

THE GREAT CENTRALIA COAL FIRE

How one small mining town went up in smoke

By Jeff Tietz

In 1962, outside the mining town of Centralia, Pennsylvania, some remnant coal in an exhausted mine tunnel caught fire. Centralia was an Appalachian valley town of 1,100 people. It had a streetcar, convent, dance hall, and VFW post, and the minor idiosyncratic shops of a tailor, shoemaker, electrician, druggist, and general practitioner. It was unimaginable at the time that the infant coal fire—a half mile away, eminently controllable, extremely lazy, and incapable of breaching the natural barriers that protected most of the town—would, ultimately, destroy Centralia.

Today Centralia's fourteen vestigial residents live in eight listingly narrow row houses dispersed across the vast, vaguely numinous vacancy opened up by the destruction of everything else. Greenbrier and mountain laurel and wintergreen have overgrown the faint remains of Centralia's homes and buildings. Stone curbs and concrete-cast front steps and the long-clotted mouths of storm drains are occasionally visible through a clamor of shock-troop vegetation. Dandelion and clover have

Jeff Tietz's last article for Harper's Magazine, "The Boy Who Loved Transit," appeared in the May 2002 issue.

colonized and expanded a median strip: the granular asphalt on either side now narrowly borders a lane of bloodroot and dogtooth violet and honeysuckle.



AMERICAN LEGION VETERANS MEMORIAL IN CENTRALIA

Centralia's valley is moist and nearly silent and framed by oak-black ridges; the streets that oriented its buildings all eventually dead-end in an onrush of new trees. Every year or so a bear runs through town.

The people in Centralia's eight estranged row houses were raised there; so were their parents and grandparents

and great-grandparents. They all want to die there. Established in 1866 in the anthracite region of eastern Pennsylvania, Centralia was a town of miners

descended from immigrant Polish and Welsh and Ukrainian and Irish and Russian miners. Hundreds of two-story brick row houses, each twelve feet wide, rose up the hillsides in strict parallel lines. The town had five churches, three Catholic and two Russian Orthodox, with plump, gilded domes. There was a polka dance hall. Irish Americans said "commode" instead of "toilet" and called movies "fill-ems."

Centralia's houses and lawns, amid the greened ruins, are in mint condition. Every winter the Hynoski brothers, Steve and Tommy, who own a coal-hauling business, plow the necessary streets. During Christmas they light a fir tree and illuminate a manger scene at the town's former main inter-

section. On Labor Day weekend, they host a party in the low, ersatz-modernist municipal building, whose ubiquitous twenty-year-old mildew can be felt in the lungs. The party is attended by everyone in town and many former residents heartbroken by their exile. The Hynoskis hire a polka DJ and the older people dance, and some-

times the floor fills with people doing the chicken polka (you flap your arms). Women cook blinis and pierogies; children play musical chairs.

At monthly town council meetings, which last less than fifteen minutes and concern the payment of tiny fees, Mayor Lamar Mervine—eighty-seven, hearing impaired, occupying his post by default and with extreme reluctance, and having for decades ignored the DIAGONAL PARKING ONLY sign in front of his unflanked row house—remains mute until he is asked to give the mayor's report. When he understands the question, he says, "No report."

Joe Moyer, a retired miner with a truculent silver crew cut who generally spends his mornings training homing pigeons for racing and his afternoons breathing oxygen from a tank, has appointed himself town constable. He patrols Centralia in a black Mercury. Several years ago he noticed Bernie Darrah reclining motionless in his easy chair in front of his living-room window. Darrah, a widower, had died in the presence of no one. One of Moyer's self-assumed duties is seeking out the unnoticed dead.

Moyer also takes care of the thousands of interred, unlocking the gates of Centralia's biggest cemetery, St. Ignatius, every morning, and locking them at night. When Moyer is away gambling with his girlfriend in At-

lantic City, John Lokitis, who lives a block away on West Park Street, becomes the gatekeeper. Lokitis fanatically grooms the accidental shrine opposite his house: a broad park lawn and American Legion Veterans' memorial. Lokitis is thirty-three. He grew up on East Park, amid four generations of his family. Now, like Joe Moyer, he is the only person living on his street: Bernie Darrah was his final neighbor.

Coal fires require oxygen, an absence of moisture, and fuel. The rubbly scattershot nature of residual coal in defunct mines, the general scarcity of subterranean oxygen, and the general prevalence of underground water make coal fires fantastically lethargic, although they are capable of rare quicksilver dashes when the relevant variables harmonize.* But coal fires are also so absurdly intransigent as to seem almost

* Geometric form is one of the most important variables, because the ratio of surface area to flammable mass determines the combustion rate of a given fuel. Oil, for example, is usually burned after dispersion through nozzles: very fine droplets have a relatively huge surface area. The ragged chunkiness of old-mine coal means that its oxygen-exposed surface is, relatively, very small. A seamless wall of coal will not burn, though it will radiate combustible gases in the presence of sufficient heat and oxygen.

immortal: to survive as embers in chrysalis, coal fires need very little oxygen—a seventh of atmospheric content. Extensive mining and raucous topography create infinite brooks and runnels and fluviations of underground air. By disintegrating mining infrastructures and desiccating ceilings of soil and rock, coal fires cause subsidence, which broadly exposes them to surface air. They can breathe wherever veins outcrop; they can spread by sending explosive gases far in advance of their flames. Their heat, which can reach 12,000 degrees, is intensely dehydrating—it conditions fuel long before consumption and simultaneously elicits highly flammable gases. In warm, airy circumstances, coal spontaneously combusts. The coal beneath Burning Mountain, in Australia, has been on fire for 2,000 years.

The genesis of the Centralia fire was some burning trash in a municipal dump that could have been extinguished with a few shovelfuls of sand. The dump was in an abandoned stripping pit that cut into older deep-mine workings. The mouths of those workings hadn't all been filled, and in May of 1962 the trash fire crawled into a mine tunnel. When the trash-pit fire was discovered, the Borough of Centralia (BOC) and Township of Conyngham (TOC) spent a month fighting over whose problem it was. TOC finally browbeat its way to victory. BOC called the Pennsylvania Department of Mines and Mineral Industries (DMMI), whose deputy secretary reported the fire to the research director of DMMI's Anthracite Division (DMMI-AD), who called the U.S. Bureau of Mines (BOM).

On July 26, 1962, BOM and DMMI personnel visited the site and discussed the situation. On July 30, those personnel and BOC representatives discussed the situation. According to a report later released by BOM, "It was recognized that the situation was serious and required immediate action." On August 6, the aforementioned parties met and talked about the fire. "The consensus," BOM's report states, "was that the fire must be extinguished as soon as possible as it appeared that the fire was spreading rapidly." Mandatory

ACRONYM KEY

ARC	Appalachian Regional Commission (federal)
BOC	Borough of Centralia
BOM	Bureau of Mines (federal)
CCAGCMF	Concerned Citizens Action Group against the Centralia Mine Fire
CCRA	Columbia County Redevelopment Authority
COC	County of Columbia
DEH	Department of Health (state)
DEP	Department of Environmental Protection (state)
DER	Department of Environmental Resources (state)
DMMI	Department of Mines and Mineral Industries (state)
DMMI-AD	Department of Mines and Mineral Industries, Anthracite Division
DOI	Department of the Interior (federal)
OSM	Office of Surface Mining (federal)
PDCA-DPD	Pennsylvania Department of Community Affairs, disaster programs division
PEMA	Pennsylvania Emergency Management Agency
RSBC	Residents to Save the Borough of Centralia
TOC	Township of Conyngham

protocols would delay BOM's participation for at least three months, so its deputy secretary suggested to DMMI's secretary that DMMI initiate the project. The deputy secretary and secretary and their deputies elected to rip open the burning tunnel and fill it with earth.

It was impossible to calculate the fire's speed, but DMMI was certain it hadn't gone far, and the standard practice of exploratory drilling was expensive. After following procedure and soliciting project bids, DMMI ordered blind excavation from the trash pit outward. At the end of August, work began. Overtime and weekend work were not permitted; holiday stoppages were obligatory. Actually, the fire had gone pretty far. It outpaced the sluggish, serial work of drilling, blasting, and excavation, except perhaps early on, but then came Labor Day and everybody went home for five days. At the end of October, work stopped, because DMMI had exhausted its allotted funds. Oxygen exposure had quickened the fire.

In late November, BOM and DMMI drilled eighty boreholes through which a noncombustible slurry could be injected. The slurry was supposed to fill mine voids and suffocate the fire. DMMI meant to ensure that the boreholes were drilled ahead of the fire, but it didn't. Many were drilled right into the fire, an action that, according to a DMMI inspector, "created, like, a volcano. And oh boy, when that busted, did that shake things and make a noise! It was red hot mad!"

DMMI worried that its allocation of slurry was insufficient—engineers could only roughly estimate the volume of the mine voids—and it wanted to get some slurry into every one of its mandated boreholes, so its inspectors forbid workers to completely fill the space beneath any individual borehole. That gave the fire eighty potential escape hatches. For some reason the boreholes were never capped, and every unsealed hole became a little bellows. By March of 1963, funds had again been exhausted. "No degree of

control," BOM's report stated, "had been achieved."

While the agencies deliberated and solicited new proposals, the fire burned for five months. Work on a containment trench began in July of 1963, but the burning tunnel was unexpectedly hot when workers hit it. Digging ten feet beyond the fire's terminus to cut it off required devi-



A STEAMING PIT, OUTSIDE OF TOWN

ating from the sanctioned work plan, which DMMI supervisors would not allow. Work halted. The fire, again rejuvenated through sustained oxygenation, burned for three and a half years.

During this time, Dr. H. Beecher Charmbury, head of DMMI, had been attending to politically expedient projects and waiting for Congress to create the Appalachian Regional Commission (ARC), which would be responsible for extinguishing mine fires. In June of 1965, BOM and DMMI submitted a new proposal to ARC. Thirteen months later, the required Contribution Contract had been signed by ARC, DMMI, BOM, and the County of Columbia (COC), in which BOC is located. Bids were advertised on July 21, 1966. When BOM's standard 16 percent planning and engineering fee was added to the low bid, the project cost exceeded the ARC-authorized

amount. This necessitated an amendment to the Contribution Contract, which ARC granted on September 12. Several unforeseen obstacles delayed the start of work until May of 1967.

The enlarged fire almost immediately exhausted the project's allotment of slurry. Dr. H. Beecher Charmbury promised to authorize the purchase of more slurry, but he didn't. Two years passed. Since anthracite fires are too resourceful to be fully contained by borehole flushing, which restricts but can't totally sever access to fuel and oxygen, a fence of boreholes filled with noncombustible fly ash was drilled, and a small trench was dug to complement it. Test drilling, however, soon found that 40 percent of the boreholes did not provide an effective barrier: the settling of the fly ash had goaded the fire into jumping the fence. The trench project ran out of money just as it drew abreast of the fire, causing a young BOM engineer named John Rosella to cry. Funds for corrective work were requested, and two years later ARC gave its approval. The money arrived in February of 1973. Another

borehole fence was completed on December 14.

By late 1975, the fire's reconnoitering gases had stolen through many of the borehole barriers; the fire flowered in behind them. The boreholes had either been incompletely filled or left vulnerable by fly-ash settlement. BOC convinced ARC to dig a new trench, but then picked a fight with COC over the purchase and relocation of several homes in the trench's path. The differences were not reconcilable, and the coal fire finally, fitfully sidled up to Centralia.

In the late fall of 1979, David Lamb, owner of the Speed Spot motorcycle shop, noticed that he couldn't light his coal furnace: carbon monoxide from ambient coal combustion had displaced most of the oxygen in his basement. John Coddington's son Joseph discovered that the basement walls of the family home were hot.

Coddington measured them at 180 degrees, and then checked the underground storage tanks of his gas station. When he uncapped them, it was like someone spitting out rancid milk. A fume crater subsided into existence in front of his station. Workers from Pennsylvania's Department of Environmental Protection (DEP) dumped earth into the crater, which forced gusts of carbon monoxide into adjacent homes, dizzying dozens of people and mythically killing an ornamental canary in its cage. The state withdrew from the scene.

In the impact zone, windows were kept open, snow vanished according to the contours of the fire's intensity, water ran hot from cold-water taps, and steam from heated asphalt obscured roads. John Coddington passed out in his sleep and was taken to a hospital, where doctors pumped oxygen into his lungs and he thanked God for sparing his life. David Lamb's asthmatic daughter was hospitalized for oxygen deprivation.

A year passed without government aid. Then a twelve-year-old boy named Todd Domboski saw smoke rising in thin myriad rivulets from his grandmother's yard. The smoke signals exerted an irresistible attractive force on the boy: as he approached them he dropped into the earth, which had just metamorphosed into a 135-degree sinkhole full of carbon monoxide. He grabbed a tree root and hung for several infinite moments, until his cousin, according to a newspaper account, "yanked [him] back from hell." He wasn't injured, but two months later his mother, Florence, was still trying to "keep him calm with medication."

The Domboski affair prompted the state to install gas detectors with alarms that sounded like canaries. In certain homes, the alarms could not be heard by residents in their bedrooms. The state set up an office in a trailer and staffed it with DEP inspectors, who hesitated to attribute the gas infiltration to the fire. One inspector told David Lamb that the gases responsible for his daughter's hospitalization came from sewer-line leakage. DEP officials told Joan Girolami that her carbon monoxide came from cigarette smoking in the

basement and running her car in the garage, but she didn't smoke in the basement and she didn't have a car. When Joe Moyer heard his alarm and called the DEP trailer, a group of inspectors arrived, said the problem was his coal furnace, which he knew to be sound, and sat down in his kitchen to have a smoke. Several inspectors were later fired when they inadvertently stuck their sewage line into a pit obliquely connected to one of the fire's shoots.

IN THE IMPACT ZONE, SNOW VANISHED,
WATER RAN HOT FROM COLD-WATER
TAPS, AND STEAM FROM HEATED
ASPHALT OBSCURED ROADS

Six months after Todd Domboski's descent—David Lamb's daughter had been hospitalized twice more for oxygen deprivation—the Pennsylvania Emergency Management Agency (PEMA) provided temporary housing for, it said, everyone in the fire zone, which was not everyone. The many afflicted people who didn't get housing continued to open their windows when gas levels spiked, except when they couldn't hear their alarms.

In August of 1981, Tony and Mary Androtti stood outside the refuge of their PEMA-issue mobile home, one in a row of mobile homes in an abandoned schoolyard. At their feet was a pot of dying marigolds. They had planted a small American flag in their implicit front yard. "Every man's home is his castle, and now these are ours," Mr. Androtti said, cinematically, when a reporter asked him about his recent experience. Healthy flower beds surrounded his condemned home in the fire zone. He went back to water them, and mow the lawn, every day. He looked down at the surrogate marigolds, aridly genuflecting in their pot. "I guess I neglected them," he said.

Coverage was regional and national and international. People in the fire zone were being interviewed five times a day. "My God, what are we to do?" Todd Domboski's grandmother kept

asking. The question became a subhead in a feature story and was subsequently amplified by national syndication. In the papers, the fire was a "smouldering . . . inferno" (*London Times*) with a "thousand-degree" heart (*Los Angeles Times*) that was creeping "along beneath Centralia . . . sending foul gases to the surface" (*Columbus Dispatch*). "The flames lick[ed] the ribs of the earth under Centralia" (*Toronto Star*). At any time the fire "might cause the earth to open up and swallow the town" (*Milwaukee Journal Sentinel*). "Shroud[ing] the Centralia region with smoke" (*New York Times*) and "belching smoke into the air, [the fire] . . . had all but destroyed the little town" (*Los Angeles Times*), which looked like "some primordial planet where the earth belches noxious gases" (*New York Times*). The *Toronto Star* noted that Centralia, which had "literally gone to blazes," made a "neat side trip for Canadians heading to Florida."

In late 1981, PEMA and the U.S. Department of the Interior (DOI) agreed on a buyout plan for twenty-seven homes in the fire zone. As if the fire were incidental, the buyout offers took fire depreciation into account, and the delineation of the relocation zone excluded many people who were directly experiencing, or fresh from directly experiencing, the fire's effects: inclusion in the buyout plan became the working definition of actionable suffering.

Joan Girolami—thirty-nine, daughter of a miner who had lost his arm in the mines, periodically gas-drunk during the fire's first foray into town, and unable to hear her gas detector from her bedroom—had been excluded. She and several other oxygen-deprived, relocation-excluded citizens affixed red ribbons—symbols of the fire's domination—to their porches. Girolami founded Concerned Citizens Action Group Against the Centralia Mine Fire (CCAGCMF). David Lamb, whose buyout offer was far below pre-fire market value and whose marriage had begun to dissolve, immediately became active in CCAGCMF. Girolami assumed the vice presidency, and for president chose Thomas Larkin.

Larkin, forty-two, had been away from Centralia for twenty years, several of which he had spent in a Catholic seminary, although he never became a priest. He had come back three years earlier to care for his dying mother. Her house, in which he had been born and raised, was remote from and immune to the fire. After his mother died, he told a reporter, he suddenly woke up to the fire. "I started to walk around the town, and I saw steam coming up, pipes in the middle of the street here and steam coming up there, and I thought, Jeez, what the hell is going on here?"

Tall and slender and mustachioed, Larkin owned more than 300 illustrations and miniatures of elephants. He listened to classical music and read H. P. Lovecraft and used Latin phrases at critical moments in conversations. He worked as a short-order cook at Snyder's Restaurant in the neighboring town of Ashland; after interviewing Larkin, a reporter came away with the impression that Snyder's was "universally acknowledged as the best eating place around." The terms "universally acknowledged," "best," "eating place," and "around" were all controversial.

"One would think," Larkin said in another interview, "that a crisis situation like this would bring the people together and make the people stand up and be counted, as it were. To speak with one voice and say, Look, it's gone on long enough, we want an end to this. But it has not. And I cannot fathom why. I think it's that many people may suffer from what might be called the ostrich syndrome."

Lamb, Larkin, and Girolami began appearing on local television. Stressing the fire's predatory unpredictability, they argued for total relocation, or at least a greatly expanded program. "Someone's going to have to die here before we get the help we need," Girolami said. "You never know," said Lamb. "Any day a house and everybody in it could sink out of sight." Larkin said, "I'm sure part of the town will have to be destroyed."

CCAGCMF came up with a plan, leaked but never realized, to sue the federal government. It organized small protests in Harrisburg. Larkin erected a sign in front of his house: THE U.S. DEPT. OF THE INTERIOR PLAYS NERO WHILE CENTRALIA BURNS. After alerting the media, Larkin, Lamb, and Girolami traveled to Washington and gave a desk set of anthracite coal to each of their congressional representatives. On *Good Morning, America*, Larkin explained about fiery wrath; beside him little Todd Domboski trembled and nodded his big-eyed head. When *People* came to town, Larkin put on a chef's hat and apron, cracked an egg into a frying pan, and steamed it over a fire-vent fissure for the magazine's photographer. After about fifteen minutes, the yolk firmed up.

These activities, Larkin admitted, were socially costly: "I have relatives in this town who don't talk to me

worth talking about. Larkin was in it "for the publicity, for the notoriety. He's been catapulted from obscurity. I'm not talking about Thom, because he makes me so mad—his theatrics, for one thing . . ." "It's too bad," Eileen Lamb said of the conflict, shortly before she and her husband broke up. "People here were so close, if you sneezed at St. Ignatius they'd say God bless you at Duffy's."

Despite the discord, most of Centralia's miners were unconcerned. They could visualize the topography of the region's anthracite veins. The fire was confined to a six-foot-thick sheet of coal, the Buck Mountain bed, which undulates through the region in quick-veering synclines and anticlines. The fire was mainly burning in an access tunnel called a gangway, which had been cut east-west into the hill that rises to Centralia's southern border. The coal bed, following the hill's contour, ascends south toward the hilltop and

out of Centralia, and descends north into the water table, which shielded about two thirds of the town. The network of tunnels around the gangway was largely unmapped, and the deeper tunnels underlay dozens of homes, but the miners who had worked in the tunnel network thought the fire's ventilation system made its spread from the gangway very unlikely.

Almost everyone in town thought the water table would permanently halt the fire, and many understood the ventilation dynamics of the mine workings. The combustion itself was inconspicuous. The fire's sheer slowness made subsidence rare, and the width of the coal bed kept it modest: when the earth above a six-foot vein collapses, it has six feet in which to fall, and the sharp angling of the Buck vein diminished the effect. Slender smoke in the fire zone was winkingly visible to the rest of the town; most people could smell the silent fire only when the wind was right, and there was no visible flame. For the small minority that supplied CCAGCMF's membership, which peaked at twenty-five, life could be



MAYOR LAMAR MERVINE

anymore, which hurts, it hurts tremendously." Centralia's mayor, John Wondoloski, said CCAGCMF's members just wanted to sell their homes at high prices. Helen Womer, who lived closer to the fire than anyone and called it "overrated," said CCAGCMF was just "a vehicle for Girolami to ride out of town in." Its members, she said, were not even

horrific; for the vast majority, the fire was a vagrant inconvenience flaring in a corral.

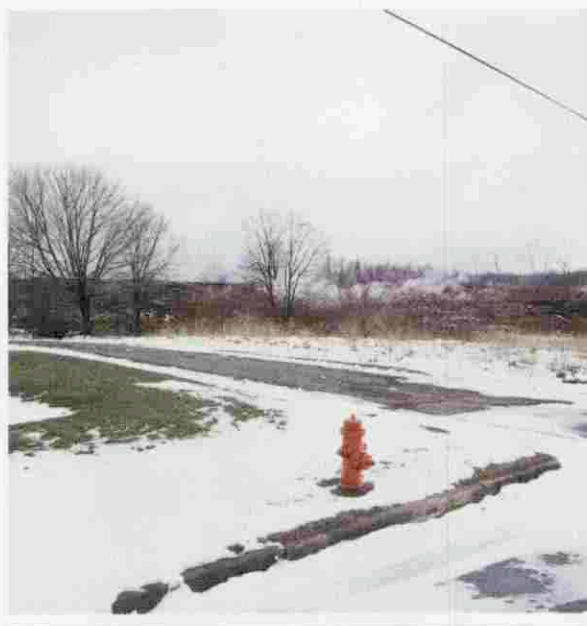
We have no plans to fight the fire any further," the U.S. Office of Surface Mining (OSM) announced around the same time in 1981 that PEMA erected its emergency-housing trailers. "Our experts believe it will burn itself out." "There is not a threat to health and safety," said Secretary of the Interior James G. Watt. "No Centralia home," said Dr. James Fox of the Pennsylvania Department of Health (DEH), "has ever had a dangerous level of gases." Several months later the fire made international headlines by exploding out of a rock face east of town. "If you come at night the whole area glows," a volunteer firefighter said. "Blue flame shoots out." The temperature of the radiating cliffside was 1,200 degrees. "There's no danger," said Paul Farley, a district manager for OSM. "The only danger might be from people wandering in, looking around, not having an understanding of where to walk."

These pronouncements, which received heavy coverage and provoked CCAGCMF condemnation, made Governor Richard Thornburg and Centralia's congressional representatives uncomfortable, although within weeks a heat-provoked landslide had ended the fire's first and only surface appearance. Representative James L. Nelligan (R.) requested a nonbinding referendum on further relocation; he wanted to know "how far to go in seeking help for the community." Written by CCAGCMF members, the referendum basically asked whether people affected by the fire should receive government help. Compensating victims seemed like basic compassion, and the referendum received overwhelming support.

Press coverage transformed this vote into the final plea of a burning people. For years officials cited it as a collective desire they could not ignore. Governor Thornburg said the vote was "a first step in the battle against this fire." While the story

was still fresh, Pennsylvania's politicians shoved OSM into a collaboration with DEP on a new borehole project. "By the spring of '83," said General DeWitt Smith, of PEMA, "we will know who the enemy is, where he is, how big he is, and what kind of danger he poses."

But OSM spent several years fighting DEP over money, during which time no action was taken, and then withdrew from the project pending the results of a fire-assessment study it had commissioned. (BOM's 1980 report on the fire came with substantial cost estimates, and any practical wisdom it might have contained was immaterial to OSM, because no oracle could foretell the success of its recommendations, and any expensive



A LONE REHYDRANT

failure might inspire big coal producers to force the repeal of the tax on which OSM depended.)

Meanwhile, in the referendum's wake, Reverend Anthony McGinley founded Residents to Save the Borough of Centralia (RSBC). Its mission was to prevent the relocation advocated by CCAGCMF and preserve the municipal government. At its rallies, RSBC's "Set Centralia Free!" chant was accompanied by church bells and the siren of the town ambulance. Problems developed between RSBC and CCAGCMF. "All we want," Reverend

McGinley soon felt moved to say, "is not to be harassed." But sympathy for RSBC was general and ardent. Thom Larkin received death threats and a succession of heavy-breathing phone calls, developed a duodenal ulcer, and resigned the presidency of CCAGCMF. He was replaced by a Catholic nun and community organizer named Sister Honor Murphy.

OSM had hired a small engineering firm called GAI Consultants. GAI rejected almost all of BOM's conclusions. BOM's 110-page, six-month study was the collaboration of a score of mining geologists, physicists, and chemists. It contained pretty much everything the Bureau of Mines, which was founded in 1910, had ever learned about anthracite fires.* Its authors concluded that two thirds of Centralia was protected by natural barriers, and estimated the cost of rehabilitating and shielding the exposed third at \$33 million.

GAI completed its study in a little over two months, during which time OSM bureaucrats bearing caveats and qualifications visited incessantly. Through its "visual examination of core samples," GAI determined that the fire, despite many intervening feet of unfissured rock, had spread to several shallower coal beds and thus could surmount Centralia's water table. The authors of the BOM report looked at GAI's seared core samples and saw natural discoloration. The entire borough, GAI said, would eventually perish if the fire was not completely extinguished, and that would cost more than half a billion dollars.

Relocation, Representative Frank

* Problems in the Control of the Centralia Mine Fire has ten tables; an appendix for surface-air sample data; three-dimensional structural models with surface overlays; stratigraphic cross-sections; computer-generated thermal contour maps; mine maps delineating tunnels, slopes, water levels, temperature areas, and phases of various firefighting projects; and multiple graphs, including three-dimensional temperature perspectives and anthracite-oxidation rates ("dimensionless") plotted against borehole temperature data.

Harrison (D.) said, "becomes something you've got to think about." Four months later, in November of 1983, Harrison was standing on the steps of the Capitol with Sister Honor Murphy and a dozen CCAGCMF members, announcing that Congress had appropriated \$42 million for the total relocation of Centralia. "This," Harrison said, "is being able to tell people who have been suffering for a generation that government does work." "I'm delirious with joy," Sister Murphy said. Several days later, at a borough council meeting delayed for thirty minutes by a Girl Scout party that ran long, the residents of Centralia gathered to hear John G. Carling, chief of the disaster programs division of the Pennsylvania Department of Community Affairs (PDCA-DPD), explain the relocation program and its administering organization, the Columbia County Redevelopment Authority (CCRA). "All you folks want," Carling began, "is to live a life of your own in a house of your choosing."

William Klink, CCRA's director, sent the homeowners of Centralia a first and final offer to sell, and set a deadline for acceptance. Those who refused would have a worthless home: the state had outlawed home sales in Centralia, and the fire had decimated property values. When the deadline passed, non-sellers were notified of their expulsion from the program. Several weeks later they were readmitted and offered a better deal. Klink's officials visited homes carrying contracts that would expire, they said, without an immediate signature. CCRA officials occasionally lied and said the contracts were not legally binding but would preserve the homeowner's future right to sell. Officials sometimes arrived with a contract in the evening, consented to a one-day extension, and returned at eight the next morning. Houses sold, absolute deadlines were extended and then extended again, people were expelled from the program and readmitted and given additional incentives, houses sold, and so on, through nearly ten cycles over a decade.

CCRA concentrated pressure on residents in the center of a block. If the

street could be cored, the people on either side of the breach would face at least a year of retrofitting: their homes would be extremely loud and poorly insulated and their basements unusable. If they opted out of this ordeal and moved, another set of neighbors would be subject to retrofitting. Many blocks capitulated before the state demolished anything.

Odd, protean regulations governed the relocation. For several years people

IN CENTRALIA, ABANDONED ROW
HOUSES, FUSED TO THEIR INHABITED
NEIGHBORS, STOOD DECOMPOSING
LIKE BAD TEETH

were required to relocate no less than seven miles, but no more than fourteen miles, from Centralia. Only one piece of land satisfied this criterion: a swamp, known as Mosquito Farm, next to a sewage-treatment plant. CCRA spent \$50,000 building elevated roads and walkways so that prospective residents could tour the site without sinking. Several years after the agency moved ten families into a new subdivision, it widened the boundaries of the fire zone and condemned their homes.

Sister Honor Murphy founded a contracting company to build houses for relocating Centralians. By 1986 most of Centralia's homes had been condemned. Before leaving, many residents performed the rite of entrusting their house keys to Molly Darrah, who kept them in a blue enamel box in her living-room breakfront until she died. Two Centralians who had spent years resisting the momentum of emigration died of heart attacks while moving out. An elderly retired miner received an eviction notice when his landlord decided to sell, and instead of complying shot his wife, drove to the top of the ridge south of town, and immolated himself in his car.

The fire was obediently following the gangway out of town. People who questioned its hazards were referred by Klink and Carling to the GAI report. "There's a new report!" Carling liked to tell people who mentioned the BOM study. Several years later he

said, "All the studies show that eventually the fire will threaten the whole town. Not today, maybe. But it's coming." State geologist Steve Jones said he "could not rule out" the wholesale consumption of Centralia by fire. Years of CCRA mailings threatened the condemnation of unsold property and warned of the great dangers of subsidence and gas infiltration. "I suspect this town is going to cease to function as a town," Klink said. "I don't see they have any other choice." He expected to finish the project by 1988.

In the papers, Centralians had become a stubborn breed with "stubborn offspring" who, despite a "vast," "huge," "gigantic," and "spreading" fire that had poisoned people with gases and tried to eat a child, "refused to acknowledge their impending doom." "The remaining old timers," reported the *Times* of London, "just laugh!"

An improvisational comedy troupe in Chicago named itself Centralia. They were inspired, member Kevin Scott told the *Chicago Sun-Times*, by "the remaining people there who have this undying hope in the face of the impending doom that surrounds them. So we do characters who are always hopeful." James Finney Boylan set a satiric novel, *The Planets*, in Centralia. In one scene skydiving Centralians find themselves beyond the reach of mine-fire smoke for the first time in their lives, and then gravity pulls them back to burning earth in which the bones of their buried pets are smoking.

In Centralia, abandoned row houses, fused to their inhabited neighbors, stood decomposing like bad teeth. CCRA neglected its condemned houses for four years. Rain and rats and mice and squirrels and birds got in; people from all over the region came to scavenge doorknobs and light fixtures and cabinets. Sometimes they came in the middle of the night. A campaign of calls to the governor's hotline finally forced CCRA to demolish the condemned homes. Entire blocks came down around single houses. Everyone who hoped that the exodus would stop lost hope. By 1992, when the state exercised its power of eminent domain and took possession of Centralia's land and

property, forty-four residences and eighty-four people remained.

CCRA planted grass on the empty lots and maintained the grass professionally for several years, during which time no buyout offers were accepted. Klink and Carling got impatient. CCRA, Carling told the residents of Centralia, was through being a good neighbor. Lawn maintenance ended. The Centralia borough council, on the advice of its lawyer, which it had retained to fight the state's eminent-domain claim, passed a resolution requiring property owners to keep their lawns below six inches. The noncompliance fine was set at a thousand dollars, per parcel, per day. The state, which had not consolidated its land, held 130 parcels.

The morning after CCRA received notification of the new ordinance, a fleet of tractors restored the vacant lots of Centralia to sleekness. According to residents, Klink told a local reporter that Centralia was trying to "cash in on the good will of the state." The lawn care lasted a few months, and then a judge denied Centralia's eminent-domain appeal. CCRA sent an eviction notice to every home. Centralia's residents didn't think CCRA wanted to drag resisting old people out of their homes in front of TV cameras—Klink recently said that "someone fairly high up" is worried about "political fallout," and that CCRA plans to let the old people die before it forcibly evicts anyone—but they also knew that \$4 million in monthly fines might overturn that restraint. The borough never enforced its ordinance. The grass turned to weeds, the weeds grew to heights of five feet, and Centralia filled with skunks and snakes and porcupines and rabbits and groundhogs and foxes and black-footed ferrets, and the prevalence of these creatures attracted bears.

One spring several years later, CCRA spent \$100,000 on wildflower seeds, sprayed herbicide over much of Centralia, and sowed the seeds several layers deep all over town. Several months later CCRA explained that the state was testing wildflower species for a median-strip beautification program. In the meantime, the residents of

Centralia found their valley inexplicably illuminated to its edges by poppies, daisies, black-eyed Susans, anemones, and azaleas.

Today the valley of Centralia is almost wholly green, but at long intervals the pointless streets, variously shattered by the upjut of weeds along faultlines, pass objects left behind during the exodus. While walking through the vacancy of town to the space across the street from the space her home had occupied, Sarah Yeager avoided contemplating these objects: a child's sound machine—a plastic ring activated, once, by buttons illustrating a pig, a horse, a rooster; a mobile home pierced from within by saplings; a gamut of shag rug, still rolled but signed by innumerable raindrops and torqued, as if it had been jettisoned from a truck; a Ford Escort knee-deep in bloodroot whose paint still throws off new dimes of sunlight.

Yeager was born and raised in Centralia, in a house her great-grandfather built before the coal companies put up row houses, but had to leave in 1999 because her roof leaked and she could no longer carry buckets of coal up the basement stairs. She was sixty-one, unmarried and without children, living on a fixed income. Because she no longer owned her home, she was ineligible for a home-improvement loan and legally barred from putting a trailer on her former property. So she took what the state offered and moved over the hill to the town of Aristes. By then most of her neighbors had died or been unable to afford essential repairs or grown terrified of being Centralia's final citizen, and the state's red symbols of imminent demolition had flashed on hundreds of surrounding doors. Her own row house, structurally incapable of standing alone, had been reinforced with H-beams and vibrated impressively as its immediate neighbors were prized meticulously away. For a decade she had solitarily occupied a plain of shorn foundations.

Sarah Yeager is a dainty and resolute person with a dropsical torso and insubstantial legs that dangle when she sits in a chair. She collects calendar Barbie Dolls and sells Centralia souvenirs for the benefit of the miniature municipal treasury. She tried, she

told me when I visited her in Aristes, to watch the demolition of her home: "I walked down the hill and sat on the curb. The construction fellas said, Sarah, what are you doing? I said, I wanna see it. They said, No, it's too heartbreaking. I left after the roof. And for two years afterward I used to walk down every other day and sit on the curb and just look at my house."

Yeager said she sometimes stopped in the center of town, where, across the street from the long-condemned Speed Spot, a wooden heart is nailed to a tree. Fastidiously painted to resemble a valentine, the heart says WE LOVE CENTRALIA. Beneath the heart is a congregational array of wooden benches and lawn chairs. Pete Kenenitz, exiled not long after Sarah Yeager, created the memorial. When I called him he suggested that we meet at the heart.

Kenenitz is a retired miner of seventy-three with nebulous eyes and limited mobility. He showed up with a large mass of chewing tobacco in his cheek; he wore red suspenders and a baseball cap that said CENTRALIA 125TH ANNIVERSARY. We sat under the heart. Two tourists in a white hatchback pulled up. One yelled to Kenenitz, "Can you tell me where the fire's located at, buddy? We been driving all over!" Out of habit, Kenenitz got up, worked his way over to the car, and directed them to the hillside southeast of town, where a swatch of heat devastation—bordered and punctured by new growth, and occupying about ten acres—smolders meekly: if the sun is obscured and you get close and look long enough, one or two up-tricklings of translucent smoke gradually become visible.

I asked Pete Kenenitz what Centralia had been like. "Best place in the Anthracite!" he said. "We had a goddamn grand thing of it here one time. It ain't that I wanted to go. I hadda go. The lawyer we had says, Keep patchin' your house up, keep patchin'. I said, I need a new furnace, I need a new roof. He says, Patch, patch." He grinned, and then pointed out his condemned, unaccompanied row house, several lots distant. Except for a thin coat of dilapidation, the house looked as if its owners had just left: in the yard, which showed the evaporating organization

of a gardener, a wooden bucket was wound above a stone well, and two fading, intact cars were aligned in front.

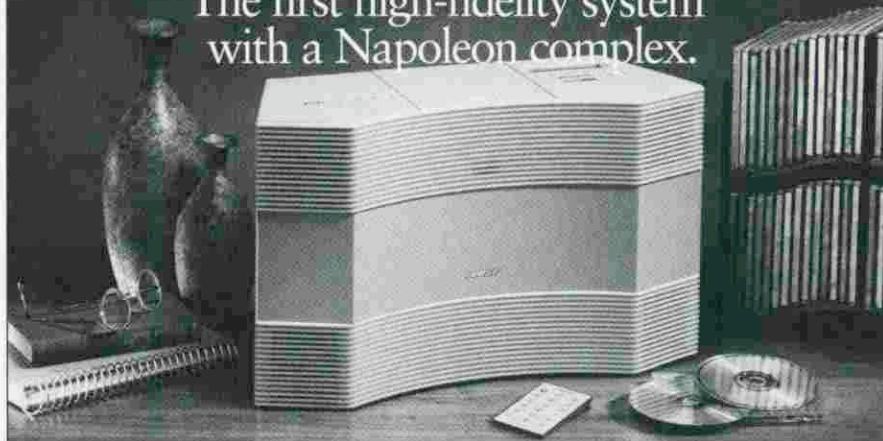
Kenenitz told me he walked around the house and looked into it sometimes. "But I cry too much," he said, "and then I say I'm never gonna do it again. I always go back, though." He paused. "There was a barroom right where we're sittin'," he said. "Ted Muldowney's bar. Know how many times I was in there? And the bar was right here too." He got up, took a few ruminative steps, and ran his hand along the bar top.

The exile Ray Reilly arrived. Every day he descends on the Centralia heart from Aristes, which he calls Centralia Heights, with several albums of Centralia photographs. When Reilly and Kenenitz encounter each other at the heart, which is several times a month, they look at the photographs. I introduced myself; Reilly handed us each a thick album. Kenenitz opened his album and his attention immediately contracted. He began to say emphatic things to himself, in a low voice.

Reilly, a lurching overbuilt guy in a CENTRALIA FIRE DEPARTMENT T-shirt of his own design, is a retired heavy-equipment operator and unilateral, self-sustaining talker. He's always reminding himself of something: the bureaucratic friction that kept him from receiving a Korean War medal, the capabilities of the Opec projector he used to sketch the Centralia firefighter onto his T-shirt, the relative merits of Wal-Mart as a place to buy wading pools for dogs. He told me that he usually finds no one at the Centralia heart: an unnaturally high percentage of older residents died soon after they were relocated; many are buried in Centralia.

Centralia now has a two-man P.R. team: the mayor, Lamar Mervine, and John Comarnisky, a high school physics teacher who is forty-nine and lives with his brother and mother in the only other house on the mayor's street. Reporters are referred to Mervine, who calls Comarnisky, who walks over, and they give interviews together on Mervine's porch. They want people to understand that Centralia is green and quiet and not aflame, and that they are not insane. They had just explained

The first high-fidelity system with a Napoleon complex.



It may be small. But the sound of the Acoustic Wave® music system rivals many big, complicated stereo systems costing much more. The performance is so impressive that when it was first introduced, *Sound & Vision* said it delivered "possibly the best-reproduced sound many people have ever heard." Patented acoustic wave-guide speaker technology is what allows the Acoustic Wave® system to deliver such a spacious, lifelike performance.

This all-in-one music system features a credit card-sized remote control, a full-function CD player

and a digital tuner with five AM and five FM presets. And our new 5-CD Changer – designed specifically for the Acoustic Wave® music system – allows you to enjoy hours of uninterrupted music.

You can even use it to connect other audio sources to your system – transforming it into a versatile audio center for movies, music and more.

Call today for more information about our 30-day in-home trial and satisfaction guarantee. And be sure to ask about our **financing options**. The Acoustic Wave® music system is available only from Bose – the most respected name in sound.

For **FREE Shipping** order by **March 31, 2004.**

Call 1-800-295-2673, ext. G6214.

For information on all our products: www.bose.com/g6214

BOSE
Better sound through research.

©2004 Bose Corporation. Patent rights issued and/or pending. The Acoustic Wave® music system design is also a registered trademark of Bose Corporation. Financing and free shipping offer not to be combined with any other offer or applied to previous purchases, and subject to change without notice. Risk free refers to 30-day trial only. Delivery is subject to product availability. Quote is regional with permission. Julian Hirsch, *Sound & Vision*, 1993.

WHY DOES ALAN CUMMING WEAR THE BRACELET?



He wears it to raise desperately needed funds for HIV/AIDS care services, education and vaccine development. Over half a million people have chosen to wear The Bracelet. What about you? Available at: The Body Shop; Kenneth Cole; Tower Records; Virgin Megastore; Ben Bridge Jewelers and other fine retailers. Or you can visit us at WWW.UNTIL.ORG or call 1-800-88-UNTIL to order.

until
THERE'S A CURE

this to me on Mayor Mervine's porch when a car pulled up. The driver, who was from Philadelphia, rolled down his window. "I'm sorry to bother you," he said, "but I'm looking for Centralia, the town that's on fire? Where the heck is it? I promised the kids."

The adversary of the Centralia PR team is Steve Jones, who conducts regular tours of the fire zone for tourists and reporters. Borehole temperatures in the borough have fallen steadily for at least a decade—the fire departed the borough proper in the mid-nineties—and Mervine and Comarnisky say that Jones's estimate of the fire's duration, and the minimum temperature he gives as evidence of its vitality, have fallen proportionately.* Jones generally gives tours on what he calls "good viewing days": when it's raining and scattered patches of heated earth steam visibly. When he is forced to give a tour on a clear day the fire is invisible, so he generates steam by pouring water on the ground. Standing in his steam, he tells people he cannot rule out the immediate cremation of Centralia.

Signs around the fire zone, erected by the state, read:

WARNING—DANGER
UNDERGROUND MINE FIRE
WALKING OR DRIVING IN THIS AREA
COULD RESULT IN SERIOUS INJURY
OR DEATH
DANGEROUS GASES ARE PRESENT
GROUND IS PRONE TO SUDDEN
COLLAPSE

These signs, Comarnisky and Mervine told me, went up a few weeks before I arrived, because CNN had informed the Department of Environmental Resources (DER) that it wanted to do a story on the fire. DER, without telling CNN, put the signs up the next day. The signs featured prominently in CNN's piece. The day of the shoot was clear, and Steve Jones showed the crew how to make steam.

In the summer of 2001, Comedy Central did a story on Centralia. The interviewer asks Mayor Mervine what

* The duration estimate has gone from 500 to 100 years, and although the universal criterion for a live mine fire is 200 degrees, Steve Jones has said that borehole temperatures of 55 degrees, a normal underground temperature, can indicate a live fire.

has changed about the town, and the mayor says, "Well, we have plenty of parking now." After the scene of the reporter hopping around on asphalt that is apparently burning his feet, and after the scene in which he pulls on an oven mitt and pats the mayor on the back and each pat induces a sizzle, and again after a steaming-earth close-up, the show cuts back to Mayor Mervine saying, "Well, we have plenty of parking now."

One of the most recent interviews Mervine and Comarnisky gave was to the *New York Times*:

The fire in an abandoned mine under this hard-coal hamlet still burns down below as doggedly as the 86-year-old mayor, Lemar [sic] Mervine, holds out here above, refusing to vacate the wasted landscape of a condemned ghost town.

"Centralia's a dangerous place to be," Steve Jones says in the article. The fire has "a history of people overcome by carbon monoxide gases in their homes. A few have slipped into holes as the ground subsides." Mervine and Comarnisky would have responded that the fire is not burning in Centralia and therefore cannot be burning beneath Mayor Mervine's porch, and that it has been two decades since anyone in town inhaled the fire's fumes or encountered subsidence.

Mervine and Comarnisky talked about the Mammoth vein, an 84-million-ton anthracite bed beneath Centralia with a retail value estimated to be in the tens of billions of dollars.* Centralia, very unusually, owns

* Coal is sedimentary, and anthracite is the oldest and therefore most pressure-cooked species: the hardest, purest (in carbon content), rarest, and most valuable. Eastern Pennsylvania has most of the anthracite deposits in the United States, and the Mammoth is the region's largest vein. Bituminous coal is the next best (West Virginia, western Pennsylvania), then sub-bituminous, then brown (China's gigantesque northern coal belt), and then a kind of coal prototype called lignite. Anthracite burns very slowly, very cleanly, and with great heat. Lignite is so immature and watery it's almost spongy. It burns like a safety flare, and its many impurities produce a comprehensive sampler of toxic fumes. Brown is also pretty bad: hundreds of coal fires in northern China burn 200 million tons of coal each year, or 20 percent of the country's output, and produce as much carbon dioxide annually as all the cars and light trucks in the United States.

its own mineral rights, and when municipal governments in Pennsylvania cease to exist, their mineral rights revert to the state. At least one coal company has offered to buy the town; the initial offer was \$20 million. Comarnisky and Mervine told the *New York Times* that they thought the value of the Mammoth had influenced the management of the fire:

Of course they cannot document such a scheme, the two concede. But as they sit in solitude on the porch, their conspiracy theory clearly strikes them as more palpable and comforting than the fire below.

One day Joe Moyer and I were sitting in folding chairs on his flawless lawn, listening to his homing pigeons coo and observing their interactions. "They mate for life," he said. "You never see any cheatin'." When they return after a flight of two or four or six hundred miles, they coalesce above the house and circle their coops for a few minutes before descending. "That Jones did one of his tours the other day," Moyer said. "They were all in ponchos and umbrellas, drinkin' and havin' a good old time, while the steam's comin' up and he's tellin' 'em the town's in danger. If he comes near here I'll punch him in the mouth. I'll knock his fuckin' head off! He's a fuckin' phony to make the best of 'em!" Moyer coughed for several minutes. I asked about the future of Centralia. "I'll never see it, but I think the time'll come when this place'll be rebuilt," he said. "I just have that hunch. I could be a thousand percent wrong."

"It never occurred to me that I should leave," John Comarnisky told me a few days later on Lamar Mervine's porch. "I have a case of arrested emotional development. I'm a perpetual seventeen-year-old. I drive a Camaro—it's an older Camaro, but I can't seem to get rid of it." Comarnisky is thick-legged; he has a hospitable, appraising face and a heavy, kempt mustache. When he was young, he'd left Centralia to get a degree in physics and work for General Electric.

He moved back to Centralia and

started teaching physics, which suits him. "What would be really, really, really nice . . . Hmmmph!" he said. "If they gave us the properties back. They're not letting us get on with our lives. I'd like to buy some land and build a cedar cabin. I put my roots down here, and I feel real comfortable here. When I get home from teaching in the evenings I go out in the back yard and I can smell the clover and the pine, and after a few minutes I'm real relaxed. There's not too many places that can do that to me."

"It's strange," John Lokitis told me, sitting in his narrow-gauge living room beneath large photographic portraits of his great-grandparents. "You watch everything you ever knew slowly being erased." He has a sandy, medium-size appearance; his pensiveness doesn't quite arrive at melancholy. Lokitis works in Harrisburg, auditing firearms dealers for the state.

"But I busy myself taking care of the grounds," he said. "Trying to keep it like the street that time forgot." Ruefully and self-consciously, he laughed. "I put the landscape timbers around the Legion memorial, and the marble stone and flowers around the base, and I painted the bench and stenciled the CENTRALIA 1866 on it. And the flag flying there is mine. The Legionnaires come and fly a flag on Memorial Day, but they take it down, and I've always liked to see a flag flying over the grounds."

From his living room, Lokitis has a clear view of the memorial and the flag and the valley of Centralia and the ridge beyond. The nonstop hills and valleys around Centralia are how the anthracite veins run. From hilltops the terrain reiterates itself to the limit of your vision. The natural misalignment of receding ridges creates views, through illusory notches and blue atmosphere, of distant valleys. Encircling the current emptiness of Centralia are dozens of inhabited valleys that precisely replicate the former Centralia: Minersville and Port Carbon and Ashland—collections of two-story, twelve-foot-wide brick row houses, rising up the hillsides in strict parallel lines that church spires dutifully interrupt. ■

WRITE...

The MFA in Creative Writing Program at Antioch University Los Angeles offers one of the nation's preeminent low-residency writing programs, and the only low-residency program on the West Coast.

Intensive ten-day residencies are held in June and December at our Los Angeles campus. For the remainder of the year, students communicate online with faculty and peer writers, and exchange monthly writing packets with individual faculty mentors.

Financial aid is available.

MFA

Fiction
Creative Nonfiction
Poetry
Teaching Certificate

CREATIVE WRITING



Award-winning faculty include:

Chris Abani
Dodie Bellamy
Leonard Chang
Susan Taylor
Chehak
Richard Garcia
Eloise Klein Healy
Steve Heller (Chair)
Tara Ison
Brad Kessler
Jim Krusoe
Peter Levitt
Brenda Miller
Carol Potter
Sharman Apt
Russell
David Ulin
Alma Luz
Villanueva
Nancy Zafris

Recent guest writers include:

Jenoyne Adams
Kim Addonizio
Ron Carlson
Bernard Cooper
Percival Everett
Jack Gilbert
Joyce Maynard
Achy Obejas
Natasha Tretheway

WHERE THINGS ARE HAPPENING

Call: 1-800-7-ANTIOCH Email: admissions@antiochla.edu Visit: www.antiochla.edu

SOLUTION TO THE JANUARY PUZZLE

H	O	I	C	K	S	S	K	Y	J	A	C	K	S
O	R	N	A	T	E	U	O	H	I	D	O	U	T
B	A	C	T	A	M	P	O	R	G	A	N	D	I
B	L	O	N	D	I	E	K	R	G	M	S	U	M
E	R	R	A	N	T	R	I	E	S	S	O	U	P
S	U	P	P	L	E	M	E	N	T	A	L	L	Y
S	M	O	O	C	H	A	R	C	S	P	E	K	E
C	A	R	T	O	O	N	C	O	U	P	L	E	S
A	G	E	N	T	P	L	A	N	E	L	O	A	D
T	G	A	R	F	I	E	L	D	P	E	I	N	T
T	I	L	S	I	T	O	V	O	O	F	S	E	A
E	E	S	T	R	A	T	I	O	N	A	L	E	S
R	U	N	O	F	F	A	N	D	Y	C	A	P	P
E	Q	U	A	L	R	R	A	I	M	E	N	T	E
D	A	G	W	O	O	D	W	E	S	T	E	R	N

NOTES FOR "STRIP MINING":

The unclued entries are CARTOON COUPLES.

Puzzle editing by Dan Asimov.

Anagrams are indicated with an asterisk (*).

ACROSS: 1. h(O)icks; 6. S-Ky-jacks; 11. *; 12. h(I do)ut; 13. p-mat(rev.); 14. (M)organ; 15. sum (two mngs.); 16. *; 17. s(O)up; 18. supple-mentally; 19. s(moo)ch.; 21. a(R.C.)s; 23. homophone; 26. age-NT; 27. *; 31. *; 32. Til(si)t; 37. two anagrams; 39. two mngs.; 40. E.-qua(l); 41. hidden; 42. two mngs.

DOWN: 2. (m)oral; 3. in-corpor(E.)al; 4. cat-pan(rev.); 5. S('em)ite.; 7. OK(rev.)-OK-i.e.-r; 8. *; 9. console; 10. U-du(c)k (rev.); 19. *; 20. co(a)t; 22. con-do; 24. homophone; 28. *; 29. E.-pony-Ms.; 30. homophone; 33. stoa(t); 34. face-t(he); 35. as-pen; 36. rev.; 38. hidden.

Copyright of Harper's Magazine is the property of Harper's Magazine Foundation and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.