Plains, N.Y., tries predicts winning lottery numbers, and claims to have helped 65 people — including a group from Scranton — win nearly \$100 million in lotteries across the United States in the past 10 years.

Her 9-year-old software program,

SMART LUCK, helps players track the results of every lottery in the United States and uses that information to compile probability charts, trends, reports and, most importantly, predictions.

At least one winner swears by the system, but experts and local lottery buffs aren't buying it.

As proof her system works, Howard offers Fred Gscheidle and 26 other members of the Fraternal Order of Eagles in Scranton, who won two jackpots using the software. Collectively they won more than \$432,000 in lotteries in Florida and Pennsylvania in 1990 and 1993.

Gscheidle swears by SMART LUCK. "It's a lot better than playing birthdays," he said. "I wouldn't have won without it."

Howard's predictions for Saturday's



TIMES LEADER PHOTOS/BOB ESPOSITO

A lottery clerk at Wegmans in Wilkes-Barre Township processes tickets for Saturday's \$40 million Keystone Jackpot.

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Lottery —

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Keystone Jackpot, currently the world's largest lottery pot, are sketchy. "It's not easy to predict for a game as new as the Keystone," she said. Still, numbers 2, 10, 16, 17, 20, 28 and 33 all look like possible winners to Howard.

Pennsylvania Lottery spokeswoman Sally Danyluk doubts whether Howard's software can improve a player's odds.

"She may do all kinds of calculations and such, but what happens during the drawing is completely unpredictable," Danyluk said. "Unless you're a psychic."

Wilkes University math professor Sam Merrill agrees. "I have no faith in this sort of thing given

that the numbers in a lottery are chosen at random," he said. "No mathematical system can predict lottery numbers."

Howard offers no guarantees.

"I could be 100 percent sure a number is going to hit and it just won't," she said. "That's the nature of the lottery. But it doesn't stop me from trying."

Others will keep trying too, although they're skeptical of Howard's system.

"I get so excited playing the lottery. I dream about what I'd do if I really won," said Ann Juan Moran, Wilkes-Barre, as she bought \$5 worth of tickets at Wegmans in Wilkes-Barre Township. "I'd take all the help I could get to win, but this sounds silly."

Moran said she regularly buys lottery tickets for several of the

state's games, especially the Keystone Jackpot, and always relies on her own admittedly unscientific system — combinations of her children's, grandchildren's and great-grandchildren's birthdays.

"That other system wouldn't work any better," Moran said. "It's too much math."

In Howard's opinion, there can never be too much math.

"It's what helps you play the game intelligently," said the former stock broker. "If you're lazy you can go for the quick picks, but I always encourage people to get involved in the process of analyzing the numbers and trends. That's when you see success."

Moran wasn't the only skeptic buying lottery tickets at Wegmans Tuesday. John Chapman, an elderly man from Ashley, said he

thought the software was "foolery."

"I pick the numbers that come to my head when I go buy the tickets," he said. "And I've got as good a chance at winning as anyone else."

Whether Wyoming Valley residents think they have a good chance or not, ticket sales are going up, up, up, said Wegmans lottery clerk Cindy Hilfiger, and though they aren't relying on Howard's software, many are trusting the computer.

At least half of Wegmans players let the lottery computer pick their numbers, Hilfiger said. "They just come in and say 'Give me a ticket for that big one,'" she said.

Jennifer L. Henn covers social issues. Call her at 829-7139.

SAMUEL MERRILL, III

Curriculum Vitae

OFFICE ADDRESS

Professor of Mathematics & Computer Science
Wilkes University
Wilkes-Barre, PA 18766
(717) 831-4837
E-mail: smerrill@wilkes1.wilkes.edu

HOME ADDRESS

11 Shaver Avenue
Shavertown, PA 18708
(717) 696-3753

PERSONAL: Born: October 27, 1939, New Orleans, LA
Married, two children

EDUCATION:

Ph.D.	Yale University	1965	Mathematics
M.S.	Pennsylvania State Univ.	1980	Statistics
M.A.	Yale University	1963	Mathematics
B.A.	Tulane University	1961	Mathematics

PROFESSIONAL EMPLOYMENT:

Wilkes University, Department of Mathematics and Computer Science: 1973-to present. Current rank: Professor. Chair of the Department 1988-90.

University of Washington - Seattle, Department of Biostatistics, Visiting Scholar: sabbatical, 1994-95.

Yale University School of Medicine, Division of Biostatistics, Dept. of Epidemiology and Public Health, Visiting Professor (statistical consulting unit): sabbatical, 1986-87.

Pennsylvania State University, Statistical Consulting Service (part-time): sabbatical, 1979-80.

University of Rochester, Department of Mathematics, Instructor/Asst. Professor: 1965-73.

CURRENT RESEARCH:

Mathematical and statistical modeling in political science (voting systems, voting behavior, and voting power)

Mathematical modeling in management science (arbitration)

Statistical analysis of clinical trials

PUBLICATIONS:

One book, 32 research articles, 4 expository articles (see attached list)

ORGANIZATIONS OUTSIDE UNIVERSITY

American Statistical Association, Mathematical Association of America, Public Choice Society

North Branch Friends Meeting (Quakers)

Project Vote

SAMUEL MERRILL, III

BOOK

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