

the wall of a house where she had lived they found dolls with headless pins stuck in them.

The evidence was circumstantial. But evidence is hard to find in witchcraft cases, since witchcraft is, after all, conducted in secret. Coupled with other testimony, the finding of the dolls was very convincing. I think there is no question that the same evidence would have got Bridget Bishop hanged in England, or burned in Scotland or on the Continent. Indeed, it is extremely probable that Bridget Bishop was a practicing witch. It is possible that, of those who were hanged, the same is true of one or two others, although the evidence in their cases is much less persuasive. But the majority were executed on only two grounds, spectral evidence plus the accumulating weight of the confessions, and there is now no doubt at all that the majority were innocent.

What brought the matter to an end, however, was not the suspicion that some of those executed might have been innocent so much as the astonishing multiplication in the number of those accused, coupled with the fact that as the accusations multiplied they ceased to be directed at persons likely to be witches—persons of known malevolence, or otherwise disreputable. Indeed the accusations finally included persons so obviously virtuous and innocent that nobody could believe them guilty. (Similar circumstances ended the career of the late Senator McCarthy. The nation simply could not believe that all those clean-cut young Army officers were subversive.)

On October 3 the Reverend Increase Mather read his "Cases of Conscience Concerning Evil Spirits Personating Men" to the ministers of Boston, and it was primarily this document that convinced Governor Phips, later in the month, to forbid further arrests or executions. By the end of the month the General Court (the legislature) had dismissed the Special Court of Oyer and Terminer, and called for a fast and the ministers' counsel.

from: Marc Mappen (ed), Witches & Historians
Interpretations of Salem

Medical and Psychological Explanations

The early historians of Salem witchcraft had little patience with the argument that the afflicted girls were mentally unbalanced. But as the scientific study of the mind grew to respectability, it became possible to explain the witchcraft outbreak in psychological terms. By the early twentieth century, it was widely accepted that some sort of "hysteria" played a part in the tragedy.

In a 1943 article in the American Journal of Diseases of Children, ERNEST CAULFIELD (1894–1972), a pediatrician and amateur historian, attempted to give some substance to this thesis. He began by analyzing seventeenth century descriptions of the behavior of children who were thought to be bewitched, and paid particular attention to an account by Cotton Mather of a young Boston girl, Martha Goodwin. Caulfield determines that these children were indeed suffering from hysteria, and he proceeds to explain how the precarious mental state of Puritan young people was brought about by the morbid and repressive nature of their upbringing.

But does Caulfield really come to grips with the vague concept of hysteria? If all Puritan children shared a tendency to hysteria, why is it that the affliction did not erupt in other New England towns as it did in Salem? Conversely, why did equally violent episodes of witch hunting occur in non-Puritan societies where, presumably, child-rearing practices were different?

8. A Physician Diagnoses Hysteria

Fortunately, because it is helpful in the diagnosis, there still exists a record of one case of witchcraft in which the fits of some bewitched children are described in great detail. This is called "Memorable Providences, Relating to Witchcraft and Possessions," and chiefly because of its detailed descriptions it is a most valuable contribution to early American medicine, though not hitherto so regarded. This case history of the Goodwin children was written a few years before the Salem tragedy. On the surface, it may seem illogical to use a Boston witchcraft case of 1688 to help explain the Salem cases of 1692,

From Ernest Caulfield, "Pediatric Aspects of the Salem Witchcraft Tragedy," *American Journal of Diseases of Children*, vol. 65 (May 1943), pp. 788–802. Copyright 1943, American Medical Association. Reprinted by permission of the American Medical Association.

but all historians agree on the almost perfect similarity in the cases and my only reason for citing these earlier cases from Boston is that here one finds a connected story limited almost exclusively to a description of the fits. Another objection to using the "Memorable Providences" is that the author, Cotton Mather, is known to have been prejudiced in favor of witchcraft. But strange as it may seem to some, the Puritans, and particularly Cotton Mather, did not oppose, but indeed advanced, the growth of science. It was this same Cotton Mather, member of the Royal Society, who wrote the first American description of measles (which, incidentally, is an American classic), and it was he who, in spite of tremendous opposition from the medical profession, influenced Zabdiel Boylston to try inoculation against smallpox, the first step toward the prevention of diseases. Mather steadfastly maintained in his "Memorable Providences" that he was recording actual facts, and, though considerable allowance should be made for his superstition, gullibility and firm belief in witchcraft, it is clear that the descriptions must have been founded mostly on observations, not only because of the similarity to the Salem court records, with which he had nothing to do, but chiefly because, even after these two hundred and fifty years, one can recognize the sickness that afflicted the Goodwin children as easily as though they had had the smallpox.

The "Memorable Providences" concerns John Goodwin, a mason, and his wife, who with their six children, Nathaniel 15, Martha 13, John 11, Mercy 7 and Benjamin 5 years and Hannah 6 months old, comprised an extremely religious family. Indeed, from some of his devout letters still extant it appears that John Goodwin was the kind of mason who would have said a prayer every time he laid a brick. One day Martha Goodwin accused the family washerwoman of stealing some of the family linen, whereupon the washerwoman's "wild Irish" mother, old Goody Glover, "bestow'd very bad Language upon the Girl . . . immediately upon which, the poor child became variously indisposed in her health, and visited with strange Fits, beyond those that attend an Epilepsy, or a Catalepsy, or those they call The Diseases of Astonishment." Shortly after, John, Mercy and Benjamin began to behave in a strange manner too, though "the godly father and the suckling Infant, were not afflicted" nor was Nathaniel except in slight degree. The most skilful Boston physicians, unable to find any physical cause, concluded that the children were afflicted with "an Hellish Witchcraft," and, needless to say, poor Goody Glover was therefore put to death. Later, Cotton Mather took the afflicted Martha Goodwin into his own home and after many months of observation wrote his account, from which the following passage is taken:

The variety of their tortures increased continually; and tho about Nine or Ten at Night they alwaies had a Release from their miseries, and ate, and slept all night for the most part indifferently well, yet in the day time they were handled with so many sorts of Ails, that it would require of us almost as much time to Relate them all, as it did of them to Endure them. Sometimes they would be Deaf, sometimes Dumb, and sometimes Blind, and often, all this at once. One while their Tongues would be drawn down their Throats; another-while they would be pull'd out upon their Chins, to a prodigious length. They would have their Mouths opened unto such a Wideness, that their Jaws went out of joint; and anon they would clap together again with the Force like that of a strong Spring-Lock. The same would happen to their Shoulder-Blades, and their Elbows, and Hand-wrists, and several of their joints. They would at times ly in a benumbed condition; and be drawn together as those that are ty'd Neck and Heels; and presently be stretched out, yea, drawn Backwards, to such a degree that it was fear'd the very skin of their Bellies would have crack'd. They would make most pitteous out-cries, that they were cut with Knives, and struck with Blows that they could not bear. Their necks would be broken, so that their Neck-bone would seem dissolved unto them that felt after it; and yet on the sudden, it would become again so stiff that there was no stirring of their Heads; yea, their Heads would be twisted almost round; and if main force at any time obstructed a dangerous motion which they seem'd to be upon, they would roar exceedingly. . . .

The Fits of the Children yet more arriv'd unto such Motions as were beyond the Efficacy of any natural Distemper in the World. They would bark at one another like Dogs, and again purr like so many Cats. They would sometimes complain, that they were in a Red-hot Oven, sweating and panting at the same time unreasonably: Anon they would say, Cold water was thrown upon them, at which they would shiver very much. They would cry out of dismal Blowes with great Cudgels laid upon them; and tho' we saw no cudgels nor blowes, yet we could see the Marks left by them in Red Streaks upon their bodies afterward. And one of them [John, 11 years old] would be roasted on an invisible Spit, run into his Mouth, and out at his Foot, he lying, and rolling, and groaning as if it had been so in the most sensible manner in the world; and then he would shriek, that Knives were cutting of him. Sometimes also he would have his head so forcibly, tho not visibly, nail'd unto the Floor, that it was as much as a strong man could do to pull it up. One while they would all be so limber, that it was judg'd every Bone of them could be bent. Another while they would be so stiff, that not a joint of them could be stir'd.

Many ways did the Devils take to make the children do mischief both to themselves and others; but thro the singular Providence of God, they always fail'd in the attempts. For they could never essay the doing of any harm, unless there were some-body at hand that might prevent it; and seldom without first shrieking out, "They say, I must do such a thing!" Diverse times they went to strike furious Blowes at their tenderest and dearest friends, or to fling them down staires when they had them at the top, but the warnings from the mouths of the children themselves, would still anticipate what the Devils did intend. They diverse times were very near Burning or Drowning of themselves, but the children themselves by their own pittifull and seasonale cries for help, still procured their Deliverance. . . . But if any small Mischief happen'd to be done where they were; as the Tearing or Dirtying of a Garment, the Falling of a Cup, the breaking of a Glass or the like; they would rejoice extremely, and fall into a pleasure and Laughter very extraordinary. . . .

Variety of Tortures now seiz'd upon the Girl [Martha, 13 years old]; in which besides the forementioned Ails returning upon her, she often would cough up a Ball as big as a small Egg, into the side of her Wind-pipe, that would near choak her, till by Stroking and by Drinking it was carried down again. . . .

The Last Fit that the young woman had, was very peculiar. The Daemons having once again seiz'd her, they made her pretend to be Dying, and Dying truly we fear'd at last she was: She lay, she tossed, she pull'd just like one Dying, and urged hard for some to dy with her, seeming loth to dy alone. She argued concerning Death, in strains that quite amazed us; and concluded, That though she was loth to dy, yet if God said she must, she must; adding something about the state of the Country, which we wondered at. Anon, the Fit went over; and as I guessed it would be, it was the last Fit she had at our House.

Inasmuch as old men and women were condemned to death as wizards and witches on this sort of evidence, it is easy to understand the unbridled scorn of the historians; and yet it is important to emphasize that there is enough here, to say nothing of the passages not cited, for an absolute diagnosis. It is also easy to show that the Salem children suffered from hysteria too, for there is hardly a sign or symptom manifested by Martha Goodwin that did not have its counterpart in one or another of the Salem children during their bewitchment. They too made "great noises" during their "lamentable fits and agonies"; they too were "dreadfully tortured" and "struck dumb and senseless for a season"; according to the Rev. Mr. Hale, "Sometimes they were taken

dumb, their mouths stopped, their throats choked, their limbs wracked and tormented so as might move an heart of stone." Samuel Sewall, of all the Puritans the most generally successful in keeping his feet on the ground, meant exactly what he said when he wrote in his diary: "It was awful to see the tortures of the afflicted." During the trial of that "rampant hag" Martha Carrier, the afflicted were "so tortured that every one expected their death upon the very spot."

By patching together the sworn testimony of numerous witnesses during the trial of Mary Easty and by making a few minor alterations for the sake of continuity, one can obtain a fairly connected first-hand description of the fits of the Salem children on one occasion at least. At the preliminary hearing in Salem Village during April 1692, five of the afflicted children were "choked in such a most grievous manner" that the examination had to be interrupted, and in spite of the prayers of the Rev. Mr. Hale they remained "almost choked to death." For some now unknown reason Mary Easty was released on May 18. On May 20, Mercy Lewis, a 17 year old servant girl, had a fit in the house of her master, Constable John Putnam.

One man testified:

I went to that house about 9 a clock in the morning and when I came there Mercy Lewis lay on the bed in a sad condition and continued speechless for about an hour. [He then left for a while but came back.] She continued in a sad condition the greatest part of the day being in such tortures as no tongue can express; but not able to speak. But at last she said "Deare Lord Receive my soule" and again said "Lord let them not kill me yett" but at last she came to herself for a little while and was very sensible and then she said that Goody Easty said she would kill her before midnight. . . . Then again presently she felt very bad and cried out "Pray for the salvation of my soule for they will kill me."

Four other men who were in that house between 8 and 11 o'clock that night testified that Elizabeth Hubbard, another 17 year old girl, was brought in while they were there. They found Mercy Lewis "in such a case as if death would have quickly followed . . . being unable to speak most of the day." The two girls then "fell into fits by turns, the one being well whilst the other was ill . . . and [the apparition] vexed and tortured them both by choking and seemingly breathless fits and other fits, threatening Mercy Lewis with a winding sheet & afterwards with a Coffin if said Mercy would not signe the Devil's book. Abundance more of vexations they both received from her [the apparition]."

Still two other men had been at the house that day and found Mercy Lewis in a very Dreadful and Solemn Condition so that Shee could not continue long in this world without a mitigation of those Torments. [They left the house for a while but] Returning the same night aboute midnight, wee found Mercy Lewis in a Dreadful fitt but her reason then Returned Again. She said "What, have you brought me the winding sheet, Goody Easty? Well, I had rather go into the winding sheet than Sett my hand to the Devil's book" but after that her fitts was weaker and weaker but still complaining that Shee was very sick of her stomake. About break of Day She fell asleep but still Continues extream sick and was taken with a Dreadful fitt just as we left her so that we perceived life in her and that was all.

Another man testified that she was "grievously afflicted and tortured . . . choked allmost to death . . . and we looked for nothing else but present death." Her fit continued well into the next day.

During most of the fit the girl was in a stupor and could not speak; so Ann Putnam (12 years), Abigail Williams (11 years) and Elizabeth Hubbard (17 years) were summoned to the bedside to attempt to identify the apparition that was tormenting Mercy Lewis. The three said that it was the apparition of Goody Easty. Near midnight, when the fit was extra severe, two men rushed out of that haunted house, hastened to Salem for a warrant and then went to Topsfield and dragged Goody Easty out of bed. She was 58 years old and the mother of seven children, yet they took her back to Salem jail and chained her to a cell. She was brought to trial, and, chiefly because of Mercy Lewis' fit and similar evidence, she was convicted and subsequently hanged.

Because of the similarity in the two instances, one could expect that the same historians who have considered the Salem children as "frauds" should have also condemned the Goodwin children as deceitful "pests," they apparently having overlooked the fact that Cotton Mather, like the Salem judges, did consider the possibility of sham but quickly rejected it. Just because some passages in the "Memorable Providences" make it appear as though Martha Goodwin may have had her tongue in her cheek while she was being observed, one can hardly conclude that Cotton Mather's whole account was ludicrous, written in a "style of blind and absurd credulity that cannot be surpassed." That the children's afflictions were attributed to the capital crime of witchcraft is deplorable enough, to say the least, but that is not the point at issue. It is essential to remember that lying was only a symptom and that primarily the children were afflicted with a mental illness. Having studied medicine and probably knowing as much about sickness as any New England physician, Mather deserves a little credit for recognizing that there was at least something unusual about this girl. "But I am resolved after this"

he wrote after observing her for many months, "never to use but one grain of patience with any man that shall go to impose upon me a Denial of Devils, or of Witches. I shall count that man Ignorant who shall suspect, but I shall count him down-right Impudent, if he Assert the Non-Existence of things which we have had such palpable convictions of." (The italics are mine).

It therefore seems reasonable to conclude that not the apparent lying but the "extreme agony of all the afflicted" accounts for the decided convictions of the judges, jury and spectators, many of them educated and reasonable men. In some cases "the tortures and lamentations of the afflicted" convinced even the relatives of the accused, and in the trials of Rebecca Nurse and a few others even the accused themselves, though vehemently denying their own guilt, nevertheless admitted that the children acted as though bewitched. Not unimportant is the fact that more than one trial had to be postponed because the children could not possibly be relieved of their "agony" by binding the accused, by prayer or by any other means. And when their trials were over, at least two convicted witches were unanimously excommunicated from the church, a horrible punishment in Puritan times, especially to one about to die. The possibility that the judges were unfair being laid aside for the moment, would the men and women of the church willingly and unaminously convict their intimate friends, whom they knew to be otherwise honorable, except for this very, very convincing evidence of "stupendous Witchcraft?"

Far more fundamental to a true understanding of the Salem tragedy than the diagnosis of hysteria are the factors at play which could have caused so much hysteria among the children of those days: hence, by far the most interesting feature of Mather's account of the Goodwin children is that every now and then he allows a glimpse of the underlying cause. The following quotation is not an isolated passage lifted from its context merely to prove a point but is representative of many similar passages, and consequently the cause and effect sequence seems more than accidental:

But nothing in the World would so discompose them as a Religious Exercise. If there were any Discourse of God, or Christ, or any of the things which are not seen and are eternal, they would be cast into intolerable Anguishes. Once, those two Worthy Ministers, Mr. Fisk and Mr. Thatcher, bestowing some gracious Counsils on the Boy, whom they then found at a Neighbour's house, he immediately lost his Hearing, so that he heard not one word, but just the last word of all they said. Much more, All Praying to God, and Reading of his Word, would occasion a very terrible Vexation to them: They would then stop their own Ears with their own Hands; and roar,

and shriek; and holla, to drown the Voice of Devotion. Yea, if any one in the Room took up a Bible to look into it, tho the Children could see nothing of it, as being in a croud of Spectators, or having their Faces another way, yet would they be in wonderful Miseries, till the Bible was laid aside. In short, No good thing must be endured near those Children, which (while they are themselves) do love every good thing in a measure that proclaims in them the Fear of God . . .

Devotion was now, as formerly, the terriblest of all the provocations that could be given her [Martha]. I could by no means bring her to own, That she desired the mercies of God, and the prayers of good men. I would have obtained a Sign of such a Desire, by her Lifting up her hand; but she stirr'd it not: I then lifted up her hand my self, and though the standers-by thought a more insignificant thing could not be propounded. I said, "Child, If you desire those things, let your hand fall, when I take mine away." I took my hand away, and hers continued strangely and stiffly stretched out, so that for some time, she could not take it down. During these days we had Prayers oftener in our Family than at other times; and this was her usual Behaviour at them. The man that prayed, usually began with Reading the Word of God; which once as he was going to do, she call'd to him, "Read of Mary Magdalen, out of whom the Lord cast seven Devils." During the time of Reading, she would be laid as one fast asleep; but when Prayer was begun, the Devils would still throw her on the Floor, at the feet of him that prayed. There she would lye and Whistle and sing and roar, to drown the voice of the Prayer; but that being a little too audible for Them, they [the devils] would shut close her Mouth and her ears, and yet make such odd noises in her Throat as that she herself could not hear our Cries to God for her. Shee'd also fetch very terrible Blowes with her Fist, and Kicks with her Foot at the man that pray'd; but still (for he had bid that none should hinder her) her Fist and Foot would alwaies recoil, when they came within a few hairs breadths of him just as if Rebounding against a Wall; so that she touch'd him not, but then would beg hard of other people to strike him, and particularly she entreated them to take the Tongs and smite him; Which not being done, she cryed out of him, "He has wounded me in the Head." But before Prayer was out, she would be laid for Dead, wholly senseless and (unless to a severe Trial) Breathless; with her Belly swelled like a Drum, and sometimes with croaking noises in it; thus would she lye, most exactly with the stiffness and posture of one that had been two Days laid out for Dead. Once lying thus, as he that was praying was alluding to the words of the Canaanites, and saying, "Lord, have mercy on a Daughter, vexed with a Devil; there came a big, but low voice from her, saying, "There's Two or

Three of them" (or us) and the standers-by were under the Apprehension, as that they cannot relate whether her mouth mov'd in speaking of it. When Prayer was ended, she would Revive in a minute or two, and continue as Frolicsome as before. . . .

Perhaps I have been bewitched into drawing false conclusions, but it seems clear to me that Martha Goodwin had resorted to hysteria mainly because of religious uncertainties and conflicts; and toward a better understanding why Puritan children felt insecure as they contemplated this world and the world hereafter it is now necessary to say something of the Puritan religion. It should go without saying that no sensible man attempts to ridicule any religion so long as it remains a force for good, but, on the other hand, it is important to examine the probable results of the impact of the Puritan religion on the minds of growing children if one wishes to fathom the disastrous events that took place in Salem.

Long before they attained the age of reason, Puritan children were made to learn the contents of John Cotton's catechism, called "Spiritual Milk for Babes, Drawn out of the Breasts of both Testaments, for their Souls Nourishment." Among the first things they learned were the dreadful consequences of Original Sin. All wickedness, all sufferings and diseases, all catastrophes were only manifestations of God's "Holy Anger" and "Holy Jealousy" because of the fall of Adam and Eve. This doctrine (the sixth question and answer in the catechism) that all children were "conceived in sin and born in iniquity" was later carried to its logical conclusion by the preachers of the early eighteenth century. When the Rev. Jabez Fitch found that over 90 per cent of all the deaths from "throat distemper" occurred among children, that to him was mathematical proof of the "woful Effects of Original Sin." The brilliant theologian Jonathan Edwards stoutly maintained that sinful children were more hateful than vipers because vipers had no souls. Whitfield literally screamed at his audiences that children were worse than rattlesnakes and alligators, which, he said, were also beautiful when small; and Benjamin Wadsworth said that "They're Children of Wrath by Nature, liable to Eternal Vengeance, the Unquenchable Flames of Hell. . . . Truly it behooves them most seriously to consider how filthy, guilty, odious, and abominable they are both by Nature and Patience."

There is an illustrative passage in the *Diary of Cotton Mather* dated Nov. 7, 1697:

I took my little [5 year old] daughter, Katy, into my Study, and there I told my child That I am to Dy Shortly and Shee must, when I am Dead, Remember every Thing, that I now said unto her. I sett before her, the

sinful . . . condition of her Nature, and I charged her to *pray in secret places every day*, . . . I gave her to understand that when I am taken from her, shee must look to meet with more Humbling Afflictions, than she does.

The literature of colonial times abounds in examples of early piety, instances of "joyful deaths" of children who had learned every word of the catechism, for the Puritans were eager to preserve these instances of holiness in order to impress their remaining children. Cotton Mather has left an account of the precocious Elizabeth Butcher, 2½ years old. "As she lay in the Cradle, she would ask herself that Question, What is my corrupt Nature? and would make Answer to herself, It is empty of Grace, bent into Sin, and only to Sin, and that continually." Many more examples of early piety are related by the Rev. John Brown in his account of "remarkable deaths" during the great diptheria epidemic in Haverhill. Epidemics, catastrophes or deaths of playmates seemed to be opportune occasions to impress on children that they were born under the wrath and curse of God. Here is an interview with a dying 7 year old child:

Being ask'd if she was willing to die, and go to Christ; she said, Yes: But Child you know you are a Sinner; she said Yes: And you know where the Wicked go when they die; she said, Yes they are cast into Hell. And Being asked, if she was not afraid of going thither: she said No, for Christ is an all sufficient Savior, and He is able to save me I hope he will: Tho' I have not yet seen Christ, yet I hope I shall see Him. . . .

A while after she said, I am weary of this World, and long to be gone!

The most pitiful, yet most significant, aspect of this gruesome theology was that the children, once convinced that they were dreadful sinners by birth, could do absolutely nothing about it. There was no use in begging for mercy or forgiveness, because every good Puritan firmly believed in predestination. God, even before the creation of the earth, the sun, the moon and the stars, had already determined who were to be saved and who were to be damned, and no one on earth could be certain whether or not he was among the elect. If God was willing, the adults, by constant prayer and good works, might experience a salvation or a flooding of the soul with an irresistible grace, and with this came the joyful feeling that they were among the elect. But this involved a complex mental process that no child could experience, much less enjoy. And so, with the avenue to mental peace left open only to adults, thoughtful children became terribly bewildered. There are no more pitiful passages in all Puritan literature than those in Sewall's diary wherein he related the gloomy religious outlook of his daughter Betty:

It falls to my [7 year old] daughter Elizabeth's share to read the 24. of Isaiah [which concerns the earth's turning upside down and the inhabitants thereof falling into space] which she doth with many tears not being well and the contents of the chapter and sympathy with her draw tears from me also. . . .

When I came in, past 7. at night, my wife met me in the Entry and told me Betty [13 years old] had surprised them. I was surprised with the abruptness of the Relation. It seems Betty Sewall had given some signs of dejection and sorrow; but a little after dinner she burst out in an amazing cry, which caus'd all the family to cry too; Her mother ask'd the reason; she gave none; at last she said she was afraid she should goe to Hell, her Sins were not pardon'd. She was first wounded by my reading a Sermon of Mr. Norton's, about the 5th of Jan. Text of Jno. 7. 34. Ye shall seek me and shall not find me. And those words in the Sermon Jno. 8. 21. Ye shall seek me and shall die in your sins, ran in her mind and terrified her greatly.

At the age of 16 Nathaniel Mather wrote in his diary: "When very young I went astray from God, and my mind was altogether taken with vanities and follies; such as the remembrance of them doth greatly abase my soul within me. Of the manifold sins which then I was guilty of, none so sticks upon me, as that being very young, I was whittling on the sabbath-day; and for fear of being seen, I did it behind the door. A great reproach of God! a specimen of that atheism that I brought into the world with me." When 19 years old, he confessed on his deathbed that the most bitter of all his trials on earth were "the horrible conceptions of God, buzzing about [his] mind."

It is needless to say much about Puritan conceptions of hell except that epidemics and earthquakes seemed to offer opportune moments for the publication of broadsides and sermons containing the most lurid descriptions. Children were taken on walks through cemeteries to see where other smaller children were buried, for a child was "never too little to die, and never too young to go to hell." The classic example of all this is Michael Wigglesworth's oft-quoted 224 stanza poem on "The Day of Doom" (1662), a work which went through numerous editions and was familiar to nearly every Puritan child. In it are depicted the terrors of the damned in terms that might even today send shivers up the spine of the most confirmed atheistic pediatrician. Of some interest are Wigglesworth's ideas of the punishment inflicted on the newly born, or, as he expressed it, on those who went "from the womb unto the tomb." On the fateful Day of Doom those little infants, exceedingly reluctant to be cast into hell because of Adam's sin, put up a strenuous argument:

Not we, but he ate of the tree
 whose fruit was interdicted:
 Yet on us all of his sad fall,
 the punishment's inflicted.

But all cases were predetermined, so the sentence was nevertheless pronounced:

You sinners are, and such a share
 as sinners may expect,
 Such you shall have; for I do save
 none but my own elect.
 Yet to compare your sin with their
 who lived a longer time,
 I do confess yours is much less,
 though every sin's a crime.
 A crime it is, therefore in bliss
 you may not hope to dwell,
 But unto you I shall allow
 the easiest room in hell.

Enough has been told to show that the average Puritan child, if he paid any attention to the rigid Calvinism of the times, must have had gloomy prospects of life beyond the grave; and there can be little doubt that some of them at least lived in constant, gnawing fear not only of death but of eternal damnation after death. Thus the appearance of hysteria among the children of Salem Village has an adequate explanation, as it has in the numerous other case histories that are known. Preserved in the Puritan literature are many isolated instances of strange diseases among children which sound much like hysteria. Though perhaps not so dramatic, because there were no executions, but just as important are the examples of mass religious hysteria during the frequent revivals, of which the "Great Awakening" in 1740 is the best example. And it is a curious fact that no one ever blames the children for the outbreak of hysteria at Northampton in 1740, yet the children of Salem are held responsible for what was an essentially similar affair. With a knowledge of the religious background of the Salem children it seems rather unimportant to argue whether Cotton Mather was guilty of the witchcraft hangings by influencing the governor, the judges or the mob on Gallows Hill. He was guilty only insofar as he was a Calvinist; but so, indeed, was nearly everybody else.

The history of the Salem witchcraft should be more concerned with the family background and medical history of the afflicted children, for they were victims as well as the persons who were hanged. It was no coincidence that Martha Goodwin, child of devout parents, acquired her hysteria just at the time when "she was in the dark concerning her Souls estate" and the mere sight of the Bible or the catechism always sent her into "hideous convul-

sions." Nor was it very strange that the first cases in Salem Village occurred in the very home of the red-hot Devil-chaser, the Rev. Samuel Parris. "Pray for the salvation of my soule for they will kill me," from the mouth of the bewitched Mercy Lewis, was one of the most significant remarks made during the Salem trials. Those children had ample reason to become hysterical when repeatedly told that the monstrous, invisible, venomous, hissing and sooty Devil was right in their neighborhood ready to devour them; and no doubt many of them were positively convinced that they were actually bewitched.

One is not obliged to accept the verdict of the popular historians that the children were deceitful, wicked, malicious and dishonest. History has been unkind to them along enough. They were not imposters or pests or frauds; they were not cold-blooded malignant brats. They were sick children in the worst sort of mental distress—living in fear for their very lives and the welfare of their immortal souls. Hysteria was only the outward manifestation of their feeble attempts to escape from their insecure, cruel, depressive Salem Village world—a world thoroughly saturated with the pungent fumes of burning brimstone.

Is there a physiological explanation for Salem? LINNDA R. CAPORAEI, a young graduate student in biology at the University of California, Santa Barbara, attributed the bizarre behavior of the residents of the village to a disease that is contracted from contaminated grain. The strange fits and visions they experienced were symptoms of this disease, convulsive ergotism.

If true, Caporaesi's thesis provides a dramatic scientific explanation to an old mystery, and it has the added appeal of linking Salem to the modern drug culture. It was undoubtedly this dramatic quality that motivated the New York Times to announce in a front page article "Salem Witch Hunts in 1692 Linked to LSD-Like Agent."

9. A Biologist Diagnoses Disease

Ergot

Interest in ergot (*Claviceps purpurea*) was generated by epidemics of ergotism that periodically occurred in Europe. Only a few years before the Salem witchcraft trials the first medical scientific report on ergot was made. Denis Dodart reported the relation between ergotized rye and bread poisoning

From Linnda R. Caporaesi, "Ergotism: The Satan Loosed in Salem?" *Science*, vol. 192 (2 April 1976), pp. 21-26. Copyright © 1976 by the American Association for the Advancement of Science. Reprinted by permission of *Science* magazine and the author. Footnotes omitted.

in a letter to the French Royal Academie des Sciences in 1676. John Ray's mention of ergot in 1677 was the first in English. There is no reference to ergot in the United States before an 1807 letter by Dr. John Stearns recommending powdered ergot sclerotia to a medical colleague as a therapeutic agent in childbirth. Stearns is generally credited with the "discovery" of ergot: certainly his use prompted scientific research on the substance. Until the mid-19th century, however, ergot was not known as a parasitic fungus, but was thought to be sunbaked kernels of grains.

Ergot grows on a large variety of cereal grains—especially rye—in a slightly curved, fusiform shape with sclerotia replacing individual grains on the host plant. The sclerotia contain a large number of potent pharmacologic agents, the ergot alkaloids. One of the most powerful is isoergine (lysergic acid amide). This alkaloid, with 10 percent of the activity of D-LSD (lysergic acid diethylamide), is also found in ololiuqui (morning glory seeds), the ritual hallucinogenic drug used by the Aztecs.

Warm, damp, rainy springs and summers favor ergot infestation. Summer rye is more prone to the development of the sclerotia than winter rye, and one field may be heavily ergotized while the adjacent field is not. The fungus may dangerously parasitize a crop one year and not reappear again for many years. Contamination of the grain may occur in varying concentrations. Modern agriculturalists advise farmers not to feed their cattle grain containing more than one to three sclerotia per thousand kernels of grain, since ergot has deleterious effects on cattle as well as on humans.

Ergotism, or long-term ergot poisoning, was once a common condition resulting from eating contaminated rye bread. In some epidemics it appears that females were more liable to the disease than males. Children and pregnant women are most likely to be affected by the condition, and individual susceptibility varies widely. It takes two years for ergot in powdered form to reach 50 percent deterioration, and the effects are cumulative. There are two types of ergotism—gangrenous and convulsive. As the name implies, gangrenous ergotism is characterized by dry gangrene of the extremities followed by the falling away of the affected portions of the body. The condition occurred in epidemic proportions in the Middle Ages and was known by a number of names, including *ignis sacer*, the holy fire.

Convulsive ergotism is characterized by a number of symptoms. These include crawling sensations in the skin, tingling in the fingers, vertigo, tinnitus aurium, headaches, disturbances in sensation, hallucination, painful muscular contractions leading to epileptiform convulsions, vomiting, and diarrhea. The involuntary muscular fibers such as the myocardium and gastric and intestinal muscular coat are stimulated. There are mental disturbances such

as mania, melancholia, psychosis, and delirium. All of these symptoms are alluded to in the Salem witchcraft records.

Evidence for Ergotism in Salem

It is one thing to suggest convulsive ergot poisoning as an initiating factor in the witchcraft episode, and quite another to generate convincing evidence that it is more than a mere possibility. A jigsaw of details pertinent to growing conditions, the timing of events in Salem, and symptomology must fit together to create a reasonable case. From these details, a picture emerges of a community stricken with an unrecognized physiological disorder affecting their minds as well as their bodies.

1) *Growing conditions.* The common grass along the Atlantic Coast from Virginia to Newfoundland was and is wild rye, a host plant for ergot. Early colonists were dissatisfied with it as forage for their cattle and reported that it often made the cattle ill with unknown diseases. Presumably, then, ergot grew in the New World before the Puritans arrived. The potential source for infection was already present, regardless of the possibility that it was imported with English rye.

Rye was the most reliable of the Old World grains and by the 1640's it was a well-established New England crop. Spring sowing was the rule: the bitter winters made fall sowing less successful. Seed time for the rye was April and the harvesting took place in August. However, the grain was stored in barns and often waited months before being threshed when the weather turned cold. The timing of Salem events fits this cycle. Threshing probably occurred shortly before Thanksgiving, the only holiday the Puritans observed. The children's symptoms appeared in December 1691. Late the next fall, 1692, the witchcraft crisis ended abruptly and there is no further mention of the girls or anyone else in Salem being afflicted.

To some degree or another all rye was probably infected with ergot. It is a matter of the extent of infection and the period of time over which the ergot is consumed rather than the mere existence of ergot that determines the potential for ergotism. In his 1807 letter written from upstate New York, Stearns advised his medical colleague that, "On examining a granary where rye is stored, you will be able to procure a sufficient quantity [of ergot sclerotia] from among that grain." Agricultural practice had not advanced, even by Stearns's time, to widespread use of methods to clean or eliminate the fungus from the rye crop. In all probability, the infestation of the 1691 summer rye crop was fairly light; not everyone in the village or even in the same families showed symptoms.

Certain climatic conditions, that is, warm, rainy springs and summers, promote heavier than usual fungus infestation. The pattern of the weather in 1691 and 1692 is apparent from brief comments in Samuel Sewall's diary. Early rains and warm weather in the spring progressed to a hot and stormy summer in 1691. There was a drought the next year, 1692, thus no contamination of the grain that year would be expected.

2) *Localization.* "Rye," continues Stearns "which grows in low, wet ground yields [ergot] in greatest abundance." Now, one of the most notorious of the accusing children in Salem was Thomas Putnam's 12-year-old daughter, Ann. Her mother also displayed symptoms of the affliction and psychological historians have credited the senior Ann with attempting to resolve her own neurotic complaints through her daughter. Two other afflicted girls also lived in the Putnam residence. Putnam had inherited one of the largest landholdings in the village. His father's will indicates that a large measure of the land, which was located in the western sector of Salem Village, consisted of swampy meadows that were valued farmland to the colonists. Accordingly, the Putnam farm, and more broadly, the western acreage of Salem Village, may have been an area of contamination. This contention is further substantiated by the pattern of residence of the accusers, the accused, and the defenders of the accused living within the boundaries of Salem Village. Excluding the afflicted girls, 30 of 32 adult accusers lived in the western section and 12 of the 14 accused witches lived in the eastern section, as did 24 of the 29 defenders. The general pattern of residence, in combination with the well-documented factionalism of the eastern and western sectors, contributed to the progress of the witchcraft crisis.

The initially afflicted girls show a slightly different residence pattern. Careful examination reveals plausible explanations for contamination in six of the eight cases.

Three of the girls, as mentioned above, lived in the Putnam residence. If this were the source of ergotism, their exposure to ergotized grain would be natural. Two afflicted girls, the daughter and niece of Samuel Parris, lived in the parsonage almost exactly in the center of the village. Their exposure to contaminated grain from western land is also explicable. Two-thirds of Parris' salary was paid in provisions; the villagers were taxed proportionately to their landholding. Since Putnam was one of the largest landholders and an avid supporter of Parris in the minister's community disagreements, an ample store of ergotized grain would be anticipated in Parris's larder. Putnam was also Parris's closest neighbor with afflicted children in residence.

The three remaining afflicted girls lived outside the village boundaries to the east. One, Elizabeth Hubbard, was a servant in the home of Dr. Griggs. It

seems plausible that the doctor, like Parris, had Putnam grain, since Griggs was a professional man, not a farmer. As the only doctor in town, he probably had many occasions to treat Ann Putnam, Sr., a woman known to have much ill health. Griggs may have traded his services for provisions or bought food from the Putnams.

Another of the afflicted, Sarah Churchill, was a servant in the house of a well-off farmer. The farm lay along the Wooleston River and may have offered good growing conditions for ergot. It seems probable, however, that Sarah's affliction was a fraud. She did not become involved in the witchcraft persecutions until May, several months after the other girls were afflicted, and she testified in only two cases, the first against her master. One deponent claimed that Sarah later admitted to belying herself and others.

How Mary Warren, a servant in the Proctor household, would gain access to grain contaminated with ergot is something of a mystery. Proctor had a substantial farm to the southeast of Salem and would have had no need to buy or trade for food. Both he and his wife were accused of witchcraft and condemned. None of the Proctor children showed any sign of the affliction; in fact, three were accused and imprisoned. One document offered as evidence against Proctor indicates that Mary stayed overnight in the village. How often she stayed or with whom is unknown.

Mary's role in the trials is particularly curious. She began as an afflicted person, was accused of witchcraft by the other afflicted girls, and then became afflicted again. Two depositions filed against her strongly suggest, however, that at least her first affliction may have been a consequence of ergot poisoning. Four witnesses attested that she believed she had been "distempered" and during the time of her affliction had thought she had seen numerous apparitions. However, when Mary was well again, she could not say that she had seen any specters. Her second affliction may have been the result of intense pressure during her examination for witchcraft crimes.

Ergotism and the Testimony

The utmost caution is necessary in assessing the physical and mental states of people dead for hundreds of years. Only the sketchiest accounts of their lives remain in public records. In the case of ergot, a substance that affects mental as well as physical states, recognition of the social atmosphere of Salem in early spring 1692 is basic to understanding the directions the crisis took. The Puritans' belief in witchcraft was a totally accepted part of their religious tenets. The malicious workings of Satan and his cohorts were just as real to the early colonists as their belief in God. Yet, the low incidence of

witchcraft trials in New England prior to 1692 suggests that the Puritans did not always resort to accusations of black magic to deal with irreconcilable differences or inexplicable events.

The afflicted girls' behavior seemed to be no secret in early spring. Apparently it was the great consternation that some villagers felt that induced Mary Sibley to direct the making of the witch cake of rye meal and the urine of the afflicted. This concoction was fed to a dog, ostensibly in the belief that the dog's subsequent behavior would indicate the action of any malefic magic. The fate of the dog is unknown; it is quite plausible that it did have convulsions, indicating to the observers that there was witchcraft involved in the girls' afflictions. Thus, the experiments with the witch cake, rather than any magic tricks by Tituba, initiated succeeding events.

The importance of the witch cake incident has generally been overlooked. Parris' denouncement of his neighbor's action is recorded in his church records. He clearly stated that, until the making of the cake, there was no suspicion of witchcraft and no reports of torturing apparitions. Once a community member had gone "to the Devil for help against the Devil," as Parris put it, the climate for the trials had been established. The afflicted girls, who had made no previous mention of witchcraft, seized upon a cause for their behavior—as did the rest of the community. The girls named three persons as witches and their afflictions thereby became a matter for the legal authorities rather than the medical authorities or the families of the girls.

The trial records indicate numerous interruptions during the proceedings. Outbursts by the afflicted girls describing the activities of invisible specters and "familiar" (agents of the devil in animal form) in the meeting house were common. The girls were often stricken with violent fits that were attributed to torture by apparitions. The spectral evidence of the trials appears to be the hallucinogenic symptoms and perceptual disturbances accompanying ergotism. The convulsions appear to be epileptiform.

Accusations of choking, pinching, pricking with pins, and biting by the specter of the accused formed the standard testimony of the afflicted in almost all the examinations and trials. The choking suggests the involvement of the involuntary muscular fibers that is typical of ergot poisoning; the biting, pinching, and pricking may allude to the crawling and tingling sensations under the skin experienced by ergotism victims. Complaints of vomiting and "bowels almost pulled out" are common in the depositions of the accusers. The physical symptoms of the afflicted and many of the other accusers are those induced by convulsive ergot poisoning.

When examined in the light of a physiological hypothesis, the content of so-called delusional testimony, previously dismissed as imaginary by his-

torians, can be reinterpreted as evidence of ergotism. After being choked and strangled by the apparition of a witch sitting on his chest, John Londer testified that a black thing came through the window and stood before his face. "The body of it looked like a monkey, only the feet were like cock's feet, with claws, and the face somewhat more like a man's than a monkey . . . the thing spoke to me. . ."

Joseph Bayley lived out of town in Newbury. According to Upham, the Bayleys, en route to Boston, probably spent the night at the Thomas Putnam residence. As the Bayleys left the village, they passed the Proctor house and Joseph reported receiving a "very hard blow" on the chest, but no one was near him. He saw the Proctors, who were imprisoned in Boston at the time, but his wife told him that she saw only a "little maid." He received another blow on the chest, so strong that he dismounted from his horse and subsequently saw a woman coming toward him. His wife told him she saw nothing. When he mounted his horse again, he saw only a cow where he had seen the woman. The rest of Bayley's trip was uneventful, but when he returned home, he was "pinched and nipped by something invisible for some time." It is a moot point, of course, what or how much Bayley ate at the Putnams', or that he even really stayed there. Nevertheless, the testimony suggests ergot. Bayley had the crawling sensations in the skin, disturbances in sensations, and muscular contractions symptomatic of ergotism. Apparently his wife had none of the symptoms and Bayley was quite candid in so reporting.

A brief but tantalizing bit of testimony comes from a man who experienced visions that he attributed to the evil eye cast on him by an accused witch. He reported seeing about a dozen "strange things" appear in his chimney in a dark room. They appeared to be something like jelly and quavered with a strange motion. Shortly, they disappeared and a light the size of a hand appeared in the chimney and quivered and shook with an upward motion. As in Bayley's experience, this man's wife saw nothing. The testimony is strongly reminiscent of the undulating objects and lights reported in experience induced by LSD.

By the time the witchcraft episode ended in the late fall 1692, 20 persons had been executed and at least two had died in prison. All the convictions were obtained on the basis of the controversial spectral evidence. One of the commonly expressed observations about the Salem Village witchcraft episode is that it ended unexpectedly for no apparent reason. No new circumstances to cast spectral evidence in doubt occurred. Increase Mather's sermon on 3 October 1692, which urged more conclusive evidence than invisible apparitions or the test of touch, was just a stronger reiteration of the clergy's

15 June advice to the court. The grounds for dismissing the spectral evidence had been consistently brought up by the accused and many of their defenders throughout the examinations. There had always been a strong undercurrent of opposition to the trials and the most vocal individuals were not always accused. In fact, there was virtually no support in the colonies for the trials, even from Boston, only 15 miles away. The most influential clergymen lent their support guardedly at best; most were opposed. The Salem witchcraft episode was an event localized in both time and space.

How far the ergotized grain may have been distributed is impossible to determine clearly. Salem Village was the source of Salem Town's food supply. It was in the town that the convictions and orders for executions were obtained. Maybe the thought processes of the magistrates, responsible and respected men in the Colony, were altered. In the following years, nearly all of them publicly admitted to errors of judgment. These posttrial documents are as suggestive as the court proceedings.

In 1696, Samuel Sewall made a public acknowledgment of personal guilt because of the unsafe principles the court followed. In a public apology, the 12 jurymen stated, "We confess that we ourselves were not capable to understand nor able to withstand the mysterious delusion of the Powers of Darkness and Prince of the Air . . . [we] do hereby declare that we justly fear that we were sadly deluded and mistaken. . . ." John Hale, a minister involved in the trials from the beginning, wrote: "such was the darkness of the day . . . that we walked in the clouds and could not see our way."

Finally, Ann Putnam, Jr., who testified in 21 cases, made a public confession in 1706.

I justly fear I have been instrumental with others though ignorantly and unwittingly, to bring upon myself and this land the guilt of innocent blood; though what was said or done by me against any person I can truly and uprightly say before God and man, I did it not for any anger, malice or ill will to any person for I had no such things against one of them, but what I did was ignorantly, being deluded of Satan.

One Satan in Salem may well have been convulsive ergotism.

Conclusion

One could reasonably ask whether, if ergot was implicated in Salem, it could have been implicated in other witchcraft incidents. The most cursory examination of Old World witchcraft suggests an affirmative answer. The district of Lorraine suffered outbreaks of both ergotism and witchcraft perse-

cutions throughout the Middle Ages until the 17th century. As late as the 1700's, the clergy of Saxony debated whether convulsive ergotism was symptomatic of disease or demonic possession. Kittredge, an authority on English witchcraft reports what he calls "a typical case" of the 1600's. The malicious magic of Alice Trevisard, an accused witch, backfired and the witness reported that Alice's hands, fingers, and toes "rotted and consumed away." The sickness sounds suspiciously like gangrenous ergotism. Years later, in 1762, one family in a small English village was stricken with gangrenous ergotism. The Royal Society determined the diagnosis. The head of the family, however, attributed the condition to witchcraft because of the suddenness of the calamity.

Of course, there can never be hard proof for the presence of ergot in Salem, but a circumstantial case is demonstrable. The growing conditions and the pattern of agricultural practices fit the timing of the 1692 crisis. The physical manifestations of the condition are apparent from the trial records and contemporaneous documents. While the fact of perceptual distortions may have been generated by ergotism, other psychological and sociological factors are not thereby rendered irrelevant; rather, these factors gave substance and meaning to the symptoms. The content of hallucinations and other perceptual disturbances would have been greatly influenced by the state of mind, mood, and expectations of the individual. Prior to the witch case episode, there is no clue as to the nature of the girls' hallucinations. Afterward, however, a delusional system, based on witchcraft, was generated to explain the content of the sensory data. Valins and Nisbett, in a discussion of delusional explanations of abnormal sensory data, write, "The intelligence of the particular patient determines the structural coherence and internal consistency of the explanation. The cultural experiences of the patient determine the content—political, religious, or scientific—of the explanation." Without knowledge of ergotism and confronted by convulsions, mental disturbances, and perceptual distortions, the New England Puritans seized upon witchcraft as the best explanation for the phenomena.

Two psychologists at Carleton University, NICHOLAS P. SPANOS (b. 1942) and JACK GOTTLIEB (b. 1951), have challenged Linnda Caporael's thesis that ergot poisoning lay at the basis of the witchcraft outbreak. In an article published in *Science* magazine, Spanos and Gottlieb argue that most of the symptoms of ergotism were not exhibited at Salem. The fact that the fits and visions of the witnesses seemed to start and stop on cue suggests a social, rather than a physiological explanation.

This is an interesting example of how researchers working with the same source material can arrive at strikingly different conclusions. It remains for the reader to decide which of the two interpretations is most persuasive.

10. The Disease Diagnosis Disputed

In a recent article in *Science* it was suggested that the residents of Salem Village, Massachusetts, who in 1692 charged some of their neighbors with witchcraft did so because of delusions resulting from convulsive ergotism. The author of the article, L. R. Caporael, argued that (i) the general features of the Salem crisis corresponded to the features of an epidemic of convulsive ergotism, (ii) symptoms manifested by the girls who were the principal accusers were those of ergot poisoning, (iii) the symptoms shown by the other accusing witnesses were also those of convulsive ergotism, and (iv) the abrupt ending of the Salem crisis suggests ergot poisoning. We shall attempt to show that these arguments are not well founded.

Features of Convulsive Ergotism Epidemics

Ergot is a fungus (*Claviceps purpurea*) that under some conditions infests rye and other cereal grains. When ingested the ergotized grain may produce a variety of cardiovascular effects leading, among other things, to gangrene (gangrenous ergotism), or neurological effects leading, among other things, to convulsions (convulsive ergotism). Epidemics of convulsive ergotism have a number of general features that differ substantially from the events that occurred in Salem.

According to Barger, epidemics of convulsive ergotism have occurred almost exclusively in locales where the inhabitants suffered severe vitamin A deficiencies. Ergot poisoning in individuals with adequate vitamin A intakes

From Nicholas P. Spanos and Jack Gottlieb, "Ergotism and the Salem Village Witch Trials," *Science*, vol. 194 (24 December 1976), pp. 1390-1394. Copyright © 1976 by the American Association for the Advancement of Science. Reprinted by permission of *Science* magazine and the authors. Footnotes omitted.

leads to gangrenous rather than convulsive symptoms. Vitamin A is found both in fish and in dairy products. Salem Village was a farming community and Salem Town, which bordered the village, was a well-known seaport; cows and fish were plentiful. There is no evidence to suggest a vitamin A deficiency in the diet of the inhabitants, and it would be particularly unlikely for the so-called "afflicted girls," some of whom came from well-to-do farming families. The absence of any instance of gangrenous symptomatology makes it highly unlikely that ergot played any role in the Salem crisis.

Young children are particularly susceptible to convulsive ergotism. Barger states:

All accounts of convulsive ergotism agree that children were more liable to convulsive ergotism than adults; thus 56 percent in the Finnish epidemic were under 10 years of age; 60 percent of Scrinic's cases were under 15 years of age. . . .

Only 3 of the 11 afflicted girls in Salem were under 15 years of age and only one of those was under 10. There is no evidence either in the trial records or in eyewitness accounts to indicate a high rate of convulsive symptoms in the young children of Salem Village during the witch crisis. In fact we could find references to only two cases of convulsions in children under ten during the period of the crisis. One of these was the afflicted girl mentioned above. The other was an 8-week-old infant that convulsed before it died. An 8-week-old infant would not yet have been weaned, and nursing infants do not suffer ergot poisoning even if their mothers have a very severe case of the disease; it is therefore unlikely that this infant died from ergotism.

The fact that most of the individuals (including young children) living in the same households as the afflicted girls showed no symptoms is attributed by Caporael to wide individual differences in susceptibility to ergot poisoning. While there are wide individual differences in susceptibility to gangrenous ergotism, convulsive ergotism is another matter. According to Barger it was common for all members of a family to develop symptoms of convulsive ergotism during epidemics. This tendency was so pronounced that convulsive ergotism was long (but erroneously) thought to be infectious.

Convulsive ergotism characteristically produces the following symptoms: (i) vomiting, (ii) diarrhea, (iii) a livid skin color, (iv) sensations of heat and cold in the extremities, (v) spastic muscular contractions in the extremities, which in severe cases may become permanent sequelae, (vi) severe itching and tingling sensations, (vii) convulsions, (viii) a ravenous appetite following convulsions, (ix) death in severe cases. Permanent dementia may also be a symptom in severe cases. Perceptual disturbances may occur, but such

disturbances would not be expected to occur independently of the other symptoms.

Caporael says that "complaints of vomiting and 'bowels almost pulled out' are common in the depositions of the accusers." This statement is incorrect. *Records of Salem Witchcraft* (RSW) contains 117 depositions by the afflicted girls and 79 depositions in which other witnesses describe the behaviour of the girls. There are also eyewitness accounts by Mather, Lawson, Brattle, and Hale which are not contained in RSW. We examined all these sources and were unable to find any reference to the occurrence of vomiting or diarrhea among the afflicted girls. In all these sources we found only three instances of gastrointestinal complaints among the girls. In one of these cases the girl making the complaint (Mary Warren) lived outside the area that Caporael suggested was exposed to ergot. Thus 8 of the 11 afflicted girls did not report any gastrointestinal symptoms. Those who did reported only a single instance. None of them reported vomiting or was observed to vomit, and there is no indication that any of them suffered from diarrhea.

We found no indication in any of the works examined that the afflicted girls manifested a livid color of the skin. We found no reference to cold sensations in the extremities, and only two references to burning sensations. In one of those cases an afflicted girl slowly reached out and touched the hood of an accused witch, then immediately pulled back her hand and "cried out, her fingers, her fingers burned." In the second case the judges had obtained a rag puppet which they believed had been used by a witch to afflict people at a distance. They burned the puppet in the presence of the afflicted girls with the following results: "A bit of one of the rags being set on fire (the afflicted) cried out dreadfully (that they were burned)." Rather than ergot poisoning, these descriptions suggest that the afflicted girls were enacting the roles that would sustain their definition of themselves as bewitched and that would lead to the conviction of the accused.

According to Caporael, the afflicted girls' convulsions "appear to be epileptiform" and their reports of being bitten, pinched, and pricked by specters "may allude to the crawling and tingling sensations under the skin experienced by ergotism victims." There is no question that the girls frequently convulsed and reported being bitten and pinched. However, a careful look at the social context in which these symptoms were typically manifested belies the notion that they resulted from an internal disease process. The trial testimony indicates very clearly that the girls convulsed and reported being bitten and pinched when an accused person's behavior provided them with a social cue for such acts.

For example, when one of the accused was ordered to look at an afflicted

girl, "he looked back and knocked down all (or most) of the afflicted who stood behind him." In another case, "As soon as she [the accused witch] came near all [the afflicted] fell into fits." The courtroom testimony contains a great many instances of the afflicted girls' convulsing en masse when the accused entered the room, looked in their direction, moved his chair, and so on. The afflicted girls' reports of being pinched, choked, and bitten are described thus by Lawson, an eyewitness:

It was observed several times, that if she [the accused witch] did but bite her underlip in time of examination the persons afflicted were bitten on their arms and wrists and produced the marks before the magistrates, ministers and others.

The afflicted also produced the pins with which the accused purportedly pinched them.

The afflicted girls were responsive to social cues from each other as well as from the accused and were therefore able to predict the occurrence of each other's fits. In such cases one of the girls would cry out that she saw the specter of an accused witch about to attack another of the afflicted. The other girl would then immediately fall into a fit. Termination of the girls' convulsions was also cued by social-psychological factors. In some cases convulsions would cease when a certain Biblical passage was read. More commonly the girls' convulsions would cease as soon as they were touched by the accused.

Convulsions at the sight of a witch, alleviation of convulsions by the witch's touch, prediction of their own and others' convulsions, and production by the afflicted of bite marks and the pins used to pinch them were all considered standard symptoms in 16th and 17th century cases of demonic possession. Taken together, these facts indicate that the afflicted girls were enacting the role of demoniacs as that role was commonly understood in their day.

Caporael points out that one ergot alkaloid, isoergine (lysergic acid amide), has 10 percent of the activity of LSD and might therefore produce perceptual disturbances. She remarks that "the spectral evidence of the trials appears to be hallucinogenic symptoms and perceptual disturbances accompanying ergotism." The term "hallucination" is, unfortunately, very unspecific, and in the psychological literature is used to refer to a wide variety of distinct experiences. Although LSD is commonly referred to as a hallucinogen, Barber has correctly pointed out that "subjects who have ingested [LSD] very rarely report, when their eyes are open, that they perceive formed persons or objects which they believe are actually out there." Instead, they tend to report perceptual distortion such as persistent after-images, rainbow-

like colors, halos on the edges of objects, changes in depth perception, contours that appear to undulate, and the like. None of the testimony given by the afflicted girls indicates perceptual distortions of that kind. Instead, they reported seeing "formed persons"—the specters of the accused—attacking, biting, pinching, and choking them and others.

As to the remaining symptoms of ergot poisoning, none of the work we studied indicates that the girls experienced ravenous appetites after their convulsions, suffered permanent contractures of the hands or feet or other signs of permanent neurological damage, suffered permanent dementia, or died. It should be noted that the girls often appeared to be quite healthy outside the courtroom. Even in the courtroom they did not exhibit the signs of chronic malaise and debilitation that might be expected after months of chronic poisoning. Thus, Brattle wrote:

Many of these afflicted persons, who have scores of strange fits in a day, yet in the intervals of time are hale and hearty, robust and lusty, as tho' nothing had afflicted them. I remember that when the chief Judge gave the first Jury their charge, he told them, that they were not to mind whether the bodies of the said afflicted were really pined and consumed, as was expressed in the indictment; but whether the said afflicted did not suffer from the accused such afflictions as naturally *tended* to their being pined and consumed, wasted etc.

In summary, while the afflicted girls exhibited rather dramatic behavior, none of them displayed the syndrome of convulsive ergotism. Instead, they showed symptoms of "demonic possession," a phenomenon that was fairly common among 16th- and 17th-century Puritans in both England and Colonial America.

It is worth noting that the initial symptoms of the afflicted girls were rather ambiguous, and that they began to correspond more closely to popular stereotypes of demonic behavior as the girls gained increasing exposure to information about those stereotypes. The initial symptoms included "getting into holes, and creeping under chairs and stools, and [using] sundry odd postures and antic gestures, uttering foolish and ridiculous speeches." About 2 weeks after these symptoms began a neighbor had a "witch cake" baked in order to determine whether the girls were bewitched. Only after this event did the girls begin convulsing and reporting the specters of witches. As the witchcraft trials progressed, the girls added to the repertoire. They collapsed en masse when looked at by the accused during the first trial. During the fourth examination they began complaining of being bitten whenever they observed the accused nervously bite her lip and of being pinched when she moved her

hand. In later examinations they began to mimic the accused; they held their heads in the same position as that of the accused and rolled their eyes up after the accused did so. This temporal pattern suggests that the demonic manifestations were learned, that the girls' behavior was gradually (although perhaps unwittingly) shaped to fit the expectations for demonic behavior held by the community.

In Caporaël's view, there is a "major difficulty in accepting the explanation of purposeful fraud . . . [namely] the gravity of the girls' symptoms." The implication of this statement is that the girls' performances somehow transcended the volitional capacities of normal, physically healthy people. Therefore it should be pointed out that numerous 16th-century English demoniacs who displayed all the symptoms manifested by the Salem girls later confessed that they had faked these displays. They confirmed their confessions by publicly enacting all of their supposedly involuntary symptoms. These facts certainly do not prove that the performances of the Salem girls consisted entirely of conscious faking, but they do indicate that the girls' behavior can be accounted for without recourse to explanations based on unusual diseases.

Symptoms of Other Witnesses

Twenty-nine of the accused witches lived in or on the fringes of Salem Village or had moved from the village within a few years of the crisis. Boyer and Nissenbaum have pointed out that most of the accused lived in one half of the village and most of the witnesses who testified against them lived in the other half. They hypothesize that this geographical split in the pattern of accusations was to a large extent a function of political and social factionalism within the village. Caporaël postulates that the accusing witnesses were exposed to ergot poisoning by their location while the accused were not exposed by theirs. She suggests that not only the girls but "many of the other accusers" had physical symptoms such as are "induced by convulsive ergot poisoning."

Records of Salem Witchcraft contains 111 depositions made by 80 different witnesses (not including the afflicted girls) against the 29 accused village residents. Trial records compiled by Boyer and Nissenbaum include a deposition made by one of these witnesses that is not included in RSW. We examined these 112 depositions looking for behavior that, even in a broad sense, might possibly represent symptoms of convulsive ergotism. These symptoms, and the number of individuals who suffered from them, are shown in Table 1. Witnesses were excluded from this table if they reported that their symptoms occurred a year or more before the Salem crisis began (five cases).

Table 1. Symptoms of witnesses (other than the afflicted girls) who testified against the accused witches. A, vomiting; B, diarrhea; C, livid skin; D, permanent contractures; E, pain in extremities; F, death; G, temporary muscle stiffness; H, convulsions; I, ravenous appetite; J, perceptual disturbances (not including apparitions); K, apparitions; L, sensations of hot and cold; M, skin sensations (biting and pinching); N, stomach pain; O, choking sensations; P, temporary inability to speak; I, symptom reported; 0, symptom not reported; ?; symptom questionable.

Reported sufferers	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Total
W. Allan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
J. Bayley	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S. Bitford	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
A. Booth	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
J. Childen	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G. Cory	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
J. Dorch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
B. Gould	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
J. Holton	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
J. Hughes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
J. Indian	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T. Indian	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E. Keyser	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M. Pope	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
H. Putnam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
J. Putnam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W. Putnam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
D. Wilkins	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
R. Wilkins	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S. Wilkins	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E. Woodwell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	39

or while they were out of Salem and therefore not exposed to the supposedly ergotized grain (one case), or for some other reason could not have been exposed to ergot (one case)—that of the 8-week-old infant referred to earlier). One of these excluded witnesses, John Londer, gave a colorful account of seeing a "thing" with a monkey's face and cock's feet. Caporaël specifically cites this testimony as a probable example of ergot poisoning despite the fact that Londer stated explicitly that he had experienced the apparition 7 or 8 years before the outbreak of the Salem crisis.

The first fact uncovered by our examination was that 78 percent of the witnesses did not report suffering even a single symptom; only 18 reported suffering one or more symptoms after the ergotism is hypothesized to have begun. Most of the testimony consisted of observation made on the afflicted girls or other factual information (such as that the witness's cow died three days after the accused passed by his barn). Three witnesses testified about the death of one man and several testified about symptoms of three other individuals. Altogether, the testimony examined contained symptoms for 21 individuals other than the afflicted girls.

The first thing to note about Table 1 is that none of the witnesses reported a pattern of symptoms characteristic of convulsive ergotism. There is no evidence that any of them suffered vomiting, diarrhea, a livid skin color, permanent contractures of the extremities, a ravenous appetite, or perceptual disturbances (other than apparitions). In 10 of the 21 cases only a single symptom was reported. G. Cory reported a short-lived inability to say his prayers, and W. Putnam mimicked the gestures of one of the accused (he clenched his fist when she clenched hers and held his head in the same position as she did hers). These are obviously not cases of ergotism. In a third case, J. Putnam suffered briefly from "strange fits." The timing of these fits makes ergot an unlikely possibility. Caporaël reasons that the village was exposed to ergotized rye by December 1691. Putnam reported having his fits in April 1692. It is unlikely that he would have been so late in succumbing to its effects.

In a fourth monosymptomatic case two of the afflicted girls testified that J. Holton was "tormented" by specters and that while they observed him the specters left him and began attacking them instead. Holton testified that he was immediately cured as soon as the girls reported that the specters had left him to attack them. Such an immediate alleviation of symptoms is obviously not characteristic of ergot poisoning.

In the other six monosymptomatic cases the witnesses each reported an apparition. These individuals all stated that on one or more occasions they saw a specter of some sort, usually the vivid image of an accused witch, a dead

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person, or an animal. All indicated belief that these imaginings were real events rather than dreams (some occurred while they were in bed) or flights of fancy. However, none of these witnesses also reported perceptual disturbances (such as halos around objects). As was pointed out above, apparition or perceptual distortions in the absence of other symptoms are not characteristic of ergot poisoning. The apparition described by these five witnesses were very similar to apparitions that five other witnesses (not included in Table I) said they had experienced several years before the hypothesized outbreak of ergotism.

The remaining 11 witnesses in Table 1 each exhibited more than one symptom. In two of these cases (Bittford and Gould) the witnesses' experiences consisted primarily of what were probably dreams of hypnotic experiences. Both men reported being in bed at night when they saw apparitions of accused witches. Bittford testified that his experience was accompanied by a stiffness in his neck that lasted several days, and Gould said that he was pinched twice on his side. Gould also reported a second apparition, which was followed by a pain in his foot lasting 2 or 3 days.

Daniel Wilkins died after an illness that lasted about 2 weeks. The only symptom reported about his illness was that he appeared to be choking shortly before he died, and this was reported only after the afflicted girls testified that they saw specters choking him. Wilkins did not show any sign of illness before the beginning of May 1692. For ergot to explain these events he would have had to be eating poisoned rye for 4 months without exhibiting any symptoms and then suddenly to have fallen ill and died in 2 weeks—a highly improbable occurrence.

Several symptoms are recorded for Wilkins's sister Rebecca, but she had not exhibited any of them until after a physician had diagnosed her brother's illness as pretermatural and after the afflicted girls had reported seeing specters attack his body.

Another brother, S. Wilkins, reported an array of symptoms which included a pain in his hand, specters of a witch and of a black hat, falling off his horse, and a strong urge to run. None of them were experienced before June 1692.

Four persons, J. Doritch, J. Indian, T. Indian, and Mrs. Pope, displayed symptoms during the trials similar to those displayed by the afflicted girls. All convulsed and reported seeing specters that afflicted them or others. Mrs. Pope convulsed whenever an afflicted girl "saw" her about to be attacked by specters, and J. Indian's convulsions could be terminated by the touch of a witch. On one occasion Mrs. Pope also reported pain in her stomach whenever an accused witch "did but lean her Breast against the Seat." T. Indian

eventually confessed that she had reported apparitions and enacted other symptoms because her master had beaten her and otherwise threatened her until she agreed to do so.

E. Keysar is the only witness in all the Salem records whose testimony includes symptoms even vaguely resembling the perceptual distortions associated with LSD. Keysar reported that, while in a darkened room, he saw "strange things" that quivered. This was immediately followed by seeing a quivering hand in his fireplace. Testimony of this type may be associated with acute anxiety and a host of other factors as well as with hallucinogenic substances. There are at least three reasons to infer that Keysar's experience was due to anxiety and expectation rather than to ergot: (i) he reported no other symptoms, (ii) the experience occurred in May 1692, five months after the time he would have begun ingesting ergot, and (iii) earlier that same day he had been severely frightened because he believed that an accused witch "did steadfastly fix [his] eyes upon me."

The final case, and the only one to exhibit as many as four of the symptoms listed in Table 1, is that of J. Bayley, who as Caporael points out did not live in Salem Village. He and his wife had spent one evening there and left the next day. On their way out of the village they passed the house of a man and wife accused of witchcraft. Bayley reported that at this point he felt a blow to his chest and a pain in his stomach. He also thought he saw the accused witches (who were jailed at the time) near the house and then became speechless for a brief period of time. Shortly thereafter he experienced another blow to the chest and thought he saw a woman in the distance. When he looked again he saw a cow rather than a woman. After arriving at his home he reported feeling pinched and bitten by something invisible. His wife experienced no symptoms. Caporael says Bayley's testimony "suggests ergot." It seems far more plausible, however, that being a fervent believer in witchcraft he experienced an upsurge of anxiety as he approached the house of two convicted witches than that he ingested ergot during his stay in the village and by coincidence experienced the first symptoms of his poisoning as he happened to pass the witches' house.

Thus, the testimony of the witnesses who testified against the Salem Village witches does not support the ergot poisoning hypothesis. On the contrary, it tends to disconfirm it.

The End of the Salem Crisis

Caporael says that "the Salem witchcraft episode was an event localized in both time and space." The implication of this statement is that the episode

was confined to the geographical area hypothesized to be afflicted by ergotized grain. However, by midsummer of 1692 individuals were being accused of witchcraft not only in Salem but also in the neighboring towns of Amesbury, Andover, Beverly, Billerica, Boxford, Charlestown, Gloucester, Ipswich, Salisbury, and Topsfield. The Salem crisis even spurred on witch accusations in Connecticut. No one has proposed that the spreading panic resulted from a concurrent spread of ergotized rye. It is therefore worth noting that the witnesses from neighboring towns who testified against their own local witches provided the same kinds of spectral testimony that are found in the Salem records. Andover even produced its own afflicted girl.

Caporaletto cites a "commonly expressed observation" that the Salem witch hunt, after escalating through the summer of 1692, ended abruptly "for no apparent reason." Her own view is, apparently, that it ended abruptly because the village was no longer exposed to ergotized rye. She points out that, after the crisis had passed, some of the magistrates and jurymen experienced deep remorse and had difficulty comprehending their own behavior. She suggests that ergot may have altered their thought processes during the crisis and after they regained their senses they could not understand what had happened to them.

It is important to point out that abrupt endings to large-scale panics about witchery were the rule rather than the exception. Midelfort, who has studied the many large-scale witch crises that occurred in 16th-century Germany describes the process. These crises commonly began with accusations against socially deviant and lower-class individuals. Accusations escalated quickly, and more and more prominent individuals who did not fit the popular social stereotype of a witch were accused. Inevitably, many people, including some of the prosecuting judges, became increasingly skeptical of the validity of the judicial procedures and the spectral evidence, and persons of standing took steps to bring the persecutions to an abrupt end. These crises were often followed by remorse and second thoughts on the part of some magistrates and other officials. The course of the Salem crisis was the same as that of the typical German crisis.

In summary: The available evidence does not support the hypothesis that ergot poisoning played a role in the Salem crisis. The general features of the crisis did not resemble an ergotism epidemic. The symptoms of the afflicted girls and of the other witnesses were not those of convulsive ergotism. And the abrupt ending of the crisis, and the remorse and second thoughts of those who judged and testified against the accused, can be explained without recourse to the ergotism hypothesis.

The Responsibility of the Puritans

The word "Puritanism" has often served as a handy explanation for whatever is repressive and joyless in American life. It is not surprising then that Puritanism has been assigned much of the blame for the persecution of the witches. At the height of the Watergate scandal of the 1970s, a congressman warned that the impeachment process could turn legislators into "a set of Cotton Mathers, engaging in witch hunts, setting extraordinarily high standards for other people, though not always for themselves."

But do Cotton Mather and his fellow Puritans deserve to be singled out for blame? For if they were responsible for the witch-craze, then how can we explain the persecution of witches that took place in non-Puritan societies, such as Anglican England and Catholic France? GEORGE LYMAN KITTRIDGE (1860-1941), in the early years of the twentieth century, used this line of reasoning to defend the Puritans. By examining the witch-beliefs of Europe, Kittridge tried to prove that Salem was "a very small incident in the history of a terrible superstition."

In the essay that follows, Kittridge refers to the Puritans as "our fathers." And in fact, Kittridge was a direct descendant of the first settlers of Massachusetts. To what extent did the author's desire to defend his ancestors' reputation influence his thinking?

11. A Small Chapter In an Old Superstition

The darkest page of New England history is, by common consent, that which is inscribed with the words Salem Witchcraft. The hand of the apologist trembles as it turns the leaf. The reactionary writer who prefers iconoclasm to hero-worship sharpens his pen and pours fresh gall into his inkpot when he comes to this sinister subject. Let us try to consider the matter, for a few minutes, unemotionally, and to that end let us pass in review a number of facts which may help us to look at the Witchcraft Delusion of 1692 in its due proportions—not as an abnormal outbreak of fanaticism, not as an isolated

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